8216630

Danko, Kenneth Lee

AN EXAMINATION OF COGNITIVE COMPLEXITY AS IT RELATES TO DIFFERENTIAL INFORMATION LOAD IN A FINANCIAL REPORTING ENVIRONMENT

Indiana University, Graduate School of Business D.B.A. 1981

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

AN EXAMINATION OF COGNITIVE COMPLEXITY AS IT RELATES TO DIFFERENTIAL INFORMATION LOAD IN A FINANCIAL REPORTING ENVIRONMENT

BY

Kenneth L. Danko

A Dissertation Submitted in Partial Fulfillment
of the Requirements for the Degree of Doctor of Business
Administration in the Graduate School of Business
of Indiana University

Chairman: Professor James A. Heintz

INDIANA UNIVERSITY
GRADUATE SCHOOL OF BUSINESS

1981

ACCEPTANCE

This dissertation has been accepted in partial fulfillment of the requirements for the Degree of Doctor of Business Administration in the Graduate School of Business of Indiana University.

Date Oct. 30, 1981

Dean, School of Business

Chairman

Member

Member

PREFACE

I would like to take this opportunity to publically thank several individuals whose input, support and encouragement were significant in the completion of this dissertation. I am eternally grateful to Jim Heintz, my dissertation chairman, who unselfishly allocated a great deal of his time and energy to this project. Without his dedication and thoughtful consideration this dissertation would not have been completed. I would also like to thank the other members of my committee, John Myers and Dennis Organ, for their time and their valuable input which I greatly appreciate.

Additionally, I would like to thank my friends Clif Brown and Dick Boland for their frequently repeated words of encouragement: "When are you going to finish?" I would also like to thank my friend Ro Verrecchia for his incessant words of encouragement (which represented only a slight variation on the preceeding theme): "Are you going to finish?" Lastly, a special thanks to my friend Ian Eggleton who almost never mentioned the dissertation.

Ken Danko
Chicago, Illinois
November, 1981

TABLE OF CONTENTS

Chapter | Page

LIST OF TABLES

Table | Page

LIST OF FIGURES

ABSTRACT

This study represents an examination of the Schroder, Driver and Streufert model of human information processing in an accounting context. This model suggests that there is an optimum level of information load which stimulates a maximum level of information processing. Any increase or decrease from this optimum level of information reduces the level of information processing, and by implication, decision effectiveness.

This study utilized the analysis-of-variance model to examine decision making at three different levels of financial information load. Student subjects were randomly assigned to one of three treatment groups, where each group was provided a different number of information items with which to make decisions. Information loads were either three, five or seven commonly reported financial items.

At each information load level, subjects were provided partial financial information for a series of "hypothetical" companies and asked to determine the appropriate stock price for each. The "hypothetical" companies represented different combinations of the three, five or seven financial information items, each having two values.

Analysis-of-variance was used to estimate each of the subjects' decision models based on their judgments of the appropriate stock price for the hypothetical companies. Based on the results of these ANOVA models, comparisons of information processing were made across the three information load levels.

The major results of this study can be summarized as follows: (1) In general, seven financial information items induced higher levels of

information processing than did three information items. However, seven items of financial information did not induce a statistically significant increase in information processing over five items of information. (2) Significant main effects for information cues explained the vast majority of the variance in subject judgments. Configural utilization of information cues explained a very small percentage of the variance for subjects in all treatment groups.

CHAPTER I

INTRODUCTION

The annual financial statements published and distributed by management represent the most important means of communicating information about the firm. In a survey of financial analysts, Rusch (1962) found that they identified the annual report as their most important source of information about companies. The generally recognized importance of financial statements has led accounting theorists and empirical researchers over the last two decades to focus increasing attention on published financial statements. The accounting literature reflects considerable disagreement concerning what information should be disclosed, how it should be measured and how it might best be presented.

Research concerning the use of financial statement information has taken two general directions. One is concerned with characteristics of individual decision makers and the other is concerned with the appropriate characteristics of the financial statements themselves. This dissertation is part of the latter group.

It is generally acknowledged that the primary purpose of financial statements is to provide information for informed decision making (AICPA, 1973). In recent years the disclosure requirements for financial statements have increased substantially. The current mood of the F.A.S.B. and S.E.C. appears to reflect a belief that increasing disclosure of accounting and accounting related information in financial reports will assist decision making. However, several individuals (Fertakis, 1969; Revsine, 1970; Miller, 1972; Wilson, 1973) have suggested that there may be a limit to the amount of information that can be useful in the decision making process. Their caution concerning the growth in financial reporting requirements is based on the model developed by Schroder, Driver and Streufert (1967). Simply stated, the Schroder et al. model suggests that there is an optimum amount of information which permits the individual to maximize the use of that information. Any increase or decrease in the amount of information will result in a lower level of information processing. Therefore, increasing disclosure requirements enacted to aid decision makers may have the reverse effect by actually reducing the level of information processing and, by implication, reduce decision making performance (Revsine, 1970).

The implication for the accounting profession is clear: there may be a trade-off between increased disclosure and the ability of users to use the information.

At this point we know very little about the effects of differential information load on decision making. Although many researchers feel that the possibility for information overload is an important consideration, we do not know at what level it might be expected to occur nor do we know much about what financial cues decision makers use. A great deal of empirical research is needed to study information processing and financial reporting. Ultimately, the accounting profession may come to recognize a practical limit to informational reporting requirements based on the limits of conceptual level as related to environmental complexity.

Recently the FASB has mentioned the possibility that it could require too much financial disclosure when considering individual decision makers and cost benifit analysis:

> The optimal information for one user will not be optimal for another. Consequently, the Board, which must try to cater to many different users while considering the burdens placed on those who have to provide information, constantly treads a fine line between requiring disclosure of too much information and requiring too little. (F.A.S.B. 1980, paragraph 36)

Without empirical research on the effects of information load on information processing, rule making bodies such as the FASB will assess disclosure requirements based on a subjective view of information processing.

Purpose of the Research

The purpose of this research is to provide an exploratory examination of how individuals use financial information in a decision making task and how this use differs when different amounts of information are provided.

In a laboratory setting, student subjects were asked to assess the appropriate stock price for a series of hypothetical companies based on different amounts of financial information. The amounts reported for the financial information items were systematically varied so that analysis-of-variance could be used to model the subjects' decision processes. Comparisons of the ANOVA models were made across three groups of subjects which received three different amounts of financial information. The comparisons were made to assess differences in the level of information processing related to differential information load.

The Schroder, Driver and Streufert (1967) Model

The human information processing system developed by Schroder et al. views an individual's information processing behavior as a function of the environment. In this formulation the dependent variable is the level of information processing (conceptual level) and the independent variable is the environmental complexity of the decision making setting. In general, the Schroder et al. model indicates that the conceptual level of the decision maker will increase with increases in environmental complexity up to an optimal point, after which, any increase in environmental complexity will result in a decrease in conceptual level. This model of information processing gives rise to the inverted-U function presented graphically in Figure 1. This figure demonstrates the characteristic response of an individual to varying levels of environmental complexity.

Conceptual Level

Although the inverted-U shaped function in Figure 1 implies that conceptual level is a unidimensional concept, the Schroder et al. model characterizes conceptual level as being composed of two basic interrelated properties.

(1) Differentiation, the number of dimensional units of information being used by the processing system. (E.g., price and weight might be used as two separate pieces of information when making a purchase decision.)

(2) Integrative complexity, the intricate combination or interconnection of differentiated information units being used by the processing system. (E.g., price and weight might be combined into a single measure like dollars per pound when making a purchase decision.)

According to the Schroder et al. model, conceptual level can be described along a continuum from concrete to abstract.

Environmental Complexity

The Schroder et al. model describes the complexity of the environment as the primary factor in determining conceptual level:

> Overly simple environments, which fail to present sufficiently diverse and/or numerous units of information, fail to stimulate the process of integration, that is, simple structures are sufficient for coping with such environments. Overly complex environments, which provide excessively diverse and/or numerous dimensional units of information, reduce the generation of integratively complex rules for processing information and also reduce the levels of differentiation and integration involved. (Schroder et al., 1967, p. 31)

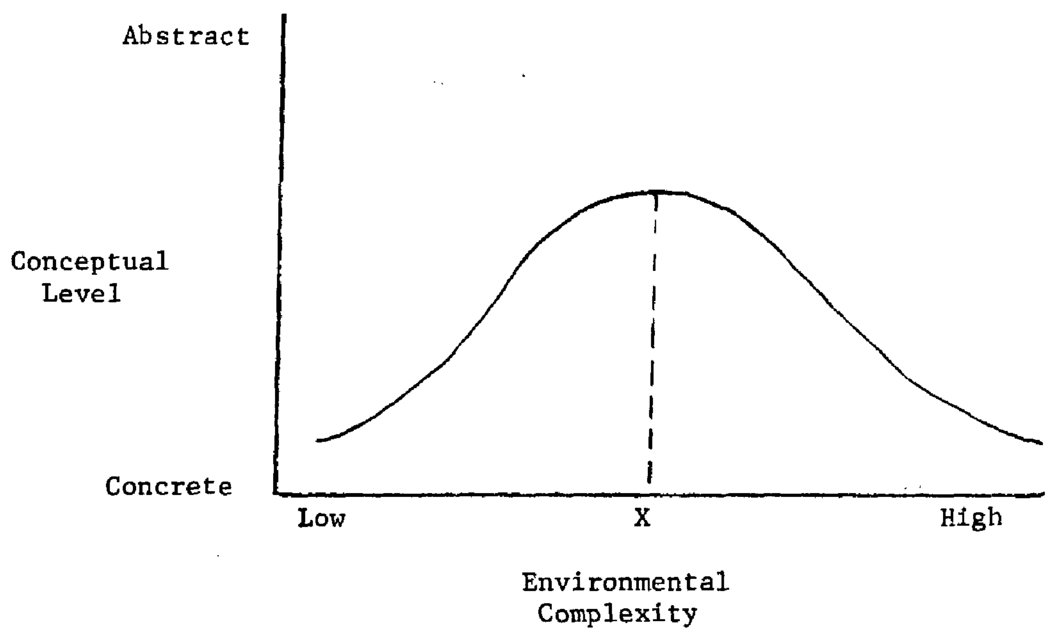
Environmental complexity is viewed along a continuum from low to high and is related to three general properties of the environment. The primary property, information load, includes the amount of information, its diversity and its rate of change. In general, as the number, diversity, and rate of change of data items increase, environmental complexity increases. Noxity and eucity are two secondary properties of the environment affecting complexity. Noxity refers to adverse consequences of behavior including threats, painful events, failure, frustration and other noxious inputs. Eucity relates to the rewards associated with the environment which would include degree of interest, frequency and amount of external rewards, and positive utility of the task. Noxity and eucity affect the perception of environmental complexity by affecting the way individuals scrutinize their environment. In most experimental situations the levels of noxity and eucity are assumed to be equal across treatment groups, leaving information load as the only manipulated independent variable.

Individual Differences

The inverted-U shaped function depicted in Figure 1 represents the general response curve of individuals to environmental complexity. When comparing two or more individuals, their response curves can differ in

Figure 1

The General Schroder et al. Model



terms of amplitude (maximum level of information processing) and position (level of environmental complexity at which maximum information processing takes place). Figure 2 demonstrates two individual response curves where the maximum level of information processing is attained at the same level of environmental complexity (simultaneous peaking). Figure 3 indicates two individual response curves where the maximum level of information processing is attained at different levels of environmental complexity (differential peaking). Individuals whose peak processing level tends to be high are referred to as cognitively complex or abstract. Individuals whose peak processing level tends to be low are referred to as cognitively simple, concrete, or low abstract.

Peaking is an unresolved issue. Schroder et al. hypothesized that at extremes of environmental complexity individuals would process information at similar levels, but that at moderate levels of environmental complexity, abstract individuals would peak higher at higher levels of environmental complexity than would concrete individuals (Figure 3). However, the results of some experiments where subjects were categorized ex ante as abstract or concrete suggest simultaneous peaking (Schroder et al., 1967; Streufert, 1970).

Information Processing and Performance

Although it may be intuitively appealing to automatically associate increases in information processing with increases in performance, Schroder et al. advise that such an assumption may be fallacious:

> If the task requires the processing of large amounts of discrepant information, and if this information must be integrated into a flexible, comprehensive system, then we would expect integratively complex persons to perform better than integratively simple persons. Conversely, we may expect superior performance by simple persons, in an open situation, if the environment is complex and the criterion is simple; such a task

Figure 2

The Schroder et al. Model Illustrating Two Individuals With Simultaneous Peaking

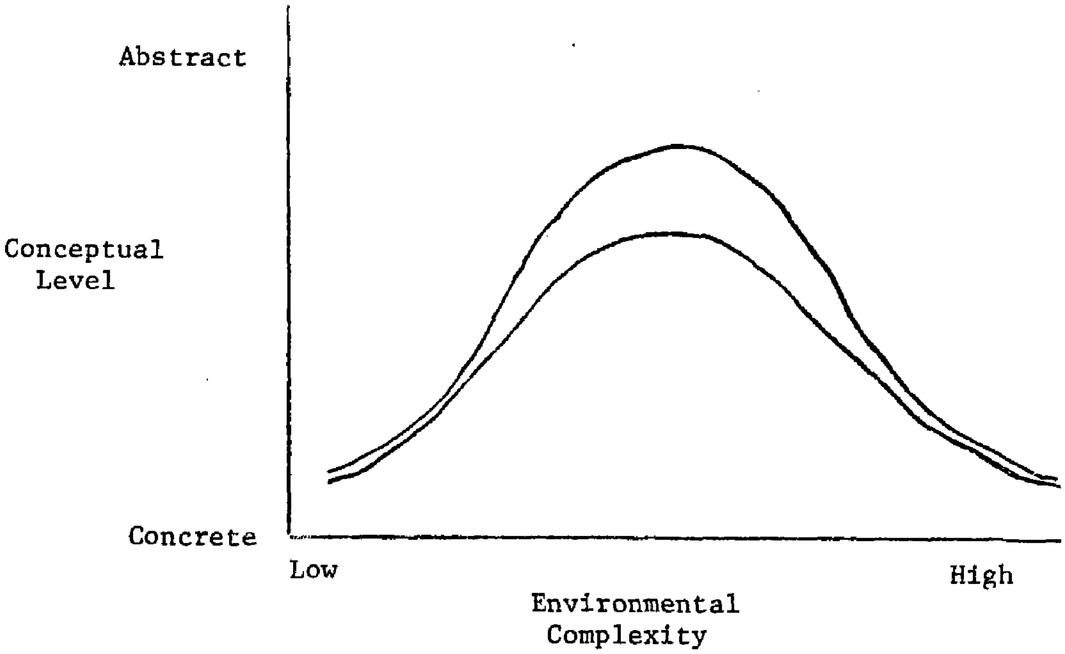
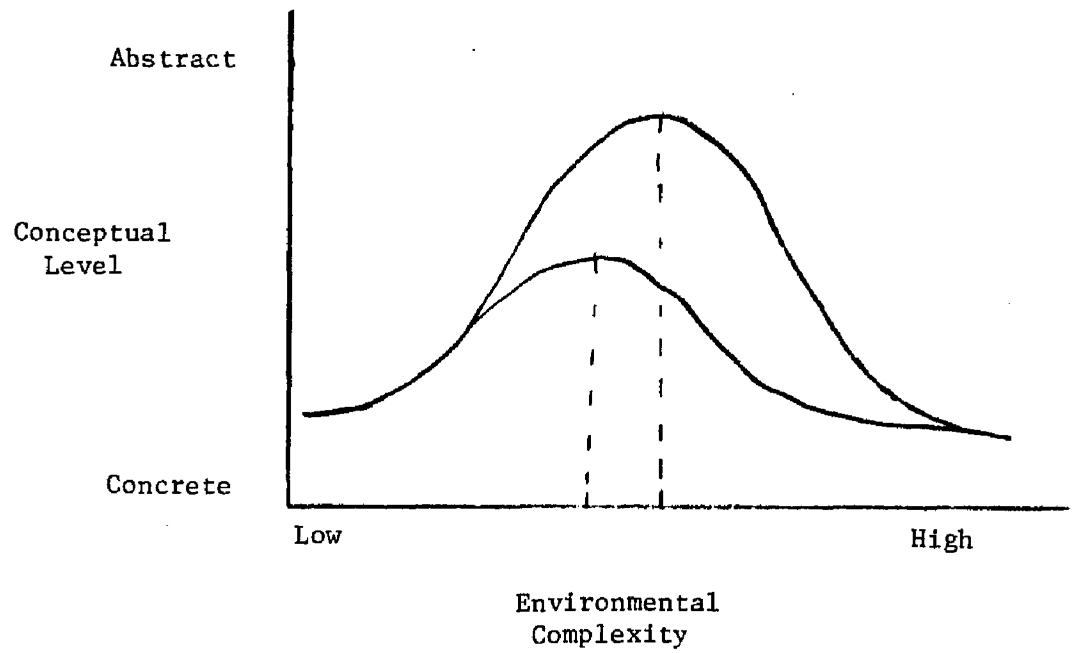


Figure 3

The Schroder et al. Model Illustrating Two Individuals With Differential Peaking



> would be one in which integration is possible, but success requires only simple and unchanging decisions. For example, persons of high integrative complexity in such an area are not likely to track only the most salient information or only information received from one single source. If such behavior is the criterion for successful performances, more abstract individuals will be at a disadvantage. We would predict no differences between simple and complex persons if both the environment and the criterion were simple. (Schroder et al., 1967, p. 122)

Although Schroder et al. discuss performance in general, they do not address specific tasks where the performance criteria might be predictive accuracy. Clearly, the decision situations involving financial accounting information would often be judged on the basis of predictive accuracy. Casey (1980) indicated that the substitution of predictive accuracy for conceptual level seemed appropriate for predicting loan default because of the inherent complexity of the task. This may or may not be true for the task involved in this study, assessing the appropriate stock price. The appropriateness of substituting performance for conceptual level in the Schroder et al. model remains an empirical question which needs to be addressed.

Organization of the Dissertation

The remainder of the dissertation is divided into four chapters. Chapter II presents a review of the relevant literature. This review is divided into two parts. The first part deals with published work in accounting that draws on the Schroder et al. model of human information processing. The second part reviews the literature related to the use of analysis-of-variance to assess cue utilization both inside and outside the accounting literature.

Chapter III presents a detailed discussion of the experimental procedure and the related analysis.

Chapter IV presents the results of the analysis of subject judgments. The final chapter presents the interpretations on these results. In addition, limitations and suggestions for further research are discussed.

CHAPTER II

LITERATURE REVIEW

Introduction

The purpose of this chapter is to review the literature related to the Schroder et al. model of human information processing in accounting as well as the relevant literature related to the assessment of cue utilization in decision making. The final section of this chapter discusses the purpose of this study and relates it to the two areas of literature which are reviewed.

The Schroder et al. Model in Accounting

Introduction

In a non-empirical paper, Revsine (1970) reviewed the Schroder et al. model and suggested implications assuming it was relevant to the accounting environment. He noted that the financial decision making environment was particularly complex and required considerable conceptual skill to be dealt with effectively. Based on the model, he hypothesized that increasing reporting requirements served to increase the complexity of the decision making environment and therefore, any increase in reported information might serve to move the level of environmental complexity beyond the point of maximum conceptual level. This in turn might lower financial decision accuracy. He implied that accounting policy makers should consider the Schroder et al. model when considering additional reporting requirements. Revsine called for empirical research in accounting to determine the relevance of the Schroder et al. model and the optimal level of financial report complexity in order to maximize the conceptual level of statement users.[1]

Miller (1972) expressed agreement with Revsine that the Schroder et al. model may be important to accountants in assessing financial reporting requirements. However, he pointed out that Revsine's conclusion that there might be an optimum level of financial statement complexity is based on an assumption of simultaneous peaking. Without simultaneous peaking it would be impossible to specify one level of financial report complexity that would maximize the conceptual level of all statement users. Miller therefore suggested that the accounting profession should attempt to provide financial reports in such a way as to maximize the conceptual level of the most sophisticated (high abstract) user groups such as financial analysts. He reasoned that this high abstract group would in turn prepare condensed (lower complexity) reports for less sophisticated (low abstract) users. In his non-empirical paper, Miller also called for research on the Schroder et al. model in accounting.

Wilson (1973), in a comment, pointed out that early empirical research seemed to imply simultaneous peaking but that these results were "tenuous at best." His comment seems to support Miller (1972) and the concept of differential peaking as being more likely.

The Revsine/Miller/Wilson articles support the notion that the Schroder et al. model is potentially relevant to accountants, and, therefore, should be thoroughly tested in accounting settings.

---

[1]Streufert (1970) and Schroder et al. (1967) empirically supported the notion of a u-shaped curve as shown in Figure 1 in a laboratory experiment involving a war game. The experimental task differed from a financial reporting environment in fundamental respects. One would be hard pressed to support the proposition that a war game is similar to assessing loan applications or predicting stock appreciation.

Empirical Research

Barefield (1972) studied the effect of aggregation on decision accuracy in a laboratory experiment involving student subjects in a managerial accounting setting. In this experiment the subjects were randomly assigned to one of two treatment groups. Each group received reports with a different level of aggregation. Individuals in each group were provided 80 reports relating to labor and materials variances and were asked to state whether labor had been used efficiently during the period. The aggregated reports consisted of a labor efficiency variance while the disaggregated reports consisted of both the labor efficiency variance and the material quantity variance. The results, although statistically insignificant at conventional levels of significance, indicated that subjects receiving disaggregated data performed slightly better (relative to an optimal decision rule) than subjects receiving aggregated data. Further analysis revealed that subjects receiving disaggregated data were more consistent in the application of their decision model.

The concept of aggregation is closely related to the concept of information load. Aggregation represents the combination of two or more related accounting numbers into a smaller group of numbers. Disaggregated financial data would contain more detailed information and, in terms of the number of information items, represent a larger information load. From an information load perspective, failure of the Barefield study to demonstrate a statistically significant difference in performance may be attributed to two factors. One, the difference in information load may not have been great enough to stimulate a difference in information processing. Two, for this particular task, differences in processing level may not be related to differences in performance.

In a related study, Abdel-khalik (1973) examined the effect of aggregation on predicting loan default in a mail survey of bank loan officers. He concluded that when a firm is marginal, disaggregated data can result in more accurate predictions of default. However, when the firm is not marginal, aggregation may not reduce the accuracy of default predicting. Abdel-khalik points out that more detailed information is desired by bank loan officers in that it can lead to more confidence in the loan decision. This is especially true when the firm is a marginal case. In this study the amount of information presented to the subjects was considerable. At the highest level of aggregation, full financial statements and related notes were provided. The results suggest that for very sophisticated individuals, large amounts of information such as are presented in fully disaggregated financial statements may not represent information overload. Alternatively, the results might simply reflect the fact that performance and processing level may not be related.

Driver and Mock (1975) report the results of a laboratory experiment involving 54 student subjects in a business game modeled upon a manufacturing concern. They were testing for differences in decision time and amount of information purchased as associated with decision style. Subjects were classified into one of four groups on the basis of their style of decision making. Flexible decision makers are said to use small amounts of information to generate several possible decisions. Decisive decision makers use small amounts of information when generating one best decision. An integrative decision style is characterized by the use of large amounts of information in arriving at several possible decisions. Individuals classified as hierarchic decision makers use large amounts of information to generate one best decision.[2] Overall, decision style was not systematically

[2] See Driver (1971) and Savich (1977) for additional discussions of decision style.

associated with either decision time or purchase of information. The authors found a particularly long decision time for subjects previously categorized as "decisive," but noted that the slow pace was not related to high data use because decisives tended to be low data purchasers. They theorized that decisives may have been overloaded by the amount of information. Overall, the results of this study suggest that decision style may not be a fruitful area for research within the Schroder et al. model. Additionally, it suggests that decision time is a poor surrogate for information processing level. The results of this study as well as the results presented in Streufert et al. (1965) suggest that information purchase does not necessarily parallel information use.

In a laboratory study involving 73 student subjects, San Miguel (1976) examined the Schroder et al. model in a managerial accounting setting. The subjects were told that they would be paid as a function of a fixed initial amount with additions to and subtractions from this amount to be made for accurate decisions and the "purchase" of information which was to be used in the decision making process. In this way, San Miguel was able to operationally define processing level on the basis of the amount of information purchased. The level of environmental complexity was manipulated by varying across experimental groups the probability of losing an important contract which was to be bid upon. San Miguel claimed to have produced the U-shaped function in an accounting context with five different probabilities of losing the contract: .1, .3, .5, .7, .9, representing five increasing levels of environmental complexity. These results are open to serious criticism for several reasons. First, there is no empirical support for the contention that the purchase of information is related to conceptual level. Additionally, uncertainty associated with failure is substantially different from the concept of environmental complexity and even further from the concept of information load. Even if researchers were to agree that uncertainty associated with failure is analogous to environmental complexity or information load, San Miguel only provided three levels of "uncertainty." Note that a probability of failure of .3 provides the same level of uncertainty as a probability of failure of .7. Therefore, the probability of .5 represents the highest level of uncertainty; this also represented the highest level of information purchase across treatment groups. At best then, the results of this study support the notion of increasing processing levels with increases in environmental complexity, if one assumes that information purchased is representative of information processing level, and that uncertainty associated with failure is representative of environmental complexity.

Savich (1977) reported the results of a laboratory experiment involving 26 senior accounting students. Savich had the subjects make buy or sell decisions for 64 hypothetical companies, rating each on a nine point scale. Their decisions were based on eight categorical items of financial information. As an example, net income was described as either "up" or "down" as compared with the prior years' results. The 64 companies represented a one-fourth replication of the 256 possible combinations of the eight items each having two categorical states. The buy or sell decisions were analyzed using stepwise multiple regression where significant regression coefficients were used as an operational measure of information processing. Savich did not examine the decisions for possible significant interaction effects even though the one-fourth design would have allowed for estimation of some of the two-way interactions. For the subject group as a whole, Savich found five significant regression coefficients out of a possible eight. Savich also tested for differences in processing level associated with cognitive style. Subjects were classified according to Driver's integrative style test (Driver, 1971). The integrative style test categorized individuals into one of four possible groups: decisive, flexible, hierarchic, and integrative. Savich hypothesized that decisive and flexible decision makers would process less data than hierarchic and integrative decision makers. This was generally supported for decisives but not for flexibles. Savich suggested that eight items of information may not have represented an overload position for flexible decision makers. The Savich study represents an important step in the assessment of cue utilization because it focuses on differences in information processing level associated with cognitive style differences.

McGhee, Shields and Birnberg (1978) reported the results of an experiment similar to Savich (1977). Twenty-four MBA students were asked to judge 64 hypothetical companies on the basis of worthiness for further consideration on an eight point scale. The same eight categorical information items were employed as in the Savich study. The 64 companies were generated as a one-fourth replication of the 256 possible combinations of the eight information items employed.

Like Savich, McGhee et al. were concerned with the effect of decision style and tolerance for ambiguity on the amount of information processed. Again, amount of information processed was operationalized by the number of significant beta coefficients in the linear model. The researchers found no significant effect for decision style or tolerance for ambiguity, which tends to support the findings of Savich (1977).

For the subjects as a group, four of the eight variables had significant regression coefficients. These four were common to both Savich (1977) and McGhee et al. (1978). Additionally, the 28 first order interaction effects were assessed. Although these were not considered in testing for the effects of decision style and tolerance for ambiguity, the researchers found an average increase of .12 in the R^2 by inclusion of the first order interaction terms.

Pratt (1978) attempted to examine the changes in conceptual level induced by the examination of financial reports. In a laboratory experiment involving students and businessmen as subjects, he used multidimensional scaling to assess their cognitive structure along a continuum from abstract to concrete. Here, the subjects were asked to rate the similarity/dissimilarity for each possible paired combination of twelve items contained in financial reports. This was followed by a session in which the subjects were asked to analyze a financial report and predict net income for the next year. Three reports, which varied in terms of complexity, were randomly assigned to the subjects; one report for each subject. Later, multidimensional scaling was again used in an attempt to assess their conceptual level. Here however, ". . . the subjects were asked to specify the similarity rankings with respect to the way in which they recently used the information contained in each section as input for their earnings prediction." Pratt found a significant change in MDS rankings related to the financial report complexity. The highly complex financial report was associated with reduced conceptual level. Note that the Pratt study does not examine cognitive complexity during the decision making task.

Rather, conceptual level is measured before and after the decision making process. This study does not establish the U-shaped curve during decision making but it is significant because Pratt used financial reports in a decision making environment. Further, the Pratt study introduces the use of multidimensional scaling to provide an operational measure of conceptual level. The results of this study are consistent with the intuitive notion (made explicit in Schroder et al., 1967) that individual cognitive complexity (low abstract--high abstract) may change over time and with experience.

Casey (1980) examined the effect of information load on decision accuracy in a task involving the prediction of bankruptcy. Bank loan officers were randomly assigned to one of three treatment groups which differed in terms of information load. The subjects were asked to examine financial statement information for each of ten firms and to predict which firms would declare bankruptcy within three years. Subjects in Group One were provided six financial ratios. Subjects in Group Two were provided the same ratios and the financial statements. Subjects in the third group were provided the ratios, financial statements and the notes to the financial statements. Since the data were drawn from existing firms, Casey had an objective measure of performance (decision accuracy).

Casey found that performance was affected by information load. The performance of subjects in Group Two was significantly better than that of the subjects in Group One. However, there was no significant difference in performance between Groups Two and Three. This research did not allow for a direct assessment of cognitive complexity in decision making. Rather, Casey assumed that decision accuracy and information processing complexity would be related. As a result, the study does not provide a test of the inverted U-shaped curve proposed by Schroder et al. The Casey study is important because it examines decision accuracy as it relates to information load in a financial reporting environment. If decision accuracy and cognitive complexity are highly corollated in the accounting environment, the results of the Casey study would suggest that full financial statements and related notes do not represent the point of information overload for sophisticated users such as bank loan officers.

Outside the accounting literature, some researchers have addressed the relationship between information load (environmental complexity) and the accuracy of expert judgments (Oskamp, 1965; Sines, 1959; Golden, 1964). The conclusion one might reach on the basis of this literature (see Simon and Newell, 1971) is that additions to information load have not been demonstrated to result in decreasing performance although increases in performance, with increasing information, can be small or nonexistent. This cannot be accepted as empirical evidence refuting the Schroder et al. model for two reasons: (1) information load may not have been high enough to induce decreases in information processing and (2) increasing conceptual level cannot always be associated with increasing performance.

Summary

To summarize the empirical work cited above: the work of Barefield (1973), Abdel-khalik (1973) and Casey (1980) suggests that sophisticated experienced decision makers may not have reached reduced information processing with current financial report complexity. The work of Driver and Mock (1975), Savich (1977) and McGhee et al. (1978) suggests that decision style may not be a fruitful area for continued research. It has not yielded significant associations with either information processing levels, decision time or the preference for information.[3] Savich (1977) and McGhee et al. (1978) suggest that multivariate techniques such as multiple regression and analysis-of-variance are potentially valuable tools for examining levels of information processing.

Examination of the theoretical and empirical work in accounting related to the Schroder et al. model suggests that the model has intuitive appeal in accounting and, if applicable, could have an impact on policy decisions involving disclosure.

Assessment of Cue Utilization

In an empirical article, Hoffman, Slovic and Rorer (1968) introduced an analysis-of-variance technique for use in assessing cue utilization. Prior to this time, studies in cue utilization had centered on the use of linear multiple regression to model the judgment process.[4] The accuracy of predictions derived from this analysis was great enough to suggest that decision makers were primarily linear in their combination of cues.[5] Hoffman et al. felt that this was contrary to the intuitive notion that efficiency of judgment in complex situations relies on the ability to combine cues in some non-linear (i.e. configural) fashion. Hence analysis-

---

[3]Note, however, that Dermer (1973) did find associations between tolerance for ambiguity and the amount of information perceived as important. Low tolerance for ambiguity was linked with more information perceived as important.

[4]See Hammond and Summers (1965) for a review of these.

[5]There are, however, examples of the inclusion of configural terms within the regression model, such as Wiggins and Hoffman (1968).

of-variance was introduced to assess both linear and configural utilization of cues simultaneously.[6]

Hoffman et al. (1968) present the results of a study in judgment where ANOVA was used. Here, radiologists' diagnoses of ulcers were based on seven dichotomous cues (symptoms were either present or absent). The results were consistent with prior studies in cue utilization in that about 90% of the variation in the judgments could be predicted by a simple linear combination of the seven cues while completely ignoring interactions. Significant interaction (configural) effects accounted for about 1.7% of the variance.

Slovic (1969) used ANOVA to model the decision processes of two stockbrokers who were judging the growth potential of stock based on eleven dichotomous cues. Significant interaction effects accounted for about 6.5% of the variance in the decisions.

In a closely related study, Slovic, Fleissner and Bauman (1972) used ANOVA to model the decision processes of 18 students and stockbrokers who judged the expectation of capital appreciation for stock based on eight cues. Here, interaction effects accounted for about 4% of the variance.

The two studies, Slovic (1969) and Slovic et al. (1972), have several things in common. Both are important because of their use of ANOVA to model the judgment process in a business setting. Both used a similar set of dichotomous cues such as "sales volume trend" which was described as either "up" or "down." And finally, both studies found significant configural effects in the decision process.

---

[6]For a more detailed discussion of ANOVA designs for use in assessing cue utilization see Hoffman et al. (1968) and Goldberg (1968).

Ashton (1974) used ANOVA to examine evaluations of internal control by 63 auditors. The subjects' judgments were based on six statements about internal control, each of which had two possible states. Ashton found that about 6.4% of the variance in judgments could be explained by interaction effects. This was the first study to use ANOVA to assess cue utilization in a purely accounting (although not financial accounting) context.

Luthy (1975) employed ANOVA to assess the use of seven items of financial accounting information by 83 student subjects in a task which involved determining appropriate stock prices. In this study, about 1% of the variance was accounted for by interaction (configural) affects. This study was important because it represents the first assessment of cue utilization in a strictly financial accounting setting. And it is also important because it is the first study where financial cues were presented as categorical dollar amounts.[7] As an example, dividends per share was either $1.10 or $0.94.

Savich (1977), which was reviewed earlier, employed multiple regression to model the main effects of 26 student subjects in a task involving making buy/sell decisions for companies based on eight categorical information cues. In an experiment using the same eight information cues, McGhee et al. (1978), also reviewed earlier, used ANOVA to assess main and interaction effects for 24 student subjects in evaluating common stock.

---

[7] The use of actual dollar amounts has the advantage of being much more realistic. That is, financial information items are reported in dollars and ratios. Other researchers have used categorical descriptions such as "up" or "down" when referring to information items such as the trend in earnings. In addition to having lower external validity (this is not how earnings are actually reported) this method for presenting information cues is vague and potentially confusing to subjects who are not conditioned to respond to descriptions in other than dollar terms.

The eight cues used in these two studies were suggested by the Accounting Principles Board in their opinion #28 as being the minimum information that should be contained in financial reports. Although McGhee et al. did not use the information about configural use of information in testing their hypothesis, they do report that configural effects accounted for about 12% of the variance in subject judgments.[8]

Summary

The literature review here suggests that ANOVA is recognized as an important tool in understanding the judgment process because of its ability to assess both linear and configural cue utilization. ANOVA has been used successfully in a variety of settings with similar results. Specifically, in each of these studies the researchers concluded that configural cue utilization, characterized by significant interaction effects, accounted for a small percentage of the total variance relative to main effects. However, this does not imply that configural cue utilization is unworthy of study or unimportant. Hoffman et al. (1968) point out that when the payoffs contingent upon accuracy are high, a small contribution to accuracy by a configural assessment of information cues can become quite significant.

Objectives of the Dissertation

This research project is designed to address the following general question on information utilization: How many information cues do people

[8]Note that this percentage is considerably higher than that reported by other researchers. This can be explained by the fact that in all of the other studies, the researchers quoted percentage of the variance accounted for by significant interaction effects. However, McGhee et al. reported an average increase in R^2 by including all interaction terms. One would expect that most of the interaction terms were not, in fact, significant.

use and how do they use these cues configurally with respect to low to moderate differential information loads? This research is suggested by and draws on the Schroder et al. model of human information processing. The accounting literature indicates that the Schroder et al. model is potentially an important theoretical construct for accountants to employ in understanding the use of accounting information in decision making. Hence, an aim of this research is to assess how financial conceptual level is affected by different levels of financial environmental complexity.

Within the accounting literature to date, only three studies have addressed the effects of information load on performance or on the level of information processing: San Miguel (1976), Pratt (1978) and Casey (1980). This research involves the first use of ANOVA to model the decision process and compare these models across information load levels. Although San Miguel (1976) examined the effect of environmental complexity on information processing, this study represents an improvment because San Miguel defined environmental complexity on the basis of uncertainty and utilized the request of information as a surrogate for the level of information processing. This study uses actual differences in the amount of information and models the level of information processing directly from the decisions made by the subjects. For the same reason this study represents an inprovement over Pratt (1978) who used MDS to assess the level of cognitive complexity after the exposure to the decision setting. Again, this study models the decision process more directly. Within the accounting literature, this study is most like Casey (1980) who studied a related phenomenon, the effect of information load on decision accuracy. This study can be differentiated from Casey (1980) in that the focus here is the level of information processing rather than decision accuracy.

This research also draws on the literature relating to cue utilization in decision making. That is, this body of literature suggests that ANOVA is a particularly good tool for modeling the judgment process. As a result, the research design of this study (at the subject level) is organized to take advantage of the ANOVA technique for analyzing investment decisions. Specifically, the information provided for subjects to make decisions is dichotomous and arranged in a factorial manner. As a result, this study uses ANOVA in the same manner as several other accounting researchers, among them: Ashton (1974), Luthy (1975), Savich (1977) and McGhee et al. (1978).

CHAPTER III

METHODOLOGY OF THE STUDY

Introduction

This chapter is divided into several parts relating to the experimental methodology. The first major section provides an overview of the research design. The second section discusses the rational for employing three treatment groups and the information load associated with each group. The third section provides a more detailed discussion of the experimental design. Included in this section are discussions of the analysis-of-variance and its use in this study. The fourth section relates the output of the ANOVA model to the Schroder et al. model. This is followed by sections devoted to the selection of specific information items, preparation of experimental materials and the administration of the experiment. The final section discusses the expected results in a situation where specific hypothesis testing is inappropriate.

Overview of the Research Design

This study employs an analysis-of-variance model suggested by Hoffman et al. (1968) to examine the level of information processing in a financial decision making task at three different levels of information load. Student subjects were randomly assigned to one of three treatment groups which differed in terms of the amount of information that was provided for the task of assessing the appropriate stock price.[1] Each subject was asked to assess 32 hypothetical companies on the basis of the information provided for each company. These 32 companies represented 32 different combinations of the two discrete levels for each information item. As an example, sales was one item of information (a cue) and had two levels, $799,788 and $1,082,066. The item (cue) "sales" was reported in each of the 32 hypothetical companies; for some of the hypothetical companies sales was reported to be $799,788, in others it was reported to be $1,082,066. Each of the other information items (cues) also had two values. As a result, the 32 hypothetical companies represented systematic combinations of the two values each information item could take on. In this way, the factorial analysis-of-variance model, as suggested by Hoffman et al. (1968), could be used to analyze the 32 judgments of each subject to model each subject's decision process.

> When judgments are analyzed in terms of an ANOVA model, a significant main effect for Cue 1 implies that the judge's responses varied systematically with Cue 1. Similarly, a significant interaction between Cues 1 and 2 implies that the judge was responding to particular patterns of these cues, that is, that the effect of variation of Cue 1 upon the judgments differed as a function of the level of Cue 2. (Hoffman et al. 1968, pp. 340-1)

The three treatment groups differed in terms of the number of information items (cues) that were provided for use in the decision process. The three treatment groups employed three, five and seven items of information respectively. That is, the subjects of one group were each asked

---

[1] The decision to use student subjects rests with the rather substantial advantage of availability. Clearly, any researcher doing work in this area who is presented with the opportunity to use subjects who make investment decisions on a daily basis would choose these subjects over a student sample. However, this is a luxury which few researchers enjoy today. This does not imply that student subjects are wholly inappropriate. Accounting students have great familiarity with financial reports and investment decision making. They do lack experience in decision making, which limits the generalizability of results to "real-life" investment decision makers. (See Abdel-khalik (1974) and Alpert (1967))

to rate the hypothetical companies on the basis of three items of information per company while another group of subjects was asked to make evaluations on the basis of five items of information per company, etc.

In this way comparisons of the decision models across the three treatment groups will indicate differences in the level of information processing associated with differences in information load. Figure 4 presents a schematic overview of the overall research design.

Selection of the Levels of Information Load Employed in the Study

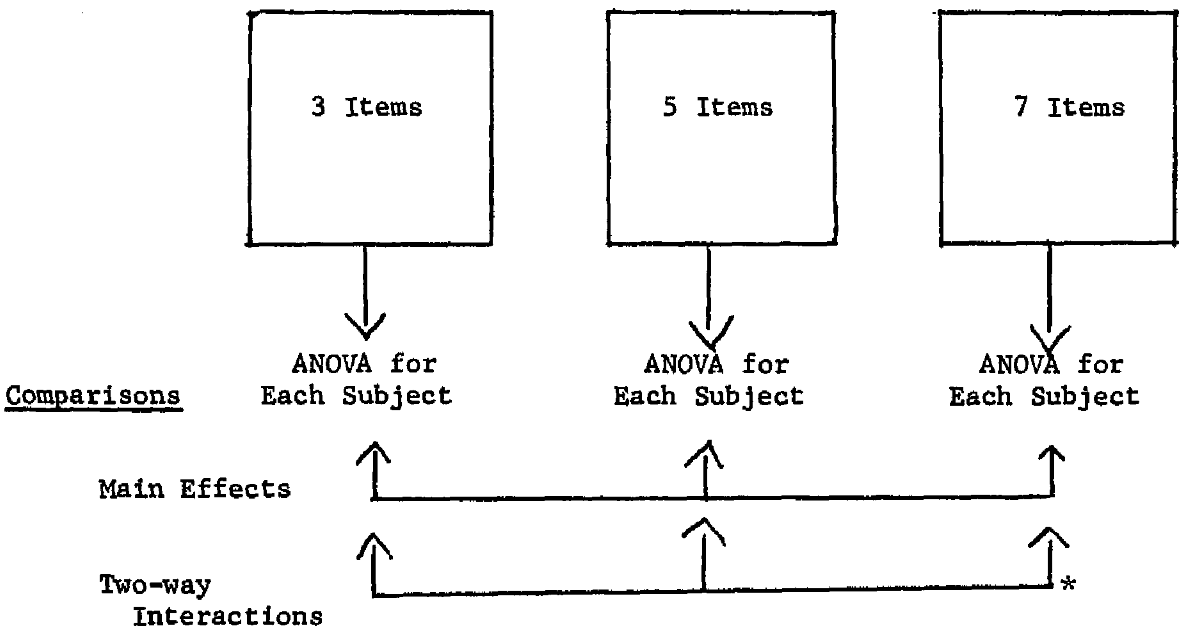
This study involves information loads of three, five and seven items of information.[2] As illustrated in Figure 1 in Chapter I, differences in information load should produce differences in conceptual level for information loads in the moderate range. That is, at an extremely high information load, small changes in the load would be expected to produce little or no change in conceptual level. It is important therefore, that any research into the effects of differences in information load on conceptual level be conducted in that moderate range. As indicated in Figures 2 and 3 in Chapter I, significant differences between individual processors' conceptual levels also take place in that moderate range of information load. Therefore, some support for the notion that the information loads employed in this study are in that moderate range may be developed by examining the differences in results for individual

[2]The decision to use three treatment groups with three different levels of financial information may be supported because it will allow examination of conceptual level over a wide span of information load. As to the number of information items, Miller (1956) suggested that seven items of information might represent an effective limit on information processing ability. In addition, experiments such as this are limited on the high side by experimental time constraints and possible subject fatigue. Note that in a design such as this, increasing the information load by one item doubles the number of possible combinations of items required in the analysis of variance.

FIGURE 4

Overall Research Design

Treatment groups differ in terms of information load:



*Testing for two-way interactions at an information load of seven items will be limited to 18 out of the possible 21 interactions as a result of the fractional replication design.

subjects in the research projects using the ANOVA model. Ashton (1974), who employed six items, does not report results by subject so that a judgment concerning individual differences in decision making cannot be made. Hoffman (1968) and Luthy (1975) both employed an information load of seven items and an examination of their results for individual subjects indicates significant (although not statistically determined) differences both in the number of main effects and in the number of interaction effects. Slovic (1972) employed eight information items and an examination of the results reported by individual subject also indicates large differences in information processing. Slovic (1969) employed eleven information items and examination of the results reported by subject indicates very little difference in information processing as characterized by the number of main and interaction effects. This cannot be taken as strong support for the notion that an information load of eleven items is at the extreme high because Slovic only employed two subjects. However, an examination of the results of Hoffman (1968), Slovic (1972), and Luthy (1975) does support the notion that an information load of seven items is in the moderate range.

The Experimental Design and Methodology

The Task

In choosing a task to examine the level of information processing in a financial reporting environment, two criteria seemed important. First, the task should represent a fairly common use of financial information. Second, the task should be one which would generally be perceived as requiring a fairly complex decision process in order to be successful. That is, if a fairly simple decision task were employed, the maximum information processing level would be constrained by the task itself rather than by the individual subjects. On the basis of these two criteria, the assessment of the appropriate stock price for hypothetical companies was selected as the experimental task.

For each of the judgment situations presented to the subjects, they were asked to indicate how much they would be willing to pay in dollars and cents for one share of common stock. The subjects were instructed that they were to determine the price they would be willing to pay for the stock assuming they were making a long run investment decision. Further, the subjects were told that there were no necessarily correct prices, rather, they were to provide responses on the basis of how they felt about each of the companies.

The Standard Company

Each subject was provided a balance sheet, income statement and statement of changes in financial position for a "standard" company. The purpose of the standard company was to provide a "benchmark" to aid the subjects in the decision making task. They were told that the standard company stock was currently worth $18.00 per share. Additionally, information from the standard company financial statements was presented side by side with the corresponding information for each of the 32 hypothetical companies to facilitate the comparison process.

The Hypothetical Companies

The subject's task was to assess the appropriate stock price for a set of hypothetical companies. The dollar amounts of the financial information items of the hypothetical companies were based on the same information items from the standard company. That is, the information items of the hypothetical companies were either 85% or 115% of the dollar

TABLE 1

Amounts Used For Construction of
the Hypothetical Companies

Information Item	Amount Reported by Standard Co.	Amounts Used For Hypothetical Companies: 85% of Standard	115% of Standard
Return on Equity	9.22%	7.84%	10.60%
Sales	$940,927	$799,788	$1,082,066
Earnings Per Share	$1.75	$1.49	$2.01
Return on Assets	4.36%	3.71%	5.01%
Operating Income	$58,369	$49,614	$67,124
Current Ratio	1.80	1.53	2.07
Dividends Per Share	$1.10	$0.94	$1.27

TABLE 2

The Four Groups (Combinations) of Information Items Presented to Subjects With an Information Load of Three Items

Group 1	Group 2
Return on Equity	Earnings Per Share
Sales	Return on Assets
Earnings Per Share	Operating Income

Group 3	Group 4
Operating Income	Return on Equity
Current Ratio	Earnings Per Share
Dividends Per Share	Dividends Per Share

amount reported by the standard company.[3] Each information item for the hypothetical companies therefore took on two possible values (115% or 85% of "Standard"[4]). Each of the hypothetical companies represents one of the possible combinations of items, each having two values.

Table 1 presents the information items employed in the experiment as well as the values reported by the standard company and the corresponding amounts used to construct the hypothetical companies.

Three Item Load

A fully crossed factorial design for three information cues, each with two levels, results in 2^3 or 8 possible combinations which translates to 8 hypothetical companies for the subjects to judge. However, it was felt that the task for all of the subjects should be similar in terms of the number of judgments to be made. Therefore, the subjects who were to make decisions based on three items of information should make the same number of decisions as the subjects who received five and seven items of information (i.e. 32 decisions). As a result, they were asked to make judgments on the basis of four different combinations of cues with three cues per combination. That is 4×2^3 or 32 combinations. The four groups of items are presented in Table 2. The selection of the

---

[3]Stallman (1969) suggested that variations of 15% to 20% from "Standard" were appropriate in research designs such as this. Additionally, this has the advantage of allowing for better comparability of the results to the results of Luthy (1975) who used variations of 85% and 115%. Slovic (1969) and Slovic et al. (1972) used non-numerical information with two possible states. For example, the yearly trend in earnings per share was described as either "up" or "down."

[4]Note that the analysis of variance design could employ more than two values for each variable. For instance, at five items with three values each, this would become a 3^5 design. However, two values are sufficient to assess if changes in the value are associated with changes in the decision.

information items in Group 1 is discussed in a later section of this chapter. The selection of the information items in Group 3 was determined by using the last three items from the seven item pool presented in Table 4 on page 43. Groups 2 and 4 were determined on an arbitrary basis so that they represented different combinations.

In addition to making the task comparable in terms of the number of decisions across the three treatment groups, employing three additional combinations at this load level affords the opportunity to determine if the level of information processing at a three item load is affected by the specific information items employed from the seven item pool used in this study.

Five Item Load

The 32 hypothetical companies which were employed for the five item load represent all of the possible values. That is, a fully crossed factorial design for five information cues, each with two levels, results in 2^5 or 32 possible combinations.

Seven Item Load

A complete factorial design for seven factors with two values (2^7) involves 128 possible combinations. This would necessitate 128 "hypothetical" companies to be rated by the subjects. Clearly, time constraints and subject fatigue prohibit 128 ratings. A one-fourth fractional replication however, would present a reasonable number of hypothetical companies to be rated (32). This would allow testing for all of the main effects and 18 of the 21 possible two-way interactions.

Cochran and Cox (1957) present a one-fourth fractional replication of a 2^7 design, that is, they indicate which 32 combinations out of the total of 128 possible combinations will provide for the most thorough analysis of main and interaction effects. The notation which follows is the same as that used by Cochran and Cox (1957). A,B,C,D,E,F and G stand for the seven information items (factors) listed in Table 4 on page 43. Recall that each factor (information item) can take on only one of two values, 85% or 115% of the standard company. For each of the 32 combinations (companies) listed in Table 3, a lower case letter indicates that, for that particular combination (company), that factor (information item) will be the higher value, 115% of the standard. The absence of a lower case letter in any combination indicates that factor will be the lower value, 85% of the amount reported by the standard company. Hence, the hypothetical company represented by combination 22. acfg will involve 115% of the standard amount for the factors A,C,F and G, and 85% of standard for the factors B, D and E.

Analysis-of-Variance

The analysis of variance model affords the opportunity to examine both linear and configural cue utilization. The linear components of the decision model are revealed by "main effects;" the configural components of the decision model are revealed by "interaction terms." A significant main effect indicates that the subject's judgments varied systematically with that particular cue (factor). A significant two-way (two factor) interaction effect indicates that the subject's judgments varied systematically with patterns of the two cues (factors).

The ANOVA model makes it possible to calculate an index (omega-squared) of the importance of the main or interaction effects. Omega-squared is an estimate of the proportion of the variance in an individual's

TABLE 3

Experimental Treatments (Combinations) for the Fractional Replication at the Seven Item Load

1.		9.	beg	17.	aeg	25.	ab
2.	fg	10.	bef	18.	aef	26.	abfg
3.	de	11.	bdg	19.	adg	27.	abde
4.	defg	12.	bfd	20.	adf	28.	abdef
5.	ceg	13.	bc	21.	ac	29.	abceg
6.	cef	14.	bcfg	22.	acfg	30.	abcef
7.	cdg	15.	bcde	23.	acde	31.	abcdg
8.	cdf	16.	bcdefg	24.	acdefg	32.	abcdf

judgment model that might be predicted from the knowledge of the level of the information cue or pattern of cues. The interpretation of omega-squared is analogous to that of the R^2 in a regression model.[5]

The use of ANOVA techniques to model decision processes is limited to situations where the cues can be regarded as categorical or discrete treatment factors rather than continuous variables. The use of a factorial design provides for orthogonality.

With the ANOVA design, each information item (such as sales) is a cue for use by the subject in his decision process; it is also a factor for the analysis. In this experiment, each factor (cue, information item) had two discrete values (levels). Each combination of one level from each factor included in the experiment is referred to as a treatment. Each treatment is presented to the subject and requires one judgment. In the context of this study, the treatments were presented as hypothetical companies to be rated. A "fully crossed" factorial design refers to a situation where all possible combinations of the different levels of the factors was employed. In contrast, the term "fractional replication" refers to the situation where only a carefully selected subset of the total number of possible combinations was used.

Outputs of ANOVA and the Schroder et al. Model

The Schroder et al. model would predict differences in conceptual level for different information loads in the characteristic inverted-U shape as shown in Figure 1 in Chapter I. The analysis-of-variance of the subjects' decisions revealed what specific items and how many items they used in their decision process as well as how many and what specific

[5]For a thorough discussion of omega-squared, see Hays (1973).

configural relationships of items were used. Recall that conceptual level is defined along two dimensions: (1) differentiation, which refers to the number of information cues used in a decision process, and (2) integrative complexity, which refers to the "interconnection" or configural utilization of information cues. The analysis of variance of investment decisions indicates the number of significant main effects as well as significant interaction effects for each subject. Differences in differentiation were assessed by testing for a significant difference between the mean number of main effects per subject for each treatment group representing the three levels of information load.

Examining for differences in integrative complexity was less straightforward. The method for examining possible differences in integrative complexity involves the use of a "profile" of two tests for differences. Differences in the mean number of significant two-way interactions between groups were assessed. Additionally, differences in the mean total omega-squared for the significant two-way interactions between groups was assessed. These two tests for differences between groups provide a profile of configural cue utilization which should allow for a reasonably informed judgment of differences in integrative complexity across the three levels of information load.

Selection of Information Items Used in the Experiment

In selecting the variables to be used in the experiment, an attempt was made to look for some degree of consensus in studies in which individuals were asked about the relative importance of financial accounting variables. Table 4 presents the seven variables selected for use in the experiment and a derived ranking of each variable in three surveys concerning the importance of accounting items.

Chandra (1975) surveyed security analysts and public accountants concerning the importance of various information items in making equity investment decisions. Respondents were asked to rate 58 information items on a five point scale. An "x" in the column labeled "Chandra" in Table 4 indicates that this item had an average ranking of 4.5 or better as determined by the security analysts. In the Chandra study, sixteen items received a ranking of 4.5 or better.

Mautz (1968) polled financial analysts and asked them to rate the relative importance of various items (sources) of information in making investment decisions. Respondents were asked to rate the relative importance of 41 items by allocating 100 points among all of the items. An "x" in the Mautz column indicates that this item received an average rank of two points or higher when comparing all the variables. A total of 22 items were ranked this high by the respondents.

Martin (1971) polled a sample of chartered financial analysts concerning the importance of various items of information for investment decision making. Here the subjects were asked to consider 47 variables. An "x" in the Martin column indicates that this item received a ranking of twelve or better when compared with all other items where the total was 350 points for all 47 items. In the Martin study, a total of sixteen items received a ranking of twelve or better.

In examining the results of these three studies for some degree of consensus as to the perceived importance of various items of information, a problem arises. Each researcher was addressing essentially the same general research question; however, their test instruments were different. In rating relative importance of items, the subjects provided responses to the items as requested in the questionnaire. Note that for each study the number of items as well as the items themselves were different, as

TABLE 4

Financial Information Items
Employed in this Study

	Chandra	Mautz	Martin	Average Rank
1. Return on Equity		X	X	1
2. Sales	X	X		2
3. Earnings per Share	X		X	3.5
4. Return on Assets		X	X	3.5
5. Operating Income	X	X		3.5
6. Current Ratio	X*	X	X	6.3
7. Dividends per Share		X	X	8.5

*As Current Assets and Current Liabilities were their wording and their order of organization and presentation. The search for consensus is complicated further because some of the "items" used by the researchers do not fit the concept of an "item" as used in this study. As an example, Chandra's item #40 relates to segmented information:

> Breakdown of sales, net operating income and investment of diversified co's. By operating division, product, line of business, or customer group (segmented on the basis of 15% or more contribution to gross revenue or operating income, f.t.p.)

This "item" received a high rating(4.648) but cannot be considered one item in the sense that reporting net income represents one item, that is, a single dollar amount. In comparing these studies to select the information items, variables such as the one shown above which could not be quantified by a single dollar or numerical amount were eliminated from consideration.

After eliminating all "items" which could not be quantified by a single numerical amount, the top ten remaining items from each study were compared to examine for a consensus. The seven items listed in Table 4 were the only items which were common to at least two of the three top ten lists. The number in the column labeled "average rank" indicates the average rank for that item based on the rank (from one to ten) in the studies for which it ranked in the top ten. There was evidence of a high degree of consensus for items that were in at least two top ten lists. As examples: return on equity was ranked first in both studies for which it was in the top ten, sales ranked second in both studies, operating income ranked third in one study and fourth in the other, return on assets ranked third in one study and fourth in the other. The absence of return on equity from the top ten ranking in the Chandra study probably occurred because return on equity was not presented as an "item" to the subjects. The same is true for earnings per share in the Mautz study, operating income in the Martin study, and dividends per share and return on assets in the Chandra study. Sales was the only item included in all three studies which ranked in the top ten for two of the studies but not in the third. This may be explained by the manner in which sales was presented as an item in the Martin study: "size of the company indicated by total sales." Perhaps the subjects did not view "size" as important information or perhaps they viewed sales as a poor measure of size. This would explain a low ranking in the Martin study, while it was ranked second by subjects in both the Chandra and Mautz studies.

Table 5 indicates the information items which were employed at each of the three levels of information load. The information items selected for information loads of three and five items were selected from the pool of seven information items. At a load of three items, those selected include the top two from the list of seven based on average rating. Earnings per share was selected as the third item even though it has the same average ranking as operating income and return on assets because it ranked first in the Chandra study. At a load of five items, those selected represent the top five items from the list of seven based on average ranking. The effect of this assignment of financial items to information loads of three and five items is essentially the same as the selection of items at a load of seven items. That is, an attempt has been made to utilize financial information items perceived by individuals to be most useful for decision making at each of the three levels of information load. The assignment of financial information items starting (at a level of three items) with those perceived to be most useful has several advantages.

TABLE 5

Financial Information Items
Employed at Each Level of
Information Load

Information Load	Information Items
3 Items	Return on Equity Sales Earnings per Share
5 Items	Return on Equity Sales Earnings per Share Return on Assets Operating Income
7 Items	Return on Equity Sales Earnings per Share Return on Assets Operating Income Current Ratio Dividends per Share

(1) It is reasonable in that it will utilize the financial items at each load that might most often be requested by subjects if they were in a position to request or search out information items. (2) Using the same items for each subject at a given information load level will allow for determination of the relative importance in use for those specific financial information items.[6] (3) This information item assignment provides the subjects at each information load level the best chance to maximize conceptual level by providing information that is perceived to be most useful. (4) The proposed selection of information items at information loads of three and five items has the advantage of insuring that the information load of five items is higher than the load of three items and that the information load of seven items is higher than the load of five items. With each successive move from a lower information load to a higher information load, the lower load items are retained and two additional items are added. Hence, five items and seven items represent increasing information load without adherence to a definition of load based strictly on the number of items.

---

[6]Given that the specific financial information items for load levels of three and five items should come from the same pool of items employed at the seven item load, three possible criteria for selection of specific items at the lower load levels could be considered: (1) for each load level, select the top items in the same way that the seven item pool was selected, (2) select the three lowest ranked items from the seven item pool for the three item load level, select the five lowest ranked items from the seven item pool for the five item load level (note that this is the reverse procedure from #1 above), (3) randomize for each subject the selection of items at load levels of three and five items. Number two above was rejected because it was not consistent with the criteria for selecting the original seven items, which was to base a selection on perceived usefulness. Number three was rejected because it would not allow for the determination of the relative contribution of specific items to the decision process.

Preparation of the Experimental Materials

Each experimental questionnaire booklet appeared the same from the outside and was composed of the same number of pages. The order of these pages was as follows:

Page Number	Description
1	*cover sheet
2 & 3	*standard company financial statements
4 thru 35	the 32 "hypothetical" companies
36	*the demographic questionnaire

*These pages were the same for all experimental booklets.

The Cover Sheet

An example of the cover sheet of instructions is presented in Appendix B. Note that this cover sheet was the same for all the experimental booklets. Prior to its use, this sheet was given to several undergraduate students who were asked to comment on its clarity. These students were not part of the subject pool drawn for the study.

The Standard Company Financial Statements

An example of standard company financial statements is provided in Appendix B. These financial statements were taken from Luthy (1975) with slight modifications made to improve clarity and remove the dates. Note that these statements were the same for all subjects.

The 32 Hypothetical Companies

Appendix C contains one of the 32 hypothetical companies used for subjects with an information load of three items. Likewise, Appendices D and E each contain an example of the 32 hypothetical companies used for subjects with information loads of five and seven items respectively. The 32 hypothetical companies were presented on 32 separate pages. Note that these 32 pages, although the same for subjects within each treatment group, were the only pages which were different between the three treatment groups.

The procedures for preparing these hypothetical companies were as follows: skeleton master sheets were run off which contained all the information except the company name and the financial information peculiar to that hypothetical company. Each of the 32 hypothetical companies' data, representing 32 different combinations of the information items, were carefully typed into the blank spaces on the skeleton sheets along with a company name which served to identify the particular combination of cue levels. These hypothetical companies were then double checked for accuracy by two people.

The three-letter identifying company names were sequenced so that the last letter (or last two letters) could be used to identify the combination while the first one or two letters were assigned in a random fashion. The last letter sequence was as follows: A,B,D, . . ., Z, AA, BA, CA, . . ., HA. This allowed for randomization of the 32 hypothetical companies without appearing out of place to the subjects who might be perplexed by a numerical designation which was not in order. With a numerical designation, subjects might also be inclined to spend time looking for some systematic association with the information items. The lettering system had the advantage of appearing random to the subjects while allowing for easy identification by the researcher.

As a final step in the preparation of the experimental booklets, the 32 hypothetical companies were shuffled in a random fashion separately for each experimental booklet to eliminate any systematic bias that may have resulted from fatigue as the subjects moved through the 32 companies.

The Demographic Questionnaire

Appendix F contains the demographic questionnaire which served as the last page for all of the experimental booklets.

The intent of this questionnaire was to provide information to characterize the subjects.

Administration of the Experiment

The experimental questionnaire booklets were ordered in stacks such that the booklets containing the experimental materials for the three, five and seven item loads occurred every third booklet in each stack. These booklets were then passed out by the researcher to two sections of undergraduate cost accounting students at Indiana University in April, 1981. The verbal instructions presented in Appendix A were then read to these classes. Additionally, the subjects were asked to return the booklets to a box placed in the front of the room when they were finished. After the last subject was finished in each class, the researcher thanked the subjects and provided a thorough debriefing concerning the nature of the experiment itself and the Schroder et al. model.

Although no formal measure of time was used, it appeared that the subjects averaged about 30 minutes to complete the task. The first subjects returned the materials in about 20 minutes and the last subject returned the materials in 45 minutes.

In Lieu of Hypotheses

In Chapter II the objectives of the research were discussed in general terms. This section is devoted to some discussion of the expected results.

Given the nature of this line of inquiry and the lack of substantial empirical research in the area, the statement of formal hypotheses does not seem appropriate. However, it does seem appropriate to discuss expectations about the possible results.

In other studies of judgment employing factorial ANOVA designs, the main effects for the factors accounted for most of the explained variance. The expectation is that the results of this study will be consistent with that finding. That is, the variance explained by configural cue utilization is expected to be small relative to the variance related to significant main effects.

As to specific information items, they are all relevant to the task and, as a result, one might expect that they would each contribute to explained variance. However, there is no firm basis on which to generate expectations about the relative effect of each main or interaction effect.

With respect to comparison across groups to examine differences in conceptual level, no prior research has been done which measures conceptual level as a function of information load during the task. At best, the measures of conceptual level employed by Pratt (1978) and San Miguel (1976) could be viewed as unproven surrogates for actual conceptual level. It appears that one of three possible outcomes is likely. (1) Conceptual level will rise (the U-shaped function will be demonstrated) across the three, five, and seven item treatment groups. (2) No differences in conceptual level will be demonstrated. (3) Differences in conceptual level will exist overall but specific contrasts between groups will not indicate significant differences.

CHAPTER IV

RESULTS OF THE STUDY

Introduction

This chapter contains results of the analysis of the subjects' judgments. The first section identifies the usable data obtained from the subjects. The second section presents the results of the ANOVA models of the subjects' judgment processes at each of the three information load levels. The third major section of this chapter presents the results of the formal comparisons of these ANOVA models across the three subject groups. The last section of this chapter presents the results of the examination of various characteristics in the subjects' experience as they relate to the level of information processing.

Usable Data

Ninety-three experimental booklets were handed out to subjects. A total of 78 usable booklets were obtained. Fifteen booklets were eliminated because they were not complete. At the five or seven item load, any examination booklet which was not complete was eliminated from the sample. At the three item level, however, it was possible to use some booklets which were not complete. Recall that at the three item level, the 32 hypothetical companies were comprised of four separate groups consisting of eight hypothetical companies in each group. As a result, four separate ANOVA models could be generated for each subject at this load level. There were two subjects who did not rate all 32 of the hypothetical companies but who rated all of the hypothetical companies in Group One, which relates to the main research questions addressed by the study. As a result, they were included in the sample of 78 subjects. However, for these two subjects, the results from each group of companies which was not complete were eliminated from the sample.

Results of the ANOVA Model

At the three and five item levels, the subject judgments represent a fully crossed, factorial design (i.e. one observation per cell). The residual term for testing the effects, both main and interaction, is usually based on the within-cell variance. However, in designs where there is one observation per cell, and therefore no within-cell variance, the usual procedure is to pool one or more of the higher order interaction sum-of-squares to form the residual term (Lindman, 1974, p. 155). That is, at the three item level, the three-way interaction sum-of-squares is not testable; rather, it is used to test the main and two-way interaction terms. At the five item level, all of the interaction sum-of-squares above two-way were pooled into the residual sum-of-squares. This procedure insured comparability of ANOVA results to those of the three and seven item loads where testing for interactions above two-way was not possible. This is consistent with the notion that higher order configural relationships make neglible contributions to information processing or are non-existent.[1] At the seven item level, the fractional design allowed for testing 18 of the 21 possible two-way interactions.

---

[1] See for instance: Goldberg (1968), Hoffman (1968) and Ashton (1974).

Three Item Load

At the three item level the subjects rated a total of 32 hypothetical companies. These companies were divided into four groups (eight companies per group) as shown in Table 2 in Chapter 3. ANOVA models were generated from these ratings for each group for each of the subjects at this load level. Recall that the ANOVA models for Group One (return on equity, sales, and earnings per share) were to be used in assessing the effect of information load on the level of information processing and that Groups Two, Three and Four were to be used to provide some assessment of the effect of the selection of three specific information items from the seven item pool on the information processing level as well as to provide 32 judgments for these subjects, the same number as subjects at the five and seven item levels rated. Table 6 presents a list of significant effects from the analysis-of-variance, by subject, for Group One items at the three item level. Table 7 summarizes this on a specific information item and configural relationship basis. Table 8 presents the ANOVA results for the 25 subjects at the three item load level summarized by item groupings.

Five dimensions of the ANOVA results are presented in Table 8: (1) Number of significant main effects, (2) number of significant interaction effects, (4) number of significant effects (both main and interaction), and (5) average variance accounted for by significant effects (both main and interaction). Note that Group One represents the "first" three items for the seven item pool and that Group Three represents the "last" three from that pool. Specific comparisons were made between all possible pairs of Groups on the basis of these five

TABLE 6

Summary of ANOVA Results by Subject
Three Item Load

Subject Number	Significant Financial Variables (Main Effects) R.O.E.	Sales	E.P.S.	Number of Significant Interactions
1			X	
2	X	X		1
3			X	
4				
5			X	
6			X	
7			X	
8				
9				
10			X	
11				
12				
13	X		X	
14				
15			X	
16		X	X	
17				
18				
19				
20			X	
21				
22				
23				
24				
25			X	
Total Number	2	2	11	1

TABLE 7

List of Significant Main and Interaction Effects
Three Item Load

Information Item or Configural Relationship	Number of Significant Effects
Earnings per share	11
Return on equity (R.O.E.)	2
Sales	2
R.O.E. x Sales	1
Total number of significant effects	16

TABLE 8

Comparison of Information Processing Across Four Groups of Information Items at the Three Information Item Load

	Group 1	Group 2	Group 3	Group 4
Information Items:	R.O.E. (2) Sales (2) E.P.S. (11)	E.P.S. (7) R.O.A. (2) Opr. Inc. (2)	Opr. Inc. (1) C.R. (3) Div./Sh. (6)	R.O.E. (3) E.P.S. (8) Div./Sh. (2)
Number of subjects:	25	23	24	25
Number of significant main effects:	15	11	10	13
Number of significant interaction effects:	1	1	0	2
Average variance accounted for by significant interaction effects:*	.73%	.01%	0%	.11%
Number of significant effects:	16	12	10	15
Average variance accounted for by significant effects:**	44.03%	33.73%	35.73%	34.44%

*Omega-squared statistics were summed for all significant interaction effects and divided by the number of subjects.

**Omega-squared statistics were summed for all significant effects and divided by the number of subjects.

dimensions. None of these comparisons was statistically significant at commonly accepted significance levels; in fact, none of these comparisons was significant at $a \leq .20$. This suggests that the level of information processing at the three item load was not sensitive to the three specific information items selected from the seven item pool.

Five Item Load

At the five item load each subject made 32 judgments of hypothetical companies representating all the possible combinations for the two levels of each item. Results of the ANOVA models in terms of significant effects for subjects' judgments at this load level are summarized in Table 9. Table 10 summarizes these results on an information item and configural relationship basis.

Seven Item Load

At the seven item level a total of 128 possible combinations exist for seven items each having two possible values. At this load level, unlike the three item and five item levels, one-fourth replication was employed. This fractional replication technique involves presenting the subjects at this load level with the 32 combinations which would allow for the most thorough analysis of their judgment processes. ANOVA results at this load level include assessment of all the possible main effects and 18 of the 21 possible two-way interactions. Table 11 presents the ANOVA results by subject, indicating the significant main and interaction effects. Table 12 summarizes these results on an information item and configural relationship basis.

TABLE 9

Summary of ANOVA Results by Subject
Five Item Load

Subject Number	R.O.E.	Significant Financial Variables (Main Effects) Sales	E.P.S.	R.O.A.	Opr. Inc.	Number of Significant Interactions
26			X	X	X	
27	X		X	X	X	1
28	X	X	X	X	X	
29	X			X		1
30			X	X		
31			X			
32	X	X			X	1
33	X	X	X	X	X	
34			X			
35	X			X		
36	X					
37			X			
38		X			X	
39			X			
40			X			2
41	X					1
42			X			
43			X	X		
44	X	X	X	X	X	
45				X	X	
46	X	X	X	X		3
47	X	X			X	
48	X	X	X	X		
49			X			
50						
51	X	X	X	X	X	1
Total Number	13	9	17	13	10	10

TABLE 10

List of Significant Main and Interaction Effects
Five Item Load

Information Item or Configural Relationship	Number of Significant Effects
Earnings per share (E.P.S.)	17
Return on equity (R.O.E.)	13
Return on assets (R.O.A.)	13
Operating income (Opr. Inc.)	10
Sales	9
R.O.E. x E.P.S.	2
R.O.E. x Opr. Inc.	2
E.P.S. x R.O.A.	2
R.O.E. x Sales	1
Sales x E.P.S.	1
Sales x R.O.A.	1
Sales x Opr. Inc.	1
Total number of significant effects	72

TABLE 11

Summary of ANOVA Results by Subject
Seven Item Load

Subject Number	Opr. Inc.	Div./ Share	Significant Financial Variables (Main Effects) E.P.S.	R.O.E.	R.O.A.	C.R.	Sales	Number of Significant Interactions
52	X	X					X	
53			X		X			
54		X	X				X	4
55		X	X	X	X	X	X	8
56	X							
57			X	X	X	X		
58				X	X	X		
59	X		X	X	X			
60		X						
61	X			X	X	X	X	1
62		X	X	X	X	X		
63		X						
64		X	X	X	X			
65	X	X		X				4
66	X	X						
67			X					
68			X	X				
69				X	X			
70			X					
71		X	X		X		X	
72		X	X	X	X			3
73		X						
74				X				
75		X	X			X	X	3
76	X					X	X	3
77			X					
78		X	X	X		X		1
Total Number	7	14	15	13	11	8	7	27

TABLE 12

List of Significant Main and Interaction Effects
Seven Item Load

Information Item or Configural Relationship	Number of Significant Effects
Earnings per share (E.P.S.)	15
Dividends per share (Div./Share)	14
Return on equity (R.O.E.)	13
Return on assets (R.O.A.)	11
Current ratio (C.R.)	8
Operating income (Opr. Inc.)	7
Sales	7
Opr. Inc. x Div./Share	3
Opr. Inc. x R.O.E.	3
Div./Share x E.P.S.	3
R.O.A. x E.P.S.	3
Sales x E.P.S.	2
C.R. x Sales	2
Div./Share x Sales	2
Opr. Inc. x R.O.A.	2
Opr. Inc. x E.P.S.	1
Opr. Inc. x C.R.	1
Opr. Inc. x Sales	1
Div./Share x R.O.E.	1
Div./Share x R.O.A.	1
Div./Share x C.R.	1
E.P.S. x R.O.E.	1
Total number of significant effects	102

Note that subjects 54, 55 and 65 have a high number of significant interaction effects relative to the other subjects at this load. These results are consistent with Luthy (1975) who reported finding subjects with 4, 5, 6 and 8 significant interaction effects using seven information items. A review of the demographic information for these three subjects provided no clue as to why they were more complex processors than the other subjects in this group. None of three reported any experience with common stock nor did they have particularly high GPA's or an inordinate number of accounting or finance courses.

Alias Pairs

The term "alias pair" refers to the situation in which two separate two-way interaction effects are calculated with the same formula. As a result of the use of a one-fourth replication at the seven item level, there are three pairs of two-way interactions in which each pair has the same computational formula. The result of the situation where alias pairs exist is that the ANOVA model cannot attribute the variance to one or the other of the two-way interactions within the alias pair. The usual procedure is for the experimenter to attribute any significant variance to one or the other of the effects within the pair. This attribution process is aided by systematically assigning information cues to factors in such a way that each alias pair contains an interaction which is judged "unlikely." As a result, any significant effect is attributed to the other interaction in the pair which is judged "more likely."

Using the notation from Cochran and Cox (1957), the seven factors are designated: A,B,C,D,E,F,G. The alias pairs are:

DE = FG
DG = EF
DF = EG

The information items were assigned to factors as follows:

Factor	Information Item	
A	Operating Income	(Opr. Inc.)
B	Dividends Per Share	(Div./Sh.)
C	Earnings Per Share	(E.P.S.)
D	Return on Equity	(R.O.E.)
E	Return on Assets	(R.O.A.)
F	Current Ratio	(C.R.)
G	Sales	

This resulted in the following alias pairs:

Alias Pairs

Two-Way Interaction Judged Less Likely		Two-Way Interaction Judged More Likely
R.O.E. x R.O.A.	=	C.R. x Sales
R.O.A. x C.R.	=	R.O.E. x Sales
R.O.E. x C.R.	=	R.O.A. x Sales

The "R.O.E. x R.O.A." pair was judged unlikely because of the redundant nature of these two measures of profitability. It seemed unlikely therefore that individuals would use these in a configural manner. The pairs "R.O.E. x C.R." and "R.O.A. x C.R." were judged as unlikely for configural utilization because of the nature of the current ratio which makes it incompatible for use with many other accounting items, particularly return on equity and return on assets. Only two significant interaction effects were affected by this process, both of which were attributed to "C.R. x Sales."

Note that the attribution of significant effects to one or the other aliases within the pair cannot affect the results of the major empirical question addressed by this study, which is the effect of information load on information processing. Examination for differences in information processing relates to the number of significant interaction effects not the identification of specific significant interaction effects.

Comparison of Processing Level Across Groups

Recall that the level of information processing was discussed by Schroder et al. as being composed of two dimensions: (1) differentiation which relates to the number of separate information items employed in the decision process and (2) integration which relates to the interconnection or configural utilization of information. This characterization of processing level dovetails with the ANOVA model of the judgment process. That is, in this study differentiation will be related to significant main effects from the ANOVA results and integration will be related to significant configural or two-way interaction effects.

Differentiation

Since differentiation relates to the number of separate information items, the results of the ANOVA of subject judgments provide a reliable assessment of the number of separate information items employed by the subjects as indicated by significant main effects for the information items. Therefore, the relative level of differentiation between groups provided with different amounts of information will be assessed on the basis of the mean number of significant main effects for subjects within each group.

Table 13 presents the results of comparison of the mean number

TABLE 13

Comparison of the Number of Significant Main Effects Across Treatment Groups

	Information Load		
	3 Item	5 Item	7 Item
Number of Effects	15	62	75
Number of subjects	25	26	27
Mean	.6000	2.3846	2.7778
Standard deviation	.7071	1.5512	1.5021
Standard error	.1414	.3042	.2891

Contrasts:	*t*	Significance of *t*
3 Item/5 Item	5.320	<.001
5 Item/7 Item	.937	.353
3 Item/7 Item	6.767	<.001

of significant main effects per subject across the three information load levels. Using a two-tailed t test, the results indicate a significant difference when comparing the three item level to the five item level. However, the difference in the number of significant main effects when comparing the five item load with the seven item load, although in an increasing direction, is not significant. Overall, this suggests increasing differentiation and then leveling differentiation when moving across increasing information load levels.

Integration

Schroder at al. (1967) discuss integrative complexity as relating to the interconnection of information items in an individual's decision model. Unfortunately Schroder et al. (1967) did not provide a convenient operational definition for measuring relative integrative complexity. The ANOVA results provide two measures relating to the interconnectedness or configural use of information in the judgment process. One measure is the number of significant interaction effects. The other measure is the relative contribution to the decision process of the significant interaction effects as indicated by the omega-squared for each significant interaction effect. The relative level of integrative complexity between Groups is judged here on the basis of these two measures. The mean number of significant interaction effects for subjects in each group is compared. In addition the mean total omega-squared for significant interaction effects for subjects in each group is compared. In the case of the mean omega-squared, it was felt that higher levels of integrative complexity would be indicated by higher omega-squared statistics because a higher omega-squared indicates that the interaction effects accounted for a higher percentage of the variance.

Table 14 presents the results of comparisons, across treatment groups, of the mean number of significant interaction effects. Consistent with the comparisons of the mean number of significant main effects, the contrast between the three item load and the five item load indicates a significant difference. Although the difference between the five item load and the seven item load is in the increasing direction, the difference is not significant. Table 15 presents the results of a comparison of the mean variance per subject which was accounted for by higher order (configural) processing as indicated by the omega-squared statistic. As shown in Table 15, although the differences are in an increasing direction, none of the comparisons across information loads indicates a significant difference.

Overall, the results of these comparisons which are related to integrative complexity are mixed. The comparisons seem to indicate increasing integrative complexity from three to seven items on the basis of the number of significant interaction effects but not in terms of the relative contribution of these effects to the decision making process.

An Overall Measure of Information Processing Level

No theoretical or empirical research has provided a valid overall measure of the information processing level. Although intuitively appealing as a construct and potentially useful for research, the creation of such a measure is made difficult by the complex multi-dimensional nature of different individual information processing systems.

TABLE 14

Comparison of the Number of Significant Interaction Effects Across Treatment Groups

	Information Load		
	3 Item	5 Item	7 Item
Number of effects	1	10	27
Number of subjects	25	26	27
Mean	.0400	.3846	1.0000
Standard deviation	.2000	.7524	1.9415
Standard error	.0400	.1476	.3736

Contrasts:	*t*	Significance of t
3 Item/5 Item	2.254	.032
5 Item/7 Item	1.532	.135
3 Item/7 Item	2.555	.017

TABLE 15

Comparison of the Total Omega-Squared for Significant Interaction Effects Across Treatment Groups

	Information Load		
	3 Item	5 Item	7 Item
Number of subjects	25	26	27
Mean omega-squared*	.0073	.0206	.0320
Standard deviation	.0366	.0428	.0818
Standard error	.0073	.0084	.0157

Contrasts:	t	Significance of t
3 Item/5 Item	1.190	.240
5 Item/7 Item	.638	.527
3 Item/7 Item	1.420	.164

*This was determined by summing the omega-squared statistics for all significant two-way interaction effects for subjects within each group and then dividing by the number of subjects. This indicates for instance, that on the average, .73% of the variance in judgments could be explained by significant interaction effects for subjects receiving three items of information.

This study does not purport to provide such a measure; however, two overall measures derived from the ANOVA modeling are presented in this section and contrasted across treatment groups. These two overall measures are not presented as complete indications of overall information processing level; rather, these are presented as possible inputs or correlates to such a measure.

The first measure is based on a simple summing of significant main and interaction effects. Table 16 presents the results of comparisons across treatment groups of the mean number of significant effects (both main and interaction). The comparisons indicate a significant difference between the three item load and the five item load. The difference between the five item load and the seven item load, although in the increasing direction, is insignificant.

Although the total number of significant effects might prove helpful in assessing overall information processing level when looking at groups of subjects, at the individual level it presents some problems in interpretation. That is, when using this as a measure of overall processing level it may not always indicate clear cut assessments of processing level when comparing two decision models. As an example, if one individual has two significant main effects and another individual has one significant two-way interaction, this measure would imply that the individual with two significant main effects is operating at a higher processing level when in fact, it isn't clear from the existing literature which individual is operating at a higher information processing level.

A second measure of processing level therefore is used which is based on a summing of the omega-squared statistics. Table 17 presents

TABLE 16

Comparison of the Total Number of Significant Effects Across Treatment Groups

	Information Load		
	3 Item	5 Item	7 Item
Number of effects	16	72	102
Number of subjects	25	26	27
Mean	.640	2.7692	3.7778
Standard deviation	.8103	1.8397	3.0043
Standard error	.1621	.3608	.5782

Contrasts	t	Significance of t
3 Item/5 Item	5.383	$< .001$
5 Item/7 Item	1.480	.146
3 Item/7 Item	5.226	$< .001$

the results of comparison across treatment groups of the mean omega-squared per subject for all significant effects (both main and interaction). This is analogous to the mean variance in the judgment model which is explained by significant effects. Note that the contrast between the three item load and the five item load is significant whereas the contrast between the five item load and the seven item load is not significant.

This measure based on omega-squared statistics also has limitations as an indication of overall processing level when comparing individual decision makers. One individual may use only one cue when making his decision but he may be so consistent in the application of his decision rule that the explained variance is 90%. In contrast, an individual may utilize a decision model involving five cues with an explained variance of 50%. Certainly, total explained variance would not be useful as the sole measure of processing level.

Clearly the two measures of information processing level described above are not perfect. Nevertheless, these two complementary measures do yield similar results. In addition, the results are consistent with the other measures reported in this study. Overall it appears that the level of information processing did significantly increase between the three and five loads, but not between the five and seven loads.

Information Relating to Subject Characteristics

The subjects were asked to provide information about themselves relating to age, education, and experience with common stock. This data was collected for two reasons: (1) to provide information about

TABLE 17

Comparison of the Total Omega-Squared for Significant Effects Across Treatment Groups

	Information Load		
	3 Item	5 Item	7 Item
Number of subjects	25	26	27
Mean omega-squared*	.4403	.6685	.7609
Standard deviation	.4738	.2997	.1955
Standard error	.0948	.0588	.0384

Contrasts	*t*	Significance of t
3 Item/5 Item	2.046	.047
5 Item/7 Item	1.316	.195
3 Item/7 Item	3.136	.004

*This was determined by summingthe omega-squared statistics for all significant effects (both main and two-way interactions) for subjects within each group and then dividing by the number of subjects. This can be interpreted as the average variance in judgments explained by significant effects.

the subject pool such as the mean age and educational level which are reported below and (2) to allow for the examination of the relationships between the level of information processing and education and experience variables.

Demographic Information

The average age of the subject pool was 20.9 years, the youngest was 19 and the oldest was 26. Of the 78 subjects, 54 were juniors and 24 were seniors. The mean reported grade point average was 3.33. The range in the number of accounting courses taken was from a low of four to a high of nine with a mean of 5.67. The range in the number of finance courses taken was from a low of one to a high of five with a mean of 1.59. Fourteen subjects reported some experience with common stock. Nine of these reported to have made a common stock purchase within the last five years and all fourteen reported that they currently owned some common shares.

The Effect of Common Stock Experience

To examine for any significant systematic effect related to experience with owning common stock, analysis-of-variance was used to compare the 14 subjects who reported some experience with owning common stock with the 64 other subjects who reported no common stock experience. An analysis-of-variance was performed by examining: (1) the number of significant main effects, (2) the number of significant interaction effects and (3) the total omega-squared for significant interaction effects for the subject pool as a whole and also within the groups of subjects at each level of information load. Table 18 summarizes the significance levels for the F statistic for each of the

TABLE 18

Significance Levels of F Statistics
for Analysis-of-Variance

INDEPENDENT VARIABLE - Common Stock Experience

	LOAD			
DEPENDENT VARIABLE	3 ITEM	5 ITEM	7 ITEM	OVERALL
Number of main effects	.6246	.0061	.8950	.6218
Number of interaction effects	.5543	.7056	.3541	.1802
Omega-squared for interaction effects	.5543	.6275	.4835	.2235

twelve tests. These analyses produced only one significant result involving stock experience and the number of significant main effects at the five item load.

Schroder et al. (1967) indicate that the expected result of experience at a task is to increase the maximum level of information processing which should occur at higher levels of environmental complexity. Although the sample size in this experiment prohibits the full exploration of this hypothesis, the results reported in Table 18 indicate that there was no systematic effect of experience on the judgment models for subjects in this experiment.

The Effect of Education

To test for any systematic effect related to education, Pearson Product moment correlation coefficients were calculated for (1) the number of accounting courses, (2) the number of finance courses, (3) the total number of courses (both accounting and finance) and (4) the GPA of the subjects with (1) the number of main effects, (2) the number of interaction effects and (3) the omega-squared for the interaction effects. These correlation coefficients were calculated for subjects within each load level as well as overall load levels. Tables 19 through 22 present these correlation coefficients. Note that only one of these coefficients (the total number of courses and the omega-squared for the interaction effects at the five item load) is significant at a $\leq .05$ using a two-tailed test. The results of this analysis indicate that there is no systematic effect of educational experience on the level of information processing.

TABLE 19

Pearson Correlation Coefficients
for Subjects at the
Three Item Load*

	ACCOUNTING COURSES	FINANCE COURSES	TOTAL COURSES	GPA
Number of main effects	-.1112	.0125	-.0937	.0369
Number of interaction effects	-.3359	.1499	-.1987	.1302
Omega-squared for interaction effects	-.3359	.1499	-.1987	.1302

*None is significant at a $\leq$ .05

TABLE 20

Pearson Correlation Coefficients
for Subjects at the
Five Item Load

	ACCOUNTING COURSES	FINANCE COURSES	TOTAL COURSES	GPA
Number of main effects	-.0256	-.0187	-.0404	.2465
Number of interaction effects	-.3533	-.0385	-.3636	.0982
Omega-Squared for interaction effects	-.3587	-.0814	-.4064*	.1221

*Significance Level: a = .039

TABLE 21

Pearson Correlation Coefficients
for subjects at the
Seven Item Load

	ACCOUNTING COURSES	FINANCE COURSES	TOTAL COURSES	GAP
Number of main effects	-.0608	-.2393	-.3057	-.3691
Number of interaction effects	-.0169	.0133	.0000	-.2820
Omega-Squared for interaction effects	-.0246	-.0947	-.1214	-.0032

*None is significant at a $\leq .05$

TABLE 22

Pearson Correlation Coefficients
for all Subjects

	ACCOUNTING COURSES	FINANCE COURSES	TOTAL COURSES	GPA
Number of main effects	-.1037	-.0124	-.1030	-.0287
Number of interaction effects	-.1053	.0661	-.0325	-.1186
Omega-squared for interaction effects	-.1764	-.0196	-.1737	.0572

*None is significant at a $\leq$ .05

CHAPTER V

INTERPRETATIONS, LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

Introduction

This chapter is divided into three sections. The first section presents an analysis and interpretations of the results which were presented in Chapter 4. The second section discusses the limitations of the study. The last section presents the suggestions for further research.

Analysis and Interpretations

Use of Specific Information Items

Three Item Load

Recall that subjects at the three item load were presented hypothetical companies relating to four different groups of three items. The results of the analysis of all four groupings indicate a high reliance on one information item in each group. Earnings per share was presented in three of the four groupings and in each case, subjects tended to rely on this information item far more heavily than on the other two information items. In the one grouping where earnings per share was not present the subjects showed the same high reliance on one information item, dividends per share. In the one grouping where both earnings per share and dividends per share were provided, subjects relied heavily on earnings per share. This suggests two possible conclusions relating to subjects at this information load level. One, subjects at this level tended to prefer earnings per share to all other information items when making their decisions. Additionally their next favored information item appears to be dividends per share. Two, at this load level subjects appeared to adopt a simple heuristic involving, in each information item grouping, their most favored information item almost to the exclusion of the other two information items presented. Evidence of this particular sort of heuristic does not appear in the results at the five and seven item levels.

Five Item Load

At the five item load the pattern of significant main effects also indicates a high reliance on earnings per share. Although earnings per share was favored in the decision process, however, it was not used to the exclusion of the other information items to the same extent as was indicated at the three item level. Nevertheless, there were some cases where the main effect for earnings per share was the only significant effect.

Seven Item Load

At this load level subjects seemed to rely about equally on three information items: dividends per share, earnings per share and return on equity. The other four information items were significant less frequently. Overall, the pattern of significant main effects does not indicate the same high reliance on one information item as occurred at the three item level. This suggests that a more complex information load may stimulate more complex processing involving more individual information items. Additionally, the number of significant main effects for dividends per share suggests that it may have been appropriate to include this information item for use at the five item level with this subject pool. Note that at the seven item level, dividends per share was the second most favored by the subjects in terms of the number of significant main effects. Although dividends per share was not included at the five item level, at both the seven and three item levels, dividends per share appeared to be the second most favored for use in the subjects' decision models.

Overall, the results of the study suggest that subjects preferred earnings per share to the other six information items when making their decisions. Additionally, at all three load levels sales was the least preferred information item. A comparison of the preference ranking derived from Chandra (1975), Mautz (1968) and Martin (1971) presented in chapter three with a ranking derived from the subjects at the seven item load reveals some differences in preferences as indicated below (Note that the results from the subjects at the seven item load are used because this is the load level where all seven information items were employed.):

Rank	Composite from Chandra, Mautz and Martin	From Main Effects at the Seven Item Load
1	Return on Equity	Earning Per Share
2	Sales	Dividends Per Share
3	Earnings Per Share	Return on Equity
4	Return on Assets	Return on Assets
5	Operating Income	Current Ratio
6	Current Ratio	Operating Income
7	Dividends Per Share	Sales

Two significant differences in perceived relative importance for these items is evident. (1) The subjects relied more heavily on earnings per share and dividends per share than would have been predicted by the results of the surveys of more experienced users. (2) The subjects relied much less heavily on sales than would have been predicted by the survey results. This suggests that there might be more significant differences in preferences for accounting information items than is suggested by the comparison of the results of the studies by Chandra (1975), Mautz (1968) and Martin (1971) since these three studies surveyed a relatively homogeneous group.

Information Processing Across Information Loads

The Schroder et al. (1967) model characterizes the level of information processing as relating to two broadly defined dimensions. (1) Differentiation relates to the number of separate information cues employed in the decision process and (2) integrative complexity relates to the interconnectedness of separate information cues in the decision process. Within the context of this study, differentiation is related to the significant main effects for individual information items employed in the experiment and integrative complexity is related to the significant interaction effects from subject decision models.

An analysis of the results of the comparisons of both main effects and interaction effects across the three treatment groups indicates a definite increase in the levels of both differentiation and integrative complexity related to the amount of information provided for decision making. Further, the fact that the differences in both main effects and interaction effects between the five item load and the seven item load were in the increasing direction but not statistically significant suggests some leveling off of the level of information processing. Stated differently, the differences between the three item load and the five item load are greater than the differences between the five item load and the seven item load. This suggests that the three load levels employed in this study are on the left hand side of the inverted-U shaped curve in Figure 1 in Chapter 1 which relates the level of information processing to the level of environmental complexity. The implications of these results are two-fold: One, the highest information load employed in this experiment (seven items) has not been shown to induce information overload (the point where further increases in environmental complexity are believed to result in decreases in the level of information processing). Two, the level of information processing has been shown to be related to the amount of information provided. Although the experimental treatments employed here do not substantiate the full inverted-U shaped function, these results do support the Schroder et al. (1967) model to the extent that the level of information processing has been shown to be related to the complexity of the environment.

The mean total omega-squared for significant interaction effects was compared across the three treatment groups as a second measure related to integrative complexity. It was felt that more complex processing in terms of integrative complexity would be reflected in both the number of significant interaction effects and in terms of the relative contribution of the significant interaction effects to the decision process. Although in the increasing direction across the three treatment groups, the differences in the mean omega-squared for significant interaction effects were not within commonly accepted levels of significance. In this instance the lack of significance might be explained in part by the wider variation among subjects as indicated by the standard deviations, than was the case with the number of significant main effects. This suggests that a larger sample size in future experiments might result in statistically significance differences.

Constrained Processing at Low Information Levels

Although not explicitly stated by Schroder at al. (1967), their model for information processing suggests that the level of information processing is constrained by the complexity of the stimulus environment. Their model implies that individuals will fully process the available cues at low levels of environmental complexity and that at intermediate to high levels of environmental complexity the processing level will begin to fall. The results of this study suggest that, at low levels of environmental complexity, individuals will not be sufficiently stimulated to fully process the available information.

At the three item load, the average number of significant main effects is .6. A full use of available information would result in three significant main effects per subject. At the five item load, the average number of significant main effects is 2.38 per subject which is significantly below a full utilization of five information items. At the seven item load the same phenomenon is observed; subjects averaged 2.78 significant main effects in an environment where there were seven possible main effects. This same low utilization of available information is more pronounced for possible interaction effects. At the three item load there are three possible two-way interactions and subjects to this load level averaged only .04 significant interaction effects. At the five item load there is a possibility for ten significant interaction effects and subjects averaged only .38. At the seven item load there were eighteen possible interactions and subjects at this load level averaged one significant interaction effect.

The observed low level of information processing relative to the maximum level possible in this experiment suggests that the level of environmental complexity stimulates the low level of subsequent information processing rather than constraining the processing to a low level. This is particularly evident at very low levels of environmental complexity such as the three item load used here. Analysis of individual subject decision models at the three item load suggests that many of the subjects adopted simple heuristics relying primarily on the one information item judged to be most relevant to the decision.

Comparison of Results With Other Studies in Cue Utilization

One noteworthy result of this study is the small contribution (based on the omega-squared statistic) to the decision making process of significant interaction effects relative to the contribution to the decision process made by main effects (linear model). Presented below are the omega-squared statistics for each treatment group for both main and interaction effects. Recall that the omega-squared statistic indicates the relative contribution to the decision process for each effect.

	Information Load			
	3 Item	5 Item	7 Item	Overall
Mean omega-squared for significant interaction effects:	.0073	.0206	.0320	.0203
Mean omega-squared for significant main effects:	.4330	.6479	.7289	.6071

This is consistent with other studies in cue utilization which have indicated that a linear model of the decision process will explain the bulk of the variance in judgments. In the study which was closest to this in terms of the type and number of cues employed, Luthy (1975) found that significant interaction effects accounted for about 1.7% of the variance in judgments when employing seven financial information cues.

At the seven item load, Luthy (1975) found an average of 1.29 significant interaction effects per subject. Results of this study are consistent with this finding (an average of 1.0 significant interaction effects per subject) which implies that on the whole, subjects are not significant configural processors in this task.

Although Luthy's study was the closest to this one, there were several other studies using ANOVA to study cue utilization where the reasearchers found that configural cue utilization, characterized by significant interaction effects, accounted for a small percentage of the variance relating to the variance accounted for by significant main effects. Hoffman et al. (1968) found that significant interaction effects accounted for about 1.7% of the variance in judgments for radiologists assessing stomach x-rays for ulcers. Slovic (1969) examined stockbrokers' assessments of stock growth potential and found that significant interaction effects accounted for 6% of the variance. Slovic at al. (1973) also examined judgments related to expected stock growth and found 4% of the variance was related to interaction effects. Ashton (1974) reported that 6.4% of the variance in auditors' judgments of internal control related to interaction effects.

Another result of this study was the demonstration of the relationship between the level of information processing and information load. Three other studies in accounting have examined for effects of information load. Both San Miguel (1976) and Pratt (1978) related processing level to information load. Casey (1980) examined differences in decision accuracy related to information load. Outside the accounting literature Oskamk (1965), Sines (1959) and Golden (1964) examined differences in the accuracy of expert judgments as they relate to information load. The results of this study are consistent with the results of each of these studies in two respects. One, this study and each of those cited above found differences in either processing level or decision accuracy related to differences in information load. Two, both in this study and in the studies cited above there was no demonstration of reduced processing level or reduced decision accuracy for subjects with the highest load level within each study. This suggests that future research within accounting environments should examine for effects of information overload on processing level and decision accuracy at higher load levels.

Limitations

Clearly in a laboratory study such as this, the major limitations relate to the questions of external validity. As with all experiments conducted in a laboratory setting using students as surrogates, the results are not necessarily generalizable to other samples of the population. This is true for a number of reasons. One, Schroder et al. (1967) discuss the effect of experience which is thought to shift the processing curve shown in Figure 1 in Chapter 1 up and to the right. It is possible therefore, that different samples of the population would yield different results in information processing. Limitations of time and resources necessitated the use of only one relatively homogeneous sample in this study. Two, the nature of this experimental situation did not provide the profit/loss incentives which might be present in more "realistic" decision environments. It is not clear, however, that the inclusion of a profit/loss incentive system in the experimental situation would have resulted in different results. Also, this experimental design does not allow an incentive system based on an objective measure of performance. There was no optimal stock price in any of the judgment situations provided to the subjects. Three, the information provided to make judgments was taken exclusively from information provided in financial reports. Individuals making these decisions in more realistic decision settings might employ information from other sources, such as economic forecasts and financial analysts reports. Note however that the primary interest to accountants is the impact of accounting related information on decision making.

One possible limitation relating to the question of internal validity concerns the use of analysis-of-variance to model the judgment process. Although this issue has not been resolved, some researchers have suggested that the ANOVA model is biased in terms of the linear components and underestimates the higher order interactions.[1] If such a bias exists, it would affect the results of this study relating to the amount of variance in judgments associated with configural cue utilization but it would not affect the relative differences in information processing between the three treatment groups.

Despite these limitations related to this research this study does make a positive contribution to the research in this field by demonstrating that the complexity of information processing is related to information load in a financial accounting environment.

---

[1]For a thorough discussion of the possible reasons for the relatively small contribution made by configural utilization of information cues in the decision process, see Goldberg (1968).

Suggestions for Further Research

The results of this study suggest two major areas for future research in information processing. One potentially fruitful area for future research revolves around the effect of information load on information processing. Within this area the major series of unanswered questions involves the potential effects of information overload (the point where further increases in information load are hypothesized to result in decreases in the level of information processing and/or performance). At what level of information load does this occur? How does this point differ for different user groups? How dramatically does information processing fall with increases in information load? These questions are of particular interest to accountants and further research is needed to answer these.

Clearly, further research is necessary to assess information processing at higher information load levels. The results of this study suggest that ANOVA is a useful tool for this purpose. Unfortunately, increasing the information load necessitates dramatic increases in the number of potential combinations and hence decisions that the subjects would need to make in this sort of research design. It would appear, however, that ANOVA could still be used to study higher information loads if the number of judgments the subjects would need to make were held to a reasonable level. Two possibilities exist. One, at higher information loads, researchers could employ fractional designs which would allow for the assessment of main effects only. It would be possible to use this same sort of ANOVA design for much higher information load levels if the assumption is made that the number of interaction effects was highly correlated with the number of main effects. Two, rather than examine individual processing models, researchers could examine aggregate processing models for groups of subjects where each subject in a group received a subset of the total number of judgments to be made.

Within this major area there are other research questions relating to differences in information processing associated with different user groups. Specifically, research is needed to assess the effect of information load and experience variables on information processing. Research on information processing using ANOVA designs is needed to assess different user groups categorized on the basis of level of experience, occupation and education variables.

The second major area of research suggested by the results of this study relates to the use of specific information cues in decision making. Research designs such as this could be employed to examine differences in the use of specific information cues for different user groups catagorized on the basis of experience, occupation and education variables. Related to this, ANOVA designs could be used to examine the phenomenon of self insight, that is, the relationship between actual use of information cues and perceived preference for information cues. ANOVA would be particularly helpful in this sort of research because it identifies the actual use of specific information cues.

BIBLIOGRAPHY

Abdel-khalik, A. Rashad, "The Effect of Aggregating Accounting Reports on the Quality of the Lending Decision: An Empirical Investigation," Journal of Accounting Research, Vol. II, Supplement 1973, pp. 104-138.

Abdel-khalik, A. Rashad, "On the Efficiency of Subject Surrogation in Accounting Research," The Accounting Review, Vol. 49, No. 4, October 1974, pp. 743-750.

Alpert, Bernard, "Non-Businessmen as Surrogates for Businessmen in Behavioral Experiments," The Journal of Business, Vol. 40, No. 2, April 1967, pp. 203-207.

American Institute of Certified Public Accountants, Study Group on the Objectives of Financial Statements, Objectives of Financial Statements, 1973.

Ashton, Robert H., "An Experimental Study of Internal Control Judgments." Journal of Accounting Research, Vol. 12, No. 1, Spring 1974, pp. 143-157.

Ashton, Robert H., "Cue Utilization and Expert Judgments: A Comparison of Independent Auditors with Other Judges," Journal of Applied Psychology, Vol. 59, No. 4, 1974, pp. 437-444.

Ashton, Robert H., "Cognitive Changes Induced by Accounting Changes: Experimental Evidence on the Functional Fixation Hypothesis," Journal of Accounting Research, Vol. 14, Supplement 1976, pp. 1-17.

Barefield, Russell M., "The Effect of Aggregation on Decision-Making Success: A Laboratory Study," Journal of Accounting Research, Vol. 10, No. 2, Autumn 1972, pp. 229-242.

Birnberg, Jacob G. and Nath, Raghu, "Laboratory Experimentation in Accounting Research," The Accounting Review, Vol. 43, No. 1, January 1968, pp. 38-45.

Casey, Cornelius J., "Variations in Accounting Information Load: The Effect on Loan Officers' Predictions of Bankruptcy," The Accounting Review, Vol. 55, No. 1, January 1980, pp. 36-49.

Chandra, Gyan, "A Study of the Consensus on Disclosure Among Public Accountants and Security Analysts," The Accounting Review, Vol. 49, No. 4, October 1974, pp. 733-742.

Cravens, David W., "An Exploratory Analysis of Individual Information Processing," Management Science, Vol. 16, No. 10, June 1970, pp. B-656-B-670.

Dermer, Jerry D., "Cognitive Characteristics and the Perceived Importance of Information," The Accounting Review, Vol. 48, No. 3, July 1973, pp. 511-519.

Driver, Michael J. and Mock, Theodore J., "Information Processing, Decision Theory and Information Systems," The Accounting Review, Vol. 50, No. 3, July 1975, pp. 490-508.

Driver, Michael J. and Streuffert, Siegried, "Integrative Complexity: An Approach to Individuals and Groups as Information-Processing Systems," Administrative Science Quarterly, Vol. 14, No. 2, June 1969, pp. 272-285.

Financial Accounting Standards Board, "Objectives of Financial Reporting by Business Enterprises," Statement of Financial Accounting Concepts No. 1, November 1978.

Financial Accounting Standards Board, "Qualitative Characteristics of Accounting Information," Statement of Financial Accounting Concepts No. 2, May 1980.

Fertakis, John P., "On Communication, Understanding, and Relevance in Accounting Reporting," The Accounting Review, Vol. 44, No. 4, October 1969, pp. 680-691.

Francia, Arthur J. and Strauser, Robert H., "Perceptions of Financial Reporting Practices by Accounting Educators: An Empirical Study," The Accounting Review, Vol. 46, No. 2, April 1971, pp. 380-384.

Goldberg, Lewis R., "Simple Models or Simple Processes," American Psychologist, July 1968, pp. 483-496.

Hammond, K.R., and Summers, D.A., "Cognitive Dependence on Linear and Nonlinear Cues," Psychological Review, 1965, 72, pp. 215-224.

Hays, William L., Statistics For The Social Sciences, New York, Holt, Rinehart, and Winston, Inc., 1973.

Hoffman, P. J., "Cue-Consistency and Configurality In Human Judgment," in B. Kleinmuntz (Ed.), Formal Representation of Human Judgment, New York, Wiley, 1968.

Hoffman, Paul J., Slovic, Paul and Rorer, Leonard G., "An Analysis-Of-Variance Model for the Assessment of Configural Cue Utilization in Clinical Judgment," Psychological Bulletin, Vol. 69, No. 5, 1968, pp. 338-349.

Hofstedt, Thomas R. and Hughes, G. David, "An Experimental Study of the Judgment Element in Disclosure Decisions," The Accounting Review, Vol. 52, No. 2, April 1977, pp. 379-395.

Libby, Robert, "Accounting Ratios and the Prediction of Failure: Some Behavioral Evidence," Journal of Accounting Research, Vol. 13, No. 1, Spring 1975, pp. 150-161.

Libby, Robert, "The Use of Simulated Decision Makers in Information Evaluation," The Accounting Review, Vol. 50, No. 3, July 1975, pp. 475-489.

Libby, Robert, and Lewis, Barry L., "Human Information Processing Research in Accounting: The State of the Art," Accounting, Organizations and Society, December, 1977, pp. 245-268.

Lindman, Harold R., Analysis Of Variance In Complex Experimental Designs, San Francisco, W.H. Freeman and Company, 1974.

Luthy, David Henry, "Configural Utilization of Accounting Information in Investment Decisions: An Empirical Investigation," D.B.A. Dissertation (Indiana University Graduate School of Business 1975).

Martin, Alvin, "The Decision-Relevance of Reported Accounting Information: An Empirical Perspective," Ph.D. Dissertation (Northwestern University, 1971).

Mautz, R. K., "Financial Reporting By Diversified Companies," New York: Financial Executives Research Foundation, 1968.

Miller, George A., "The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information," The Psychological Review, Vol. 63, No. 2, March 1956, pp. 81-97.

Miller, Henry, "Environmental Complexity and Financial Reports," The Accounting Review, Vol. 47, No. 1, January 1972, pp. 31-37.

Miller, James G., "Information Input Overload and Psychopathology," American Journal of Psychiatry, Vol. 116, No. 8, February 1960, pp. 694-704.

Pratt, James H., "The Association Between Financial Report Complexity and User Financial Information Conceptual Levels: An Analysis Under Experimental Conditions," D.B.A. Dissertation (Indiana University Graduate School of Business, 1978).

Revsine, Lawrence, "Data Expansion and Conceptual Structure," The Accounting Review, Vol. 45, No. 4, October 1970, pp. 704-711.

Rusch, Hugh L, The Importance Of Good Financial Public Relations, Opinion Research Corporation, Princeton, New Jersey, 1962.

San Miguel, J., "Human Information Processing and Its Relevance to Accounting: A Laboratory Study," Accounting, Organizations and Society, December 1976, pp. 357-374.

Schroeder, Harold M., Driver, Michael J. and Streufert, Siegfried, "Human Information Processing," New York: Holt, Rinehart, and Winston, Inc., 1967.

Sieber, Joan E. and Lanzetta, John T., "Conflict and Conceptual Structure as Determinants of Decision-Making Behavior," Journal of Personality, Vol. 32, No. 4, 1964, pp. 622-641.

Simon, Herbert A. and Newell, Allen, "Human Problem Solving: The State of the Theory in 1970," American Psychologist, Vol. 26, No. 2, February 1971, pp. 145-159.

Slovic, Paul, "Analyzing the Expert Judge: A Descriptive Study of a Stockbroker's Decision Processes," Journal of Applied Psychology, Vol. 53, No. 4, August 1969, pp. 255-263.

Slovic, Paul, Fleissner, Dan, and Bauman, W. Scott, "Analyzing the Use of Information in Investment Decision Making: A Methodological Proposal," The Journal of Business, April 1972, pp. 283-301.

Slovic, Paul, "Psychological Study of Human Judgment: Implications for Investment Decision Making," The Journal of Finance, Vol. 27, No. 4, September 1972, pp. 779-799.

Slovic, Paul and Lichtenstein, Sarah, "Comparison of Bayesian and Regression Approaches to the Study of Information Processing in Judgment," Organizational Behavior and Human Performance, Vol. 6, No. 6, November 1971, pp. 649-744.

Stallman, James C., "Toward Experimental Criteria for Judging Disclosure Improvement," Journal of Accounting Research, Supplement 1969, pp. 29-43.

Streufert, Siegfried and Schroder, H.M., "Conceptual Structure, Environmental Complexity and Task Performance," Journal of Experimental Research in Personality, Vol. 1, 1965, pp. 132-137.

Streufert, Siegfried, "Complexity and Complex Decision Making: Convergences Between Differentiation and Integration Approaches to Prediction of Task Performance," Journal of Experimental Social Psychology, Vol. 6, November 1970, pp. 494-509.

Wiggins, N.L., and Hoffman, P.J., "Three Models of Clinical Judgment," Journal of Abnormal Psychology, 1968, 73, pp. 70-77.

Wilson, David A., "A Note on 'Environmental Complexity and Financial Reports'," The Accounting Review, Vol. 48, No. 3, July 1973, pp. 586-588.

Wright, William F., "Financial Information Processing Models: An Empirical Study," The Accounting Review, Vol. 52, No. 3, July 1977, pp. 676-689.

APPENDIX A

Verbal Instructions to the Subjects

Verbal Instructions

I am involved in an important research project examining investment decision making. I would very much appreciate it if you would agree to participate by filling out this short questionnaire. Let me make the following points related to this questionnaire:

1. You are under no obligation to participate in this research. Although I would like to have you fill out the questionnaire, your grade in this course will not be affected by a decision not to participate. You may also discontinue work on the questionnaire at any time.
2. I want to assure you that your responses to the questionnaire will be anonymous. No one will know which questionnaire you filled out.
3. Instructions: Be sure to read the cover page thoroughly. Please follow the instructions carefully. After you have read the cover page, I will answer any questions.
4. This is not a test, there are no necessarily "right" answers. I am interested in what <u>you</u> think is an appropriate stock price.
5. There is no time limit, when you are finished, come up to the desk and put the questionnaire in the box.
6. Are there any questions?

APPENDIX B

Written Instructions and Standard Company Financial Statements

INVESTMENT QUESTIONNAIRE

Hypothetical Situation

Your task is to rate the investment potential of a series of hypothetical companies by indicating what price you would be willing to pay for their common stock. To aid you in this task, you are provided the financial statements of a standard company on pages 2 and 3 of this questionnaire for the purpose of comparison. In addition, you are given the stock price of the standard company: $18.00 per share.

Please assume that you are assessing the stock prices of these companies for making long-term investments. Also, assume that the standard company and all of the companies you are asked to rate operate in the same manufacturing industry and have outstanding the same number of shares.

Instructions

After careful evaluation of the partial financial statement information for each potential investment (one per page), please indicate what price, in dollars and cents, you would be willing to pay for the common stock of the company if you were willing to pay $18.00 for the Standard Company stock. Record the price you would be willing to pay in the appropriate space.

Note: This is not a test, there are no necessarily "right" answers. In this case we are interested in what you think is an appropriate price.

Standard Company
Balance Sheet
December 31, 19--

Assets		
Current Assets		
Cash	$ 47,384	
Notes and accounts receivable	104,822	
Inventories	152,415	
Prepayments	3,447	
Total current assets		$308,068
Investments		60,767
Other Assets		
Notes receivable	$ 8,920	
Other noncurrent assets	11,802	
Total other assets		20,722
Property, Plant, and Equipment		
Land	$ 58,481	
Buildings	174,529	
Machinery and equipment	657,153	
Less allowances for depreciation	(342,258)	
Total property, plant, and equipment		547,905
Total assets		$937,462

Liabilities and Stockholders' Equity		
Current Liabilities		
Accounts payable	$115,457	
Income taxes payable	16,845	
Current maturities of long-term debt	38,656	
Total current liabilities		$170,958
Long-term Debt (less current maturities)		280,597
Other Liabilities		
Deferred federal income taxes	$ 36,269	
Other	5,939	
Total other liabilities		42,208
Total liabilities		$493,763
Stockholders' Equity		
Common stock, par value $1	$ 23,379	
Additional paid-in capital	130,679	
Retained earnings	289,641	
Total stockholders' equity		443,699
Total liabilities and stockholders' equity		$937,462

Standard Company
Income Statement
For the year ended December 31, 19--

Revenue from Sales	$940,927
Cost of goods sold	574,384
Gross profit	$366,543
Operating expenses	308,174
Operating income	$ 58,369
Other income	8,444
Net income before taxes	$ 66,813
Federal income tax	25,900
Net income	$ 40,913
Earnings per share	$1.75
Dividends per share	$1.10

Standard Company
Statement of Changes in Financial Position
For the year ended December 31, 19--

Sources:	
From operations:	
Net income	$ 40,913
Items in earnings not affecting working capital:	
Depreciation	43,577
Noncurrent deferred income taxes	3,048
Other	349
Working capital provided by operations	$ 87,887
Issuance of long-term debt	15,372
Issuance of common stock	5,077
Sale of property, plant, and equipment	4,908
Sale of investments	809
Decrease in working capital	16,790
	$130,843
Applications:	
Cash dividends	$ 25,717
Capital expenditures	82,427
Retirement of long-term debt	22,699
	$130,843

APPENDIX C

Sample Hypothetical Company at the Three Item Load

COMPANY NSC

	Standard* Company	Company NSC
Return on Equity	9.22%	10.60%
Sales	$940,927	$799,788
Earnings per Share	$1.75	$1.49

*These figures are based on the Standard Company Financial Statements provided on pages 2 and 3.

- -

In dollars and cents, what price would you be willing to pay for the stock of Company NSC if you were willing to pay $18.00 for the Standard Company Stock?

Standard Company	Company NSC
$18.00	$____.____

APPENDIX D

Sample Hypothetical Company at the Five Item Load

COMPANY TSD

	Standard* Company	Company TSD
Return on Equity	9.22%	7.84%
Sales	$940,927	$1,082,066
Earnings per Share	$1.75	$1.49
Return on Assets	4.36%	3.71%
Operating Income	$58,369	$49,614

*These figures are based on the Standard Company Financial Statements provided on pages 2 and 3.

In dollars and cents, what price would you be willing to pay for the stock of Company TSD if you were willing to pay $18.00 for the Standard Company Stock?

Standard Company	Company TSD
$18.00	$____.____

APPENDIX E

Sample Hypothetical Company at the Seven Item Load

COMPANY XNB

	Standard* Company	Company XNB
Operating Income	$58,369	$49,614
Dividends per Share	$1.10	$.94
Earnings per Share	$1.75	$1.49
Return on Equity	9.22%	7.84%
Return on Assets	4.36%	3.71%
Current Ratio	1.80	1.53
Sales	$940,927	$799,788

*These figures are based on the Standard Company Financial Statements provided on pages 2 and 3.

In dollars and cents, what price would you be willing to pay for the stock of Company XNB if you were willing to pay $18.00 for the Standard Company Stock?

Standard Company	Company XNB
$18.00	$____.____

APPENDIX F

Demographic Questionnaire

ADDITIONAL QUESTIONS

Please answer the following questions as completely as possible.

1. What is your age?_______

2. What is your current class rank? (please circle one)

   Freshman   Sophomore   Junior   Senior

3. What is your current grade point average?______

4. From the following list of accounting and finance courses, please circle the courses you have taken. Include the courses in which you are registered this semester.

   A 201
   A 202
   A 206
   A 211
   A 212
   A 322
   A 323
   A 325
   A 328
   A 335
   A 336
   A 337
   A 339
   A 340
   A 411
   A 424
   A 434
   A 490
   Other Accounting,____________

   F 301
   F 302
   F 420
   F 446
   F 464
   F 490
   F 494
   Other Finance,______________

5. How many common stock purchases have you made in the last five years?________

6. How many companies do you presently own stock in?________

VITA

NAME:	Kenneth Lee Danko	
BORN:	Gary Indiana on June 17, 1950	
DEGREES:	B.S.	University of Detroit, 1972
	M.B.A.	University of Detroit, 1974
	D.B.A.	Indiana University, 1981