MEMORY BIAS IN THE USE OF ACCOUNTING INFORMATION: AN EXAMINATION OF AFFECTIVE RESPONSES AND RETRIEVAL OF INFORMATION IN ACCOUNTING DECISION MAKING

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Dissertation submitted to the Faculty of the
Virginia Polytechnic Institute and State University
in partial fulfillment of the requirements for the degree of

Doctor Of Philosophy
in
General Business
with a major in Accounting

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April 30, 1998
Blacksburg, Virginia

Key Words: Decision Making, Affective Response, Memory Bias

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(ABSTRACT)

This dissertation is based on the Kida-Smith (1995) model of "The encoding and retrievability of numerical data." It is concerned with the variable conditions under which a positive affective response (i.e., a decision or opinion that results in a positive valence) on previously viewed accounting information may and may not influence current decision-making.

An affective response to accounting numbers may adversely influence decisions made based on those numbers. Prior research has found that individuals recall information that is consistent with prior decisions more readily than they recall inconsistent information. Research has also shown that current judgements are biased toward prior decisions or judgements. These biases may cause current decisions to be suboptimal or dysfunctional.

Two 2x2 experiments were conducted to examine four hypotheses. These hypotheses concerned (1) the influence of an affective response on an investment decision when the differences between two sets of accounting numbers are small and when the differences are large, (2) the influence of an affective response on the recall of numerical data, (3) the influence of time on the recall of numerical data given an affective response, and (4) the influence of an affective response on an investment decision when the level of cognitive processing at the time the affective response is produced is low and when the level of processing is high.

The first experiment used graduate students in an accounting course to investigate the influence of differences between numerical amounts on decision making. It also investigated the influence of time between the encoding and retrieval on recall of numerical amounts.

The second experiment used accounting practitioners to investigate the influence of differences between numerical amounts on decision making, and to examine the influence of different levels of cognitive processing at the time of encoding on decision making.

Results indicate that an affective response does produce suboptimal decisions. In the case of accounting practitioners, however, the influence of the affective response is mitigated when the magnitude of the difference between the accounting numbers previously viewed and those undergoing current examination is large rather than small.

The affective response did not significantly influence the recall of numerical amounts. There was no significant change in the influence of the affective response on recalled amounts with increased time between encoding and retrieval. Also, there were no significant changes in decision-making with increased processing at the time of encoding.

ACKNOWLEDGEMENTS

This dissertation is the result of a collaborative process. There are many people whose contribution must be acknowledged. I hope that everyone will understand that I must begin at the beginning. First, I give thanks to my Heavenly Father for providing the ability and power necessary for life and accomplishment, and for always reminding me that He is with me and I can succeed.

Very special thanks go to Dr. John C. Anderson, my dissertation committee chairperson. I could not have completed this dissertation in a timely manner had it not been for Dr. Anderson's dedication, advice, assistance, and encouragement. I thank the other members of my dissertation committee, Dr. Robert M. Brown, Dr. Steven D. Sheetz, Dr. Reza Barkhi, and Dr. Robert C. Williges, for their advice and assistance.

Special thanks to Dr. Robert M. Brown and Dr. Christine M. Haynes for allowing me to conduct my experiment during their class time, and to their students for their participation. I thank Dr. John C. Anderson for using time at the Continuing Professional Education seminar at the Accounting and Auditing Conference to conduct the experiment.

Much appreciation goes to The KPMG Peat Marwick Foundation and The College Fund for their financial support during my doctoral process. I would also like to thank Dr. Wayne Leininger for the support provided by the accounting department at Virginia Tech.

Last, but not least, I express my appreciation to my family. I am eternally grateful to my husband, Cornell, for giving me the freedom and the support to complete this process. I could not have done it without him. I thank my children, Dionne and Maranda, for their love and support, and Kiah for being the bundle of love and joy that she is.

Finally, I will end as I began. Thank God for placing each of these people in my life.

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CHAPTER 1

INTRODUCTION AND MOTIVATION

Most decision-makers are exposed to an abundance of accounting information and a major portion of that information is in numerical form. It is inconvenient and costly to review all relevant information when a decision is being made. It is necessary, therefore, for decision-makers to rely on memory of previously examined data for a major portion of the information needed when making a decision.

It is important to consider how that information is remembered and how it is recalled. If we are to understand how accounting information is used in decision-making by both the preparer and the user of the information, we must understand how this information is encoded in and retrieved from long-term memory. This is especially important because of the limited capacity of working memory (Atkinson and Shiffrin, 1968; Baddeley and Hitch, 1974; Baddeley, 1995) and the volume of accounting information that can be relevant to a single decision, making it necessary to rely on information retrieved from long-term memory when making decisions (Libby and Trotman, 1993).

A major issue to be considered is the fact that it is often (if not always) problematic (if not impossible) to determine whether a decision made based on accounting numbers is optimal. It is usually only when a better alternative can be identified after the results of the decision are available that the issue arises. Decision-makers are usually satisfied with a "good" decision and are not overly concerned with the optimality of the decision. A "good" decision would be one that produces positive results or meets or exceeds some

predetermined criterion but not necessarily the best results possible given all the information that the decision-maker has at his/her disposal.

For several years, accounting academians have discussed the cognitive aspects of decision-making and called for experimental and empirical research that will alleviate the deficiency in understanding *how* decisions are made using accounting information (Einhorn & Hogarth, 1981; Dillard, 1984; Peters, 1993; Hogarth, 1993). It is important that we understand how decisions are made using accounting information and why those decisions can be suboptimal. People make mistakes. It is important to understand conditions under which they do or do not perform well if we are to evaluate and improve decision-making ability (Hogarth, 1981). Understanding memory processes is essential to the understanding of judgement and decision-making (Moeckel, 1990).

If a cognitive process such as an affective response (i.e., a decision or opinion that results in a positive valence) causes suboptimal or dysfunctional decisions, knowledge of this process and the way that it functions provides the opportunity for decision-makers to take actions to mitigate its effect. Research in this area is not only relevant to accountants and business managers. Decision-making is a part of all facets of human life and many of those decisions involve numerical data. Hogarth (1987) indicates that people make judgements as an inevitable part of living, and Iselin (1996) indicates that accounting information is an ingredient in most decisions with financial implications.

This study represents a step in the process of understanding decision-making with accounting numbers. Accounting tasks are complicated and so are the cognitive processes that they involve (Hogarth, 1993). Breaking these complex processes down into simple processes and experiments can provide answers to one question at a time (Peters, 1993). This study examines the affective response and the variable conditions under which it may exist. Kida and Smith (1995) define affect as evaluative reactions such that the data are represented as a positive or negative valence in memory structures (p. 586). Once a decision-maker forms an opinion or makes a decision, s/he becomes committed to the general valence of the opinion or decision causing future decisions to be affected in favor of the general valence.

In accounting and other business decision situations, small differences are often considered immaterial and unimportant. If the affective response is most influential when the differences in the data are small, little or no corrective action may be necessary. If, however, the influence of an affective response (1) persist with large (material) differences in the data, or (2) increases with an increase in the time between encoding and retrieval of information, then decision-makers may wish to consider mitigating actions. Under such circumstances, it may be useful to remind decision-makers of the need to re-examine the original numerical data when making on-going investment decisions, and avoid relying on an initial affective response.

Kida and Smith (1995) present "a model of encoding and retrieving numerical data that can aid our understanding of decision-making with accounting numbers" (p. 585). The Kida-Smith model is reproduced in Figure 1. This study first discusses the Kida-Smith model and the eight propositions (Figure 2) that they offer for empirical examination. It continues with a discussion of the initial experimental examination of the model by Kida, Smith, and Maletta (1997).

The purpose of this study is to extend the findings of Kida, Smith, and Maletta (1997) and test the robustness of their results. One of their experiments tested the effect of a strong positive affective reaction on investment decisions. Decision-makers are exposed to a large amount of numerical data, and it is difficult for verbatim memory traces to be retrieved. Research has found that decision-makers form affective responses to the data they examine. These affective responses are available for a longer period of time and are accessible by a greater variety of cues than the data to which they are related. When an affective response is retrievable and the original data are not, the affective response may be used to reconstruct the data, and the reconstruction may be subjective and biased. Birnberg and Shields (1984) emphasize the importance of this issue to accountants in the retrieval of experiences and facts from memory for decision-making. Cognitive psychology research likewise indicates a bias towards the features or traits of a category prototype (Mervis and Rosch, 1981; Tsujimoto, 1978). This study examines the variable conditions under which an affective response may exist and lead to suboptimal decision-making.

Specifically, this study examines four hypotheses. The first hypothesis concerns the influence of an affective response on an investment decision when the differences between two sets of accounting numbers are small and when the differences are large. Hypothesis two concerns the influence of an affective response on the recall of numerical data. The third hypothesis deals with the influence of time on the magnitude of recalled numerical data given an affective response. The final hypothesis concerns the influence of an affective response on an investment decision when the level of cognitive processing is low at the time the affective response is encoded and when the level of processing is high.

Chapter 2

LITERATURE REVIEW AND HYPOTHESES

This section reviews the Kida-Smith (1995) model and other research relevant to the implications of the model, followed by a discussion of Kida, Smith, and Maletta's (1997) initial examination of the Kida-Smith model. The numerical distance effect (McCloskey et. al., 1985; Clark and Campbell, 1991; Campbell and Clark, 1988; Holender and Peereman, 1987) in cognitive psychology has important implications for the current research. The effect and its relevance to decision-making using accounting information is also discussed, followed by the hypotheses to be tested.

2.1 Kida and Smith's Model of the Encoding and Retrievability of Numerical Data

The model of the encoding and retrievability of numerical data (Figure 1) deals with the different forms in which numerical information is encoded in memory and how that information is subsequently retrieved. The first proposition (Figure 2) states that numerical data may be encoded in memory as numbers, as comparisons between numbers, and as affective reactions to the numbers and comparisons. Accounting data in isolation usually has little meaning or usefulness. It must be evaluated by comparing it with similar data of other time periods for the same entity (trend analysis), data for the same time period for different entities, and/or predetermined values or levels. Proposition 1 implies that the examination of a comparative income statement may result in the net income being encoded in memory as numerical amounts (e.g., $400,000 in 19x1, $500,000 in 19x2, and $600,000 in 19x3), a comparison (e.g., increasing/decreasing, higher/lower), and an affected reaction (e.g., favorable/unfavorable, good/bad). In other words, an evaluation (a judgement, an opinion) is formed and encoded in memory with the numerical data. The

data may be encoded in any or all of these forms. The retrievability of the different forms of encoded data or information is not considered to be equal.

The information that is retrieved is used in decision-making. Citing fuzzy trace theory (Brainerd and Reyna, 1990), Kida and Smith (1995) propose that decision-makers derive gist from numerical data in the form of affective responses and these affective responses provide more retrievable memory traces than the numerical amounts or comparisons between numerical amounts. Memory traces are described as existing on a continuum from verbatim to fuzzy where the numerical data produce verbatim traces and affective responses produce fuzzy traces. Memory holds both closely verbatim traces and fuzzy traces but the fuzzy traces last longer and are more easily retrieved (Brainerd and Reyna, 1990).

Proposition 1 can be supported by the depth-of-processing theory. Craik and Lockhart (1972), Craik and Tulving (1975) and Birnberg and Shields (1984) present the notion of depth-of-processing that holds that there are levels in memory. Depth refers to the degree of integration of a new stimulus with other stimuli already in memory. More highly connected elements represent greater depth. The implication of the depth-of-processing concept for accounting information is that numerical amounts are perceived by the sensory system and encoded at a surface level that is not related to much other information. These amounts are compared with similar amounts from prior periods of the same entity, similar amounts for the same period of different entities, industry averages, and/or predetermined acceptable levels. A comparison results in a factual conclusion, such as "Net income is above the industry average." After making all necessary comparisons, further evaluation results in an affective reaction, such as "Net income is good." Note that such an affective reaction may require more than one comparison. So, we have the perception of the numerical datum at a surface level, the combining of the numerical datum with other data or information for deeper processing to form comparisons, then the combining and evaluation of comparisons for more deep processing to form affective reactions. Each successive level relates the new datum to a broader range of relations.

Lockhart and Craik (1990) argue that the foundation of their levels of processing theory “was the claim that the memory trace should be understood, not as the result of a specialized memory-encoding process, but rather as a by-product or record of normal cognitive processes such as comprehension, categorization, or discrimination” (p. 89). They also argue that deeper processing “refers to the greater involvement of processes associated with interpretation and implication within the relevant domain" (p. 102). Craik and Tulving (1975) report the results of ten experiments designed to explore the levels of processing theory. These experiments generally support the levels of processing theory (Craik and Lockhart, 1972). The implications of these results for this study are that cognitive judgments about meaning result in better memory performance than judgements about physical characteristics that require less deep processing. Lockhart and Craik (1990) and Craik and Tulving (1975) propose and examine the levels of processing theory for word memory, but Birnberg and Shields (1984) suggest that the merits of levels of processing be considered by behavioral accounting research.

Kida and Smith’s (1995) Proposition 2 (Figure 2) is presented in two parts and deals with the relative retrievability of data encoded in the three forms stated in Proposition 1. The first part of Proposition 2 states that affective reactions are more retrievable from memory than comparisons and comparisons are more retrievable than numeric amounts. The implication of Proposition 2a is that once information is in memory it may be retrieved and used in a different context or to make a different decision than when it was encoded. Fuzzy traces (affective responses) last longer and can be accessed by a greater variety of cues (Brainerd and Reyna, 1990), which may cause the affective response to be retrievable when the data are not. If only comparisons or affective responses can be retrieved, a suboptimal decision may result. Suppose that an income statement is examined such as the one mentioned earlier where net income is $400,000 in year 19x1, $500,000 in year 19x2, and $600,000 in year 19x3. Judgement is made that net income is increasing and good. Later another income statement is examined in which net income is also good, say $800,000 in year 19x1, $750,000 in year 19x2, and $700,000 in year 19x3. If the decision-maker can only retrieve the affective response that the first net

income was “good and increasing” and s/he decides that the second income is “good and decreasing,” any decision based on this information may not be the optimum decision.

In their review of literature on Fuzzy-trace theory, Brainerd and Reyna (1990) present the fuzzy-trace theory and its implications for the retrieval of information. They argue that as information is encoded, it is mined for senses, patterns, and gists. As new data are perceived at the surface level, they are processed to determine their essence and more information that is relevant to the task is stored in working memory than specific facts that are presented as part of the task. This information varies along a continuum of exactness from fuzzy traces to verbatim traces. Brainerd and Reyna (1990) define fuzzy traces as vague representations that contain only the sense, pattern, or gist of the encoded data. Verbatim traces are defined as representations that preserve the exact content of the encoded data. Brainerd and Reyna (1990) also indicate that fuzzy traces are more available and more accessible than verbatim traces. They state that richly detailed verbatim information is unstable in memory and is less likely to be fully encoded than gist, making it less available. Also, even if verbatim information is available, it can only be used in processing if it is accessible. “Since the verbatim traces are complex and fine-grained, encoding specificity forecasts that the range of retrieval cues that produce matches will be narrower than for fuzzy traces; fuzzy traces accept a broader range of inputs as retrieval cues” (p. 18). This implies that the judgment made concerning accounting information will be more retrievable than the information used to make the judgment.

The second part of Kida and Smith's Proposition 2 states that affective reactions to an underlying construct will be more retrievable than affective reactions to the data. In accounting, underlying constructs refer to dimensions such as solvency, profitability, leverage, and liquidity. These dimensions are not directly measurable but may be captured by one or more measurable variables. Underlying constructs are a type of broad data category and Proposition 2b proposes that the evaluation of these constructs will be more easily retrieved from memory than the evaluation of the data measuring the constructs. This implies that a decision-maker may recall that a firm is profitable, or liquid, or solvent, without being able to recall the relevant numerical amounts.

Proposition 3 deals with the relative retrievability of information based on similarity of encoding and retrieval conditions and states that the greater the similarity the better the recall. This does not diminish the relationship between numerical amounts, comparison, and affective reactions. The degree of similarity between encoding and retrieval conditions simply represents a shift on the continuum of retrievability for any memory trace. Both numerical amounts and affective responses will be more retrievable as the similarity between encoding and retrieval conditions is increased. For a given level of similarity, affective responses will be more retrievable than numerical amounts.

Proposition 4 has three parts and deals with the reconstruction of encoded representations that cannot actually be recalled. The basic premise of these propositions is that affect will be retrievable more easily and for a longer time period than numerical amounts and comparisons. When affect is retrievable and numerical amounts and comparisons are not, if they are needed, numerical amounts and comparisons will be reconstructed in such a way that they are consistent with the retrieved affect. A strong positive or negative affect and increased time between encoding and retrieval will increase the likelihood of such reconstruction.

The first part of Proposition 4 suggests that not only are affective reactions more retrievable, but decision-makers will reconstruct numerical amounts and comparisons to be consistent with the recalled affect. Theoretical support for this proposition comes from several sources. Hogarth (1987) argues that memory is reconstructive and is affected by expectations. Kolodner (1983) states that "Human remembering is often a process of reconstructing what must have happened rather than directly retrieving what did happen" (p. 284). These observations can be supported by research on the concepts of script and schema.

A script is a type of schema. Kida and Smith (1995) define schema as "an organized base of knowledge about particular concepts (e.g. persons, events, things, etc.) that have been constructed based on prior experience" (p. 596). Choo (1996) defines a cognitive script as "a sequence of actions and events in an individual's knowledge structure that enables that individual to understand a specific situation or context and

guides his or her behavior in that situation or context" (p. 339). Basically, people organize their world by building in memory models of similar experiences. They start with events of short duration called vignettes. Vignettes are linked together to form a coherent sequence of events. A vignette is the most elemental unit of a script. Experiences with scripts reinforce them and individuals learn to expect them to occur (Abelson, 1976; Birnberg and Shields, 1984; Choo, 1989).

Choo (1989) says, "In functional terms, schemas direct attention to relevant information, guide its interpretation and evaluation, allow for inferences when information is missing or ambiguous, and facilitate its retention" (p. 481). Choo discusses Graesser et al.'s (1979) script copy plus tag model and Hastie's (1980) depth-of-processing-network associational model and their views on "gap-filling." The two models suggest different processes and reasons for gap-filling but they agree that people gap-fill to make up for forgotten events. Choo explains that the nature of the gap-filling depends on the prototypicality of the original script. Birnberg and Shields (1984) indicate that people tend to retrieve data from memory that is consistent with the prototype script. The data that is retrieved may not have really occurred but may be presumed to have occurred because it is consistent with the script.

There is also empirical support for Proposition 4a. Lingle and Ostrom (1979) conducted studies using decision time to determine what information people selectively recall when making memory based person judgments. In the theory portion of their article, they make several points that are relevant to the current research. They state that when people make a cognitive judgment about stimulus information, they are often able to remember the judgment better than they remember the stimulus information. Once an initial stimulus-based judgment is made, it is likely that information that is relevant to making that judgment will receive more attention, be more deeply processed, and better remembered. If the initial judgment is later remembered, it could serve as a cueing mechanism and facilitate the recall of information that aided in making the judgment. This would result in judgment relevant information being better remembered than judgment irrelevant information when making a subsequent memory based judgment.

One of the experiments conducted by Lingle and Ostrom (1979) tested the hypothesis that "an initial judgment influences the set of cognitions on which a later judgment is based by determining whether the similarity between a first and second judgment influenced how quickly the second judgment could be made" (p. 182). The task required undergraduate students to make a series of decisions concerning whether hypothetical individuals were suitable for different occupations. The results of the experiment were that mean decision time was significantly shorter for similar second judgments than for dissimilar second judgments. Based on these results, Lingle and Ostrom concluded that an initial stimulus-based judgment made by a person influenced how quickly the person made subsequent memory based judgments. The implication is that the initial stimulus-based judgment is used when making the second judgment, resulting in less cognition and less decision time required for the second judgment.

Choo (1996) used a cognitive script approach to examine how auditor's knowledge content may affect their judgment performance in a going-concern task. CPA/auditors were asked to evaluate and make a going-concern judgment for a real-world company. Choo observed that, in the going concern task, auditors demonstrated different knowledge content by the extent of their knowledge distinctiveness, abstractness, and contingency for the task. Choo concluded that these knowledge differences produce performance differences and may be observed from cognitive scripts that auditors developed through repeated exposure to the task.

Beaulieu (1996) tested the memory of commercial loan officers for accounting and character information. Loan officers attending state commercial lending schools were presented a case that included a short background passage and a list of twenty-six facts. They then made a decision whether to approve or deny the loan and made a risk assessment on the likelihood of full payment. After a ten-minute distractor task, the loan officers were asked to recall as much information from the case as possible. More correct facts and accounting information were recalled when the facts were consistent with the loan decision than when they were inconsistent. These studies demonstrate that after information has been used to make a judgment, recall for that information is biased toward

information that supports the judgment and information that supports the decision-maker's script used in making the judgement.

Moeckel (1990) examined the effects of audit experience on two types of memory error that she called "failure to integrate" and "reconstruction." She defined failure to integrate as "failure to make mental connections between separately received pieces of information" (p. 368) and reconstruction as "altering the mental representation of information to make it consistent with existing knowledge (or memories)" (p. 368). She examined reconstruction as a possible cause of failure to integrate and as a cognitive error in itself. In Moeckel's experiment, auditors simulated a supervisor's review of a set of hypothetical audit work papers and approximately twenty-four hours later completed a recognition test. The work papers contained eight sets of contradictory audit evidence. Each set consisted of information with an unstated implication and information contradicting the implication. Reconstruction errors were determined to have occurred when the auditors' responses to the recognition test demonstrated that their memories had been altered to bring about consistency between contradictory information sets. Auditors at all experience levels (assistant, staff, senior, and manager) made reconstruction errors and failure to integrate errors were linked to reconstruction. Also, more experienced auditors made more reconstruction errors than less experienced auditors. This finding is consistent with the script concept.

Kida and Smith’s (1995) Proposition 5 is presented in two parts and relates to the effect of the decision-maker’s objectives and expected future use of data on the encoding and retrieval of numerical data. Kida and Smith propose that while generally affect is more retrievable than comparisons and comparisons are more retrievable than numerical amounts, the objectives of the decision-maker at the time of encoding can override this relationship.

Proposition 6 refers to the level of confidence in retrieved information. Kida and Smith (1995) characterize confidence as “willingness to rely.” They indicate the importance of this proposition by making the point that decision-makers will be more likely to rely on memory for information or data that they feel confident about without

referring to the source of the information when making decisions. This proposition is directly related to propositions 2 and 4. The implication is that because affective reactions are more easily retrieved than numerical amounts and comparisons, the decision-maker will have confidence in the retrieved affect and will use it to reconstruct comparisons and numerical amounts. If the affect or the reconstruction is inaccurate or inappropriate for the current decision context, judgment errors may result.

The importance of the above statements is revealed in Moeckel and Plumlee's (1989) examination of auditors' confidence in a recognition task. They hypothesized that "Auditors will be at least as confident of their inaccurate memories as of their accurate memories" (p. 656). Auditors were asked to examine a set of working papers that contained intentional contradictions. Each contradiction was made up of two subsets. One subset was vague but lead to a particular implication. The other subset was explicit and contradicted the implication. The experiment was designed to emphasize the importance of the review. The day after the review, the auditors were given a recognition test and asked to rate their level of confidence in their responses. The auditors were instructed to base their confidence rating on how willing they would be to rely on their memories rather than verify the information. The highest mean confidence rating was for a cell that consisted of 259 incorrect responses. The second highest mean confidence rating was for a cell with 381 correct responses. Although the evidence was not consistent, Moeckel and Plumlee concluded that the auditors were generally as confident in their inaccurate responses as they were in their accurate responses.

Proposition 7 relates to "The effect of processing on encoded representations" (p. 600) and states that even when data is easily accessible from external sources, decision-makers will primarily use affect in processing operations. In their review of fuzzy trace literature, Brainerd and Reyna (1990) conclude that subjects prefer to reason intuitively by processing fuzzy traces rather than verbatim traces. They state that this is natural because fuzzy traces enjoy a number of advantages over verbatim traces in retrievability and processing.

Proposition 8 concerns “The effect of information load on encoded representations” (p. 601). As information load increases verbatim memory traces will be lost more quickly. This leaves the most fuzzy traces, affective responses to constructs and broad categories, in memory. This increases the likelihood that affective responses will be primarily retrievable if data must be retrieved for future decisions. If numerical amounts or comparisons need to be recalled, they are more likely to be inferred from the general affect.

2.2 Test of the Kida-Smith Model

Kida, Smith, and Maletta (1997) examine a number of the propositions presented in Kida and Smith (1995). They conducted three experiments that investigated memory retrieval and decision-making using experienced managers and obtained results consistent with expectations based on Kida and Smith’s propositions (Figure 5).

The first experiment tested Proposition 2a. Managers were presented with 12 financial ratios concerning a firm’s profitability, liquidity, and leverage. These managers were asked to evaluate the likelihood that the firm would experience financial difficulties in the foreseeable future. Approximately one hour later, the managers were asked to recall what they could remember about the data. The managers correctly recalled 64.4% of their affective reactions towards the ratios, 41.4% of the comparisons, 17.5% of verbatim numbers, and 26.7% of numbers within 25% accuracy of the verbatim numbers (i.e., "approximate" numerical amounts). These results demonstrate the retrievability hierarchy of the different forms of encoded information. An important implication for the current study is that the managers were able to recall "approximate" numerical amounts (within 25% accuracy) better than they were able to recall verbatim numbers. This is also consistent with fuzzy trace theory.

Given that affective reactions are more readily available for recall than comparisons and numerical amounts, the second experiment tested Proposition 4a and examined whether managers reconstruct memory traces to be consistent with a recalled affective reaction. As in the first experiment, managers were given 14 financial ratios and

asked to evaluate the likelihood that the firm would experience financial difficulties in the foreseeable future. An hour later, they were given 21 items of financial information and asked to indicate whether the item was a part of the original information. The results of experiment 2 demonstrated the reconstructive nature of memory. Managers indicated that items consistent with the overall affective reaction were part of the original data more frequently than items that were not consistent with the affective reaction, whether the items were part of the original data or not. Items that were part of the original data but inconsistent with the affective reaction were considered not to be a part of the original data more frequently than they were considered to be original data items. These results demonstrate a significant bias toward the overall affective reaction to the data.

Managers often make investment decisions based on information acquired over time and stored in long-term memory. Kida, Smith, and Maletta's third experiment examined the extent to which the retrievability of information affects decisions made with accounting numbers (Proposition 4b). Managers were given ten numerical accounting measures for five firms (Firms A, B, C, D, and E) and asked to evaluate the data. They were told that they would be asked to select a firm for an investment at some future time. In order to create a strong positive affect, the data for one firm (Firm B) were markedly better on all items than the other firms in the set. After an hour of unrelated activities, the managers were given comparable data for five additional firms (Firms F, G, H, I, and J) for examination. They were told that these firms were in the same industry as the first group of firms and were to be considered for investment. Two of the firms (Firm G and Firm I) demonstrated slightly better performance than Firm B on all items. The data did not, however, distinguish among the firms in the second group enough to produce a strong positive affect. After another hour's delay, the managers were asked to consider their recollections of all ten firms and indicate their first and second choices for investment. The first choice of 82% of the managers was Firm B (the firm with the strong positive affect but the third best performance among all ten firms). The second choice of these managers was Firm G (the best firm in the second group and the best among all ten firms). The remaining managers (18%) chose Firm G first and Firm B second. Firm I (the second best performing firm among all ten) was not chosen by any of the managers. This

phenomenon of dysfunctional decision-making is examined more thoroughly in the current study. The robustness of these results is tested by varying the magnitude of the performance differences among firms.

2.3 The Numerical Distance Effect

There exists, within cognitive psychology, a substantial body of research into the cognitive representation and processing of numerals (McCloskey et. al., 1985; Clark and Campbell, 1991; Campbell and Clark, 1988; Holender and Peereman, 1987). The numerical distance effect has been the subject of much of this research. "This *numerical distance effect* suggests that numerical comparisons are carried out on internal semantic representations that reflect magnitude or quantity relations among numbers" (McCloskey and Macaruso, 1995). This effect is demonstrated when individuals judge which of two numbers is larger or smaller. The closer the numbers are in magnitude, the slower the response (i.e. the longer it takes to make the judgment). The implication of the numerical distance effect is that it is more difficult to determine which number is larger or smaller when they are close in magnitude.

According to Tzelgov, Meyer, and Henik (1992), the distance effect was reported for perceptual comparisons by Cattell in 1902, and Dehaene (1992) indicates that Henmon (1906) found that "response time is a logarithmic function of the distance (numerical or physical) between items" (p. 20). Moyer and Landauer (1967) reported that the time to decide which of two numbers is larger or smaller decreases smoothly as the numerical distance increases between them. Tzelgov, Meyer, and Henik (1992) report the results of three experiments in which evidence was found for the distance effect in numerical judgments. In these experiments, subjects compared numbers to an internal standard (i.e., a number held in memory). The standard was presented visually or verbally. In each case, when a number was presented for comparison, reaction time to respond whether the number was larger or smaller was slower the closer in magnitude the number was to the internal standard.

The above research dealt with immediate or almost immediate response. Morin, DeRosa, and Stultz (1967) report that the numerical distance effect is also present when a number is being compared to a set of consecutive numbers held in short-term memory. Subjects memorized a set of consecutive digits and were then presented with digits to compare with the memorized set. Their task was to indicate whether the digit being presented was within or outside the memorized set. The outside response time decreased the further the digit was away from the set. Dehaene and Cohen (1991) obtained similar results with a severe acalculia patient.

A possible explanation for the numerical distance effect is that the internal representations of close numbers overlap more than those of more distant numbers; making it more difficult to distinguish between the magnitudes of close numbers than more distant numbers (Dehaene and Akhavein, 1995). The implications of these findings are that people are more likely to be able to distinguish between two numerical amounts if those amounts are materially different; whether the numbers being compared are before them for visual comparison or they are held in memory. In accounting, immaterial differences are considered to have little or no effect on decisions and warrant little attention, and likewise may not be very accessible from memory.

I, therefore, propose an addition to the model (Figures 3 & 4). Proposition 9: As the numerical distance between previously viewed data and current data becomes more material, the influence of an affective response on the previously viewed data will decrease.

2.4 Hypotheses

The experiments presented here examine memory and decision accuracy given a strong positive affective reaction relative to the magnitude of differences among the data (Exhibit 2).

Previously mentioned research indicates that human cognition naturally processes numerical amounts and the differences between them in a manner that causes small

differences to be more difficult to discern than larger differences. Accountants are trained to value materiality making it likely that they will ignore small differences. Business managers are not likely to spend valuable time on small differences; they too are likely to ignore them. Cowan (1995) restates his 1988 conclusion that although some simple associative learning goes on automatically, learning involving specific episodic contexts for events is attention-dependent (p. 167). He further states that what has been the focus of attention is what is recorded in memory. Jacoby (1991) emphasizes the key role of attention in long-term memory retention and retrieval. The basic idea is that memory storage takes place automatically, but explicit, direct recall of the stored material is possible only with the presence of attention both at the time of encoding and at the time of recall. If accounting decision-makers are better able cognitively to discern larger differences in magnitude than smaller differences, and they are predisposed by training to attend more to larger differences than smaller differences, it seems logical to expect them to remember larger differences more accurately than smaller differences. As the difference in numbers gets larger (i.e., becomes material) the influence of the affect will decrease. The following hypothesis is, therefore, proposed (in alternative form):

H_1: In evaluating current financial information, an affective response on previously encoded data will become less influential in current decision-making when the current data becomes more differentiated from the past data.

Literature discussed earlier indicates the reconstructive nature of human memory (Hogarth, 1987; Kolodner, 1983; Birnberg and Shields, 1984; Choo, 1989 & 1996). This literature implies that in the absence of recall of numerical data, the affective response will control memory and decision-makers will reconstruct the data to agree with the affective response. When the affect is inconsistent with the actual data or information, the reconstruction may be inaccurate (Kida, Smith, and Maletta, 1997; Moeckel, 1990).

Using a free recall task in their first study, Kida, Smith, and Maletta found that managers recalled affective responses towards the ratios 64.4% of the time.[1] Using a recognition task in their second study, they found evidence of reconstructed memory traces to be consistent with the affective response. The experiments that are reported here are free recall tasks used to test reconstruction of memory traces consistent with an earlier affective response.[2] Accordingly, the following hypothesis is proposed (in alternative form):

H_2: Numerical data will be inaccurately reconstructed to be consistent with an affective response on original data.

Fuzzy-trace theory indicates that fuzzy-traces last longer and are more accessible than verbatim information (Brainerd and Reyna, 1990). As time passes, verbatim information will be lost and fuzzy traces (affective responses) will fade more slowly. Reconstruction of information takes place because the affective response is available and the original amounts are not, therefore, the affective response is used to reconstruct the original amounts so that they are consistent with the affective response. It is, therefore, reasonable to propose a third hypothesis (in alternative form):

H_3: An increase in time between encoding and retrieval will increase the amount by which reconstructed numerical amounts are consistent with a retrieved affect (but inconsistent with the original values.)

Craik and Lockhart, 1972, state that increased processing results in increased recall. Increased processing of ratios at the time of encoding will result in a stronger memory trace of an affective response and, therefore, a stronger recall of the affective response. Alternatively, it could be argued that the increased processing of ratios would also lead to a

[1] Managers recalled 17.5% of the ratios verbatim and 26.7% of the ratios within 25% of the actual value of the ratio.

[2] Free recall should be a more rigorous and a more realistic test of this phenomenon than recognition. Prior research has shown that recognition task result in greater incidence of recall than free recall (Bahrick, Bahrick, and Wittlinger, 1975; Conway, Cohen, and Stanhope, 1991). In a decision-making situation, it is more likely that the decision-maker will need to recall numerical values observed earlier while examining

greater recall of the numerical amounts, resulting in less reliance on an affective response when trying to compare previously observed amounts with current amounts. Previous research has, however, shown that few numerical amounts can be recalled accurately (e.g., only 17.52% in Kida, Smith, and Melatta).

As information load increases, verbatim memory traces are lost, leaving affective responses in memory (Brainerd and Reyna, 1990). It is the fuzzy trace or affective response that is more retrievable. Therefore, it is hypothesized that the outcome of an increased level of processing will be a stronger affective response, which will manifest itself in financial decision-making by the decision-maker being more likely to persist in investing in a firm where the original investment decision elicited an affective response.

H_4: In evaluating current financial information, an affective response on previously encoded data will be more influential in current decision-making when the previous encoding of the affective response was done at a higher level of processing.

The following chapters detail the testing of these hypotheses, the results of the testing, and a discussion of the results.

new numerical values than it is that the decision-maker will need to decide whether a particular numerical value was a part of the previously observed data.

Chapter 3

RESEARCH DESIGN AND METHODOLOGY

Two experiments were conducted to test the hypotheses. The first experiment used graduate students enrolled in a graduate accounting course at Virginia Tech. This experiment tested hypotheses one, two, and three.

The second experiment used accounting practitioners attending a Continuing Professional Education seminar at the Accounting and Auditing Conference sponsored by Virginia Tech and the Virginia State Society of CPAs. This experiment tested hypotheses one, two, and four.

This chapter discusses a number of issues related to the collection and analysis of data. First each experiment is discussed, including a description of the tasks, the participants, the procedure, the independent variables, and the dependent measures used to test each hypothesis. Finally, the procedures used to analyze the data are introduced.

3.1 First Experiment

The first experiment consisted of two decision tasks, with a distractor task between the first and second decision tasks. The instruments were put into two small envelopes (one for each task). These two task envelopes were put into a larger envelope with a cover letter explaining the procedures to be preformed. There are four different combinations of the two tasks, which constitute four experimental groups (small difference - short time, small difference - longer time, large difference - short time, and large difference - longer

time). Participants were divided into four groups by randomly distributing the envelopes. The experimental design is summarized in Exhibit 2.

3.1.1 Task One

This study is intended to extend the findings of Kida, Smith, and Maletta (1997) and to further test the Kida and Smith (1995) model. Therefore, the instrument design is based on an instrument used in Kida, Smith, and Maletta's (1997). The instrument was developed by examining actual ratios for firms in the Computer and Business Machines Industry. Seven ratios were produced for each of five firms (Exhibit 3). The number of ratios was chosen in an attempt to minimize memory overload in short-term memory. The traditional view of short-term memory claims that it has the capacity to hold up to seven plus or minus two units of information (Miller, 1956).

In order to produce a positive affect, four ratios related to earnings (return on assets, return on equity, net profit margin, and earnings per share), and market share, for one firm (Firm D) were manipulated such that each ratio was clearly superior to the same ratio for the other four firms[3]. Two other ratios (debt to equity, and current ratio) were included in the case to make it more realistic but were not a part of the manipulation because there is no clear consensus concerning their evaluation. Participants were expected to recognize the superior performance of Firm D and to form a positive opinion (affective response) concerning its performance. They were asked to indicate this positive affective response by identifying the firm that they preferred.

[3] The ratios for Firm D are Return On Assets, 12.4; Return On Equity, 25.1; Net Profit Margin, 7.6; Earnings Per Share, 4.72; Market Share, 3.15. The next highest rations (not all the same firm) are 9.7, 21.3, 6.8, 3.69, and 2.58 respectively.

3.1.2 Task Two

The instrument for the second task consisted of a small difference case and a large difference case, each with seven ratios for five additional (different) firms. In the small difference case (Exhibit 4), one firm in task two (Firm J) demonstrates superior performance to Firm D by a small difference on one ratio: return on equity is 7% higher for Firm J (26.9 vs. 25.1). The other four earnings ratios are slightly above but basically the same as Firm D. In the large difference case (Exhibit 6), four ratios of Firm J are superior to Firm D by a large difference: Firm J is superior to Firm D on return on assets by 21.8% (15.1 vs. 12.4), return on equity by 28.7% (32.3 vs. 25.1), net profit margin by 21.1% (9.2 vs. 7.6), and market share by 20.3% (3.79 vs. 3.15)[4]. After studying the ratios in the second task, participants are asked to respond to three questions and to supply demographic data.

3.1.3 Participants

The participants in the first experiment were 67 graduate students[5] enrolled in one of two graduate accounting courses at Virginia Tech. The experiment was conducted during regular class time but participation was voluntary. Supplemental data was collected on current degree program, age, gender, undergraduate degree, and experience (Table 1). Fifty-six participants were enrolled in the MBA program, 6 in master of accounting and 2 in other programs.[6] The ages ranged from 22 to 44 with a median age of 26. There were 45 males and 19 females[7]. Thirty-one of the participants had undergraduate degrees in accounting or business and 32 had non-business undergraduate degrees[8]. Only 16 of the

[4] Earnings per share decreased slightly, 6% (4.45 vs. 4.72).

[5] Two of the instruments were invalid.

[6] One student was enrolled in computer science and one was a Ph.D. student. One participant did not supply this information.

[7] One graduate participant did not provide gender.

[8] Two graduate participants did not provide their undergraduate degree.

65 participants indicated that they had any experience using accounting numbers for decision-making purposes. This experience ranged from 3 months to 10 years.

3.1.4 Procedure

The first experiment was administered to graduate students enrolled in a graduate accounting class. In the first task, all participants were given seven financial ratios for five companies in the same industry. They were informed by the instructions that the ratios represent three-year averages with no appreciable difference from average in the current year. Participants were told to study and evaluate the data. The seven financial ratios include return on investment, return on assets, debt to equity, net profit margin, current ratio, earnings per share, and market share (Exhibit 3). In order to create a "positive affect," the data for one firm (Firm D) clearly indicates better performance than the data for the other four firms on the five ratios related to earnings: return on assets, return on equity, net profit margin, earnings per share, and market share. The participants were allowed approximately ten minutes to study the data and then indicated the firm in which they would be most willing to invest.[9]

The students then participated in a distractor task for approximately forty-five minutes.[10] Before the end of the class, envelopes were collected from participants.[11] The "longer time" groups were allowed to leave with instructions not to discuss the experiment and to be in attendance at the next class meeting, two days later. Each participant received a number for identification purposes and the same number was attached to his/her envelope. These numbers were discarded when the envelopes were re-distributed two days later.

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[9] This response served as a manipulation check. If a participant did not respond "Firm D," the data for that participant was not used.

[10] The distractor task was a lecture on an unrelated topic.

[11] The "short-time" groups immediately did the second task and provided demographic information. The "long-time" groups came back two days later and did the second task and provided demographic information.

In the second task, participants were given seven ratios for an additional five firms. They were told that these firms are in the same industry as the first five and the ratios also represent three-year averages with no appreciable difference from average in the current year. They were told to consider these new firms with the firm they selected earlier in the first decision task.

In order to test Hypothesis 3, half the small difference group and half the large difference group were given the second task approximately forty-five minutes after the first task, and the other half of each group was given the second task two days after the first task.

Participants were asked to respond to three questions. First they were asked "If you could only invest in one firm, how likely are you to invest in the firm you selected earlier in the first decision task, compared to the five firms above." Their responses were obtained on a scale from zero to ten anchored as "Very Unlikely" and "Very Likely." The second question asked for their confidence in their investment judgment and also allowed for responses on a scale of zero to ten (Exhibit 4). The third question asked "For the firm you selected earlier in the first decision task, please try to remember the ratios and record them below." The names of the seven ratios were listed with spaces provided for participants to reply (Exhibit 5). Participants were also asked how confident they were in their response to each ratio.

3.1.5 Independent Variables

There are two independent variables in the first experiment, each with two levels. The first independent variable is DIFFERENCE and is manipulated to be "small" or "large." It is operationally defined as the magnitude of the differences between the ratios of the best firm in the first task and the ratios of the firms in the second task.

TIME between encoding and retrieval of data is the second independent variable. Participants made their second decision either forty-five minutes (short time) or two days (longer time) after the first decision.

3.1.6 Dependent Measures

The dependent measure for the first hypothesis is "how likely participants are to invest in Firm D" (LIKELIHOOD), measured by the participant's response to question one (Exhibit 4). Kida, Smith, and Maletta found that when managers had been give a positive affect, they chose to invest in the firm for which the positive affect had been developed even when that firm was not the best choice. Cognitive psychology literature on the numerical distance effect gives rise to the possibility that decision-makers may be better able to distinguish between two sets of accounting numbers when the magnitude of the differences between the numbers in the two sets is large rather than small (McCloskey et. at., 1985; Holender and Peereman, 1987; Campbell and Clark, 1988; Clark and Campbell, 1991; Tzelgov, Meyer, and Henik, 1992; Dehaene, 1992; McCloskey and Macaruso, 1995).

To test hypothesis one, all participants were given "positive affect" data in the first task (Exhibit 3). In the second task, groups one and three received the "small difference" data (Exhibit 4) and groups two and four received the "large difference" data (Exhibit 6). The first hypothesis is evaluated by comparing the responses of the small difference groups to the responses of the large difference groups on question one (Exhibit 4), which asks how likely the participant is to invest in Firm D compared to one of the firms in the second group. The optimal response to this question is "zero" because in each case there is at least one firm (Firm J) with superior performance to Firm D. The mean response in the small difference case should be significantly higher (more likely) than in the large difference case because theoretically, the small difference participants would rely more on the affective response when making the investment decision, compared to the large difference case.

The dependent measure for hypotheses two and three is "recall accuracy" and is measured by the difference between the reconstructed value of each of the seven ratios in response to question three (Exhibit 5) and the ratio's actual value. For hypothesis two to be supported, participants must reconstruct the ratios to be significantly better (i.e. greater) than they actually were. For hypothesis three to be supported, this reconstruction must

take place more extensively (i.e. the recalled ratio amounts must be higher) when the second task is performed two days after the first task than when the second task is performed forty-five minutes after the first task.

3.2 Second Experiment

The second experiment was similar to the first experiment and examined accounting practitioners. It consisted of two tasks separated by a distractor task.[12] Each task had two levels constituting four groups (small difference - low processing, small difference - high processing, large difference - low processing, large difference - high processing). Participants were divided into groups by the random distribution of the instruments.

3.2.1 Tasks

As in the first experiment, participants were given seven ratios for five firms. The ratios of Firm D demonstrated superior performance in comparison to the other four firms in order to create a positive affective response (See section 3.11). Half the participants received the "low processing" instrument (Exhibit 3); the other half received the "high processing" instrument (Exhibit 7). The low processing instrument asked participants to study the ratios and indicate the firm in which they would be willing to invest. The high processing instrument instructed the participants to rank the firms on each ratio and then to indicate their preference.

The second task in experiment two was the same as the second task in experiment one (See section 3.12) using both the small and large differences. For the second experiment, however, only the short time period between task one and task two was used.

[12] The distractor task for the second experiment was a CPE seminar.

3.2.2 Participants

Participants in the second experiment were accounting practitioners attending a session of the Accounting and Auditing Continuing Education Conference sponsored by Virginia Tech and the Virginia State Society of CPAs. The attendees at this conference are generally CPAs working in local or regional public accounting firms, or CPAs working in local or regional business. Participation in this experiment was voluntary. Ninety attendees participated in the experiment resulting in 76 usable instruments (Table 2). The ages of the participants ranged from 26 to 70, with a mean of 44 years.[13] There were 46 males and 20 females with a median of 11 years experience making investment decisions using accounting information (range 0-30) and a median of 16 years experience making other decisions using accounting information (range 0-35).

3.2.3 Procedure

The second experiment was administered to accounting practitioners attending an Accounting and Auditing Continuing Education Conference. The instruments were distributed at the beginning of the session and the participants were instructed to complete task one. Task one for the second experiment was the same as task one for the first experiment except that half of the participants received the low processing instrument (the same as in the first experiment), and the other half received the high processing instrument. After the participants made their decision in the first task, the instruments were put aside and the Continuing Education session was conducted.

Before the end of the session, the participants were instructed to resume work on the instrument and complete task two and the demographic information. Task two was the same as in experiment one with half the low processing group and half the high processing group receiving the small difference data and the other half of each group receiving the large difference data.

[13] Not all participants provided age. Supplemental information was not provided or not complete for 14 of the 76 practitioner participants.

3.2.4 Independent Variables

There are two independent variables in the second experiment, each with two levels. The first independent variable is DIFFERENCE and is manipulated to be "small" or "large." It is operationally defined as the magnitude of the "differences" between the ratios of the best firm in the first task and the ratios of the firms in the second task.

Level-of-processing (PROCESSING) is the second independent variable and is manipulated to be either low or high at the time of encoding, during the first task.

3.2.5 Dependent Measures

The dependent measure for hypotheses one is LIKELIHOOD. For hypothesis one, groups 6 and 8 are compared to groups 7 and 9 (Exhibit 2) on their responses to question one (Exhibit 4). As in experiment one, it is expected that the responses of the small difference groups (6 and 8) will be greater (i.e. more likely to invest in Firm D) than the responses of the large difference groups (7 and 8).

The dependent measure for hypothesis two is "recall accuracy", tested by comparing the participants recall of the seven ratios (Exhibit 5, question 3) to the actual ratios of Firm D in task one. For hypothesis two to be supported, participants must reconstruct the ratios to be significantly better (i.e. greater) than they actually were.

For hypothesis four, groups 6 and 7 are compared to groups 8 and 9 on responses to question one (Exhibit 4). This hypothesis will be supported if responses of the high processing groups (8 and 9) are less than the responses of the high processing groups (6 and 7). Exhibit 2 summarizes the testing of the dependent measures.

3.3 Analysis

In their third study, Kida, Smith, and Maletta found that managers made suboptimal decisions when exposed to data that produced an affective response and were later asked to make a decision concerning that data. The testing of hypothesis one is intended to be a

more rigorous examination of this phenomenon by testing whether materiality is an issue. Kida, Smith, and Maletta used small differences in their data that might be considered immaterial. If the phenomenon only exist when the difference between the alternative decisions is immaterial, it may not be a serious problem. If it exists, however, when the difference is material, then there is a problem that should be addressed.

One-way analysis of variance (ANOVA) is used to analyze the relationship between LIKELIHOOD and DIFFERENCE in both the first and second experiment. LIKELIHOOD is the response provided by the participants after viewing the data in the second task when asked how "likely" they are to invest in the firm they selected in the first task. The responses of the small difference groups and the responses of the larger difference groups to this question are used to test Hypothesis one (Exhibit 1). The hypothesis will be supported if the small difference groups' responses are significantly greater than the responses of the large difference groups.

Hypothesis two assumes that the participants are unable to remember the ratios for the firm they selected in the first task and when asked to provide them to the best of their ability, they will reconstruct the ratios using what they can remember. This should be the affective response. Only instruments with Firm D selected in the first task were used in the analysis. Because the participant has the ratios from the second task available when providing this information, and there is at least one firm in the second group of ratios that demonstrates superior performance to Firm D, it is expected that the affective response will lead the participant to reconstruct the ratios to be greater than their actual value. This is tested by examining responses of all participants to question three (Exhibit 5). A retrieved response greater than the actual ratio value (Exhibit 3) is consistent with an affective response. The proportion of affective responses was tabulated for each ratio by using the nonparametric sign test to evaluate the hypothesis that the median of the data is equal to *the actual value of the ratio*. If the median is larger than the actual value and the difference is significant, the hypothesis is supported.

Hypothesis three is concerned with the influence of time on the recall of ratios; specifically, whether increased time between encoding and retrieval causes the

reconstruction of ratios to be more consistent with a previously formed affective response. Hypothesis two assumes that the participants are unable to remember the ratios. Hypothesis three makes this assumption plus the assumption that memory traces fade with the passage of time due to decay (Thorndike, 1914) or interference (McGeoch, 1932), but memory traces of affective responses last longer than memory traces of numerical values (Brainerd and Reyna, 1990). Increased time between encoding and retrieval result in the need to reconstruct more of the ratios based on the affective response.

This hypothesis is tested by multivariate analysis of variance (MANOVA), using the responses on question three (Exhibit 5) to compare groups 1 and 2 to groups 3 and 4. Hypothesis three will be supported if the long time groups' responses are significantly larger than the responses of the short time groups. A larger response by the long time groups would indicate reconstruction of numerical amounts to be more consistent with a positive affective response with increased time between the first and second tasks.

Hypothesis four is analyzed using the one way ANOVA to examine the relation between PROCESSING and LIKELIHOOD. A high level of processing should produce a stronger affective response and cause participants to be more likely to invest in Firm D than a low level of processing. The following chapter presents the results of these analyses.

Chapter 4

RESEARCH RESULTS

This chapter discusses the results of the testing of each hypothesis (Figure 5). Hypotheses one and two are tested in both experiments. Hypothesis one is supported for Practitioners but not for Graduate Students. Hypothesis two is not supported for either experiment. Hypothesis three is tested in experiment one but is not supported. Hypothesis four is tested in experiment two but is not supported. The actual findings are detailed in the remainder of this chapter.

The data were first subjected to tests of the assumptions of independence, randomization, normality, and homogeneity of variance. These tests and their results are presented in the Appendix A.

4.1 Hypothesis One

The first hypothesis states that an affective response on previously encoded data will become less influential in current decision-making when the current data becomes more differentiated from the past data. To establish that an affective response has occurred, each instrument used in the analysis indicated that Firm D is selected for investment in the first task. A one-way analysis of variance (ANOVA) was conducted to analyze the data. The response to question one (Exhibit 4) served as the dependent measure (LIKELIHOOD) and the difference between the ratios in the first and second tasks served as the independent variable (DIFFERENCE). The optimum LIKELIHOOD response in the second task is zero. The results of the testing of this hypothesis in the first and second experiment are summarized in Tables 3 and 4.

4.1.1 First Experiment

Fifty-five of sixty-five[14] (84.62%)[15] of the graduate students responded greater than zero that they would be likely to invest in Firm D instead of one of the firms in the second task. This indicates the occurrence of suboptimal decision-making[16]. In order for hypothesis one to be supported, participants should indicate that they would be more likely to invest in Firm D when the magnitude of the differences between the ratios of the firms in task one and the ratios of the firms in task two is small than when the magnitude of the differences is large.

Participant responses covered the scale from 0 to 10. The mean LIKELIHOOD response is 5.200 for the small difference and 4.588 for the large difference (Table 3, Panel B). The standard deviations are also comparable (3.485 and 3.366). Although the mean LIKELIHOOD response is greater for the small difference than for the large difference, as predicted, the F statistic is 0.50 and the p-value is 0.484; DIFFERENCE is not statistically significant (Table 3, Panel A). Panel C of Table 3 shows that DIFFERENCE is not significant when CONFIDENCE is used as a covariant (p = 0.397). Panel D shows that DIFFERENCE is still not significant when the model is expanded to include the

[14] Two of the original 67 instruments in the first experiment were not usable: one because Firm E was chosen in question one, and the other because a subject in the longer-time group did not return the second day. Four other instruments were dropped for H2 and H3 because the answers on recalling ratios were incomplete.

[15] These results are equivalent to those found by Kida, Smith, and Maletta in their third study in which the best firm was selected 18% of the time.

[16] The optimal response to question one, which asked how likely participants were to invest in Firm D after examining the data for the firms in task two, is zero. The mean response for graduate students was 4.823 (p = 0.0000) and for practitioners 4.607 (p = 0.0000). Each mean response is significantly greater than zero, as shown below.

Mean Responses on Likelihood of Continuing to Invest in Firm D

Experiment	N	Mean	Std. Dev.	T	P
Graduate Students	65	4.823	3.399	11.44	0.000
Practitioners	76	4.607	3.274	12.27	0.000

independent variable of TIME (the manipulated length of time between encoding and retrieval of information).

4.1.2 Second Experiment

The second experiment tested accounting practitioners. Sixty-five of seventy-six[17] (85.53%) participants provide LIKELIHOOD responses above zero that they would invest in Firm D instead of one of the firms in the second task. There was a significant DIFFERENCE, p = .016 (Table 4), in subjects likelihood of investment in Firm D (LIKELIHOOD), comparing subjects who viewed ratios in task two with a large difference from task one ratios (mean value for LIKELIHOOD = 5.5 from Table 4, Panel B), to subjects who viewed ratios in task two with a small difference from task one ratios (mean value for LIKELIHOOD = 3.7 from Table 4, Panel B). Thus, a large difference in the ratios between task one and task two resulted in practitioners being less influenced by an affective response, supporting hypothesis one[18].

[17] Fourteen of the original 90 instruments in the second experiment were pulled from the sample because the participants did one or more of the following: selected a firm other than Firm D in the first task, did not indicate a selection in the first task, or did not answer question one in the second task. Another 9 instruments were dropped for H2 and H3 because the answers on recalling ratios were incomplete.

[18] Because the Kolmogorov-Smirnov Normality Test (Table A4) of LIKELIHOOD for the practitioner sample resulted in a p-value only slightly above 0.05 (p=0.069), the Kruskal-Wallis Test was conducted for comparison. This distribution free test also indicates that DIFFERENCE is significant (p=0.021) with a median `LIKELIHOOD response of 6.0` for the small difference and 3.0 for the large difference, as shown below.

Experiment One - Practitioners
Kruskal-Wallis Test of Hypothesis One

Difference	N	Median	Ave Rank	Z
Small	38	6.000	44.3	2.30
Large	38	3.000	32.7	-2.30
Overall	76		38.5	

H = 5.33 DF = 1 **P = 0.021** (adjusted for ties)

4.2 Hypothesis Two

Hypothesis two states that numerical data will be inaccurately reconstructed to be consistent with an affective response on original data. Sign tests[19] were used to compare the data for each ratio to the actual amount for Firm D, and t-tests were performed for comparison. For this hypothesis to be supported, each ratio would have to be reconstructed to be significantly better than its actual value. Hypothesis two is tested in the first and second experiment and the results are summarized in Tables 5 and 6.

4.2.1 First Experiment

Graduate students in the first experiment did not consistently reconstruct the ratios to be better than actual. The medians of return on assets (ROA) and market share (MS) are greater than their original values, and the median of net profit margin (NPM) is equal to its actual value (Table 5, Panel A). Only the median for MS (3.50) is significantly greater than the actual amount of 3.15 (p=0.000). The medians for return on equity (ROE) and earnings per share (EPS) are less than the actual values. EPS (3.80) is significant (0.000) but is less than the original amount of 4.72. Only ROA, NPM, and MS have more responses above their actual amounts than below.

T-tests were conducted for comparison (Table 5, Panel B) and produced similar results. MS is the only ratio with a mean response (4.189) significantly greater than its original amount (p=0.012). ROA, and NPM are above their original amounts but are not significant, whereas, ROE and EPS are significant but each mean response is below its actual amount.

[19] The Kolmogorov-Smimov Normality Tests in Tables A1 and A2 indicate that the hypothesis of a Gaussian distribution is rejected for all the ration in the practitioner sample and all except CR in the student sample. Therefore, the sign test is being used to test this data instead of the t-test.

4.2.2 Second Experiment

Practitioners in the second experiment were able to recall the exact ratio more often than the students in the first experiment but the overall results are basically the same (Table 6, Panel A). The medians for three ratios (ROA, ROE, and EPS) are significantly different from their actual values. All three are below the original amounts. The medians for NPM is equal to its original value of 7.60. Ten participants recalled the actual amount for NPM.

The T-tests (Table 6, Panel B) found significant differences between the reconstructed amounts and the actual amounts for ROE, EPS, and MS, but only MS is in the hypothesized direction.

4.3 Hypothesis Three

Hypothesis three predicts that time will play a role in the reconstruction of numerical data. Specifically, it states that an increase in time between encoding and retrieval will increase the amount by which reconstructed numerical amounts are consistent with a retrieved affect. This hypothesis is analyzed using multivariate analysis of variance (MANOVA) where the reconstructed ratios serve as the dependent measures and TIME as the independent variable (Table 7). This hypothesis will be supported if reconstructed ratios are generally higher when time is long than when time is short and the difference is significant.

Hypothesis three is tested in the first experiment. Panel A of Table 7 shows that three tests were conducted to analyze this data: Wilk's test, Lawley-Hotelling test, and Pillai's test. These tests resulted in F of 1.446 and p-value 0.222, therefore, the null hypothesis of no group differences cannot be rejected. Table 7, Panel B shows that only ROE has a long time mean (24.13) that is greater than the short time mean (20.761). For ROA, NPM, EPS, and MS, the short time means are greater. P-values from univariate ANOVAs show that none of these differences were significant.

4.4 Hypothesis Four

Hypothesis four predicts that increased processing at the time of encoding will cause an affective response that is stronger (i.e. more influential in current decision-making). This prediction is tested in the second experiment using low and high levels of processing. It will be supported if the mean LIKELIHOOD response is significantly higher when processing is higher.

Panel B of Table 8 shows that the mean LIKELIHOOD response is higher (4.718 vs 4.489) and the standard deviation lower (3.092 vs 3.494) when the level of processing is high than when it is low, as predicted. Panel A, however, shows that the difference in the LIKELIHOOD response for the two levels of PROCESSING is not significant ($F=0.09$, $p=0.763$). PROCESSING is also not significant when it is included in the expanded model with DIFFERENCE, the interaction between DIFFERENCE and PROCESSING, and CONFIDENCE as a covariant (Table 4, Panel C). The Kruskal-Wallis Test in Panel C of Table 8 shows a median of 4.0 for low processing and 5.0 for high processing, however, the difference is not significant ($p = 0.778$).

Chapter 5

DISCUSSION AND CONCLUSION

This chapter contains a discussion of the results of the data analysis presented in the previous chapter and the conclusions drawn from those results. The first section contains a discussion of the results of the analysis of each hypothesis. The second section contains the implications of the present study. The limitations of the study are reviewed in the third section. The concluding section provides recommendations for future research.

5.1 Discussion of Results of Hypotheses Testing

Accounting information is used in decisions with major financial and social implications. These decisions may require the consideration of large amounts of information, much of which is in numerical form. This information is often acquired over time and is retrieved from memory when the decision is being made. Understanding the cognitive processes employed in the encoding and retrieving of numerical information may motivate decision-makers to take actions that will improve the optimality of decisions.

Research that examined the affective component of cognition was discussed in Chapter 2. This research indicates that decision-making may be biased based on previous experience. When numerical information is an input for decisions, the affective response to the information, rather than the information itself, may be used in the decision process. This may result in suboptimal decisions.

The purpose of this study was to extend the findings of Kida, Smith, and Maletta (1997) and test the robustness of their results and to further test and extend the Kida and Smith (1995) model (Figure 5). This was done by examining the variable conditions under

which an affective response may exist and lead to suboptimal decision-making. Four hypotheses were tested, each examining the affective response to numerical data and one of the following: numerical distance, reconstruction of data, reconstruction of data with increased time, and increased level of processing at the time of encoding.

5.1.1 Affective Response and Numerical Distance

Hypothesis one predicted that an increase in the differences between numerical data would reduce the influence of an affective response on previously encoded data when new financial information is being evaluated. The two experiments used to test this hypothesis produced conflicting results. The first experiment using graduate students failed to support the hypothesis, but the second experiment using practitioners did support it.

Perhaps the explanation for different results for students and practitioners can be found in script theory. Kida and Smith (1995) point out that their model concerns the underlying issues of numerical, comparative and affective encoded representations that apply to both experts and novices. However, experts typically have well-developed schemata and scripts (p. 603). It is probable that the students and the practitioners used different types of cognitive scripts during the experiments. Students should have a strong test taking cognitive script with the goal of providing the "correct response". Materiality may not be an important factor. The affective response was not mitigated by materiality because no script has been developed that takes materiality into consideration. The practitioners, on the other hand, may have employed cognitive scripts that did incorporate materiality, and therefore, the materiality of the differences between the magnitude of the ratios produced differing responses to the data.

5.1.2 Affective Response and Reconstruction of Data

Using a recognition task, Kida, Smith, and Maletta (1997) found evidence of the reconstructive nature of memory in their second study: managers were more likely to recognize items as being part of an original data set if they were consistent with an earlier decision. In a free recall task, Beaulieu (1996) found that loan officers recalled more facts

when they were consistent with the loan decision. The current study used a recall task but the results of neither experiment supported the hypothesis that reconstruction of ratios would be consistent with the affective response.

Three possible explanations for the lack of support for this hypothesis are offered. First, the decision was made in a somewhat sterile environment. No information was presented in the case to create an emotional attachment to the decision. Participants were simply told that they were to choose a firm for investment. This could have produced an affective response that was not strong enough to influence reconstruction. Second, in the effort to not overload short-term memory, the memory load could have been too low making it unnecessary to reconstruct the data. However, this is probably not the case. In their first study, Kida, Smith, and Maletta (1997) gave managers 12 financial ratios. Approximately one hour later, the managers recalled 17.5% of the ratios verbatim. Beaulieu (1996) gave loan officers 26 financial and character facts. Ten minutes later, the loan officers recalled the subject matter and direction of 74% of the accounting information. The graduate students in the first experiment recalled 2.3% of the ratios verbatim and the practitioners in the second experiment recalled 8.4% verbatim. Finally, and more probable, it is possible that the task was too difficult. There were five firms in each of the two tasks and seven ratios for each firm. Although the participants were asked to recall only seven ratios, they were exposed to seventy ratios and were not informed in advance that they would be expected to recall some of the data. This task may have produced frustration that interfered with normal reconstructive processes.

One other possibility needs to be considered. Kida and Smith (1995) indicate that decision-makers may have internal norms for financial ratios and these norms may be used in the decision-making process (p. 603). If the internal norms were lower than the ratios provided in the experiment and the norms were used in the first decision task, reconstruction may have been based on the norms and not the affective response on the data provided in the experiment. This may explain why the reconstructed means and medians for ROE (actual value 25.10) and EPS (actual value 4.72) were consistently and significantly below their actual values.

5.1.3 Affective Response and Reconstruction with Increased Time

The third hypothesis predicted that increased time between encoding and retrieving information would result in increased influence of the affective response that would manifest itself in the form of higher amounts being recalled for ratios. If reconstruction is not taking place as predicted, it cannot be influenced by time. If the memory load was too great for reconstruction to take place, the amount of time between encoding and retrieval is irrelevant. If reconstruction did in fact take place but was based on internal norms rather than or in addition to the affective response on the data, analysis is not possible without knowledge of the value of the internal norm. Also, if internal norms are used in reconstruction, those norms, and therefore the reconstruction, would not be influenced by increased time between encoding and retrieval of information.

5.1.4 Affective Response and Level of Processing

Increased processing did not significantly influence decision-making. It was expected that increased processing would result in a stronger memory trace for the affect as well as for the data. Theoretically, with a higher level of processing, the affective response should have been more easily retrieved. It is possible that the manipulation was not strong enough. Lockhart and Craik (1990) suggest that memory performance depends on the qualitative type of encoding achieved. A stronger manipulation might use a deeper level of processing, for example, semantic processing rather than mere categorization or classification (Hashtroudi, 1983 and Frase and Kamman, 1974).

5.2 Implications

The primary implication of this study for the accounting profession relates to the influence of an affective response on decision-making using accounting information. There was evidence of an affective response and dysfunctional or suboptimal decision-making.

Increasing the materiality of the differences between the financial ratios significantly decreased the likelihood of investing in the firm on which the affective

response had been produced (Firm D) in the practitioner sample, supporting hypothesis one. This implies that materiality plays an important role in decision-making using accounting information. This does not indicate that there is no need for concern. Increased materiality reduced but did not eliminate suboptimal decision-making. In each sample approximately 85% of the participants were likely to continue to invest in Firm D, indicating the need to take actions to mitigate the effects of the affective response.

5.3 Limitations

This was a laboratory experiment with limited information, resulting in limited external validity. The laboratory experiment provided greater control. The resulting increase in internal validity permitted the examination of specific characteristics of the affective response phenomenon.

The external generalizability of is also limited by the fact that the students are from a single institution and the practitioners are from one geographical area.

5.4 Recommendations for Future Research

This study highlights several areas to be considered for future research. First, a stronger, more detailed case for encoding data may produce a more influential affective response. Additional information concerning the motive for the decision and the amount of the investment should create a sense of accountability and therefore a greater personal investment in the decision.

Second, decision-making and reconstruction could be tested separately, testing reconstruction with fewer items. To be realistic, decision-making needs to be tested using enough information for an informed decision. Reconstruction needs to be tested at a level that human cognition can handle, and the size of the data set should be taken into consideration when the results are interpreted.

Third, when testing reconstruction, internal norms could be taken into consideration. It may be necessary to determine whether individuals use an internal norm when reconstructing information.

Fourth, when testing the influence of levels of processing on affective response, a stronger manipulation (i.e., an even higher level of processing) may be necessary.

Kida and Smith (1995) present eight propositions for examination. This study deals with only four of those propositions. Future studies may examine the remaining propositions and in the process other questions will be generated for investigation. Individual differences could also be considered for a better understanding of how accounting information is used.

Figures

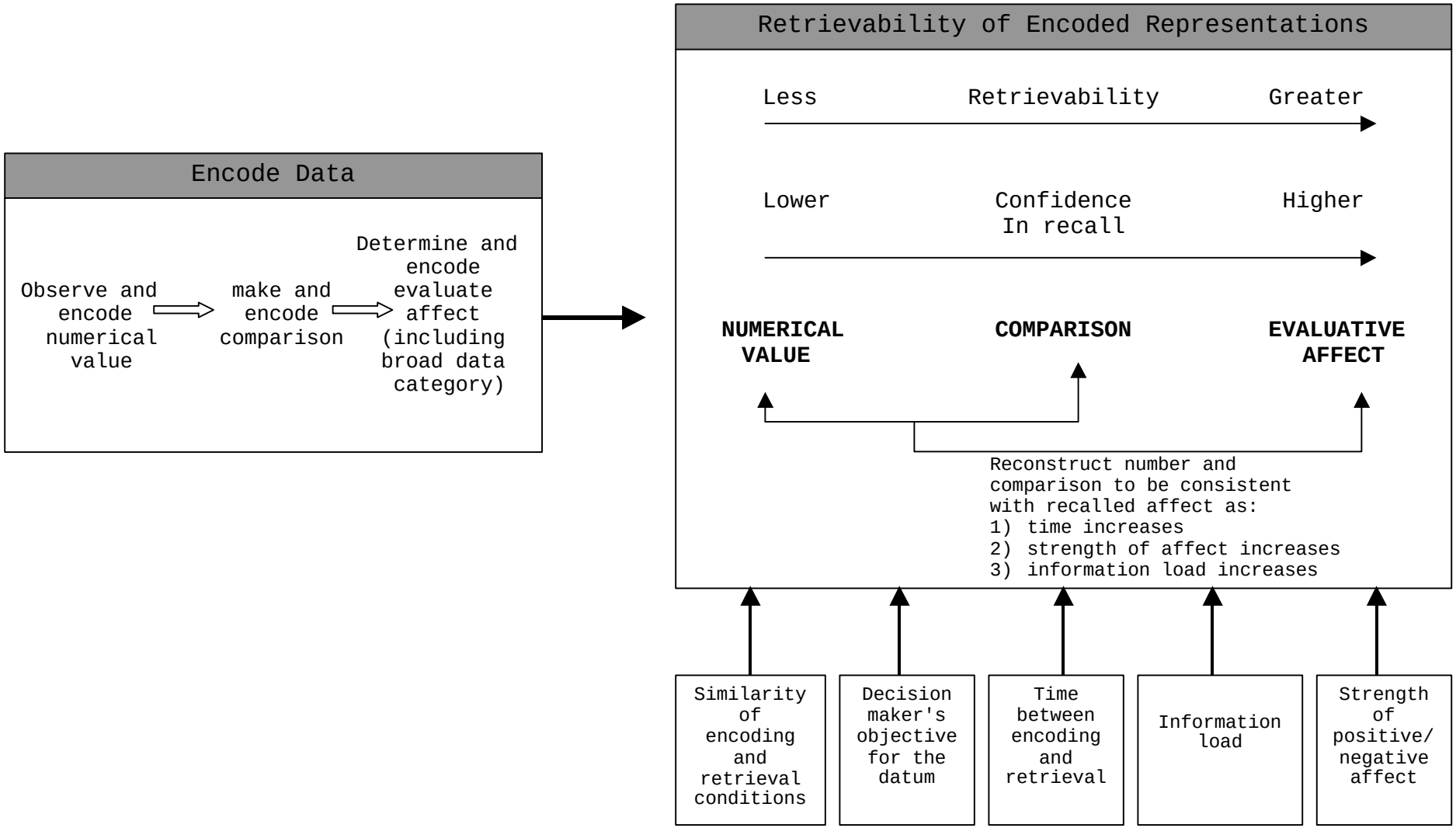

Figure 1
The encoding and retrievably of numerical data.
By Thomas Kida and James F. Smith (1995, p.588)

KIDA AND SMITH (1995) PROPOSITIONS	
1.	Numerical data may be initially encoded as numerical values, as comparisons between numerical values, and as affective (evaluative) reactions to those comparisons.
2a.	The retrievability of encoded representations increases from numerical values, to comparisons between numerical values, to affective reactions to those comparisons.
2b.	Affective reactions to underlying constructs or broad categories of data will have greater retrievability than affective reactions to a datum.
3.	Memory for a numerical value, comparison or evaluative reactions will be greater as the similarity between encoding and retrieval conditions increases.
4a.	Given differences in the retrievability of encoded representations, decisions makers will reconstruct numerical values and comparisons to be consistent with a recalled affect.
4b.	Reconstructing numerical and comparative data from affective representations is more likely to occur when a decision-maker has a strong positive or negative affect.
4c.	Reconstructing numerical and comparative data from affective representations is more likely to occur as the time between encoding and recall increases.
5a.	The encoding and retrieval of numerical data will depend upon the decision-maker's objectives for that data when they are first observed.
5b.	The retrievability of numerical values will increase if it is believed that they will be needed for future decisions.
6.	Decision-makers will be more confident in recalled affective responses than in recalled numerical values or comparisons.
7.	For most decision contexts, affective reactions to numerical data will be used to process (combine) data, and such processing will contribute to the greater relative retrievability of affect in future tasks.
8.	As the amount of numerical data increases, the relative difference in the retrievability of affective reactions to underlying constructs or broad data categories will increase as compared to other forms of encoded representations.

Figure 2

KIDA AND SMITH (1995) PROPOSITIONS

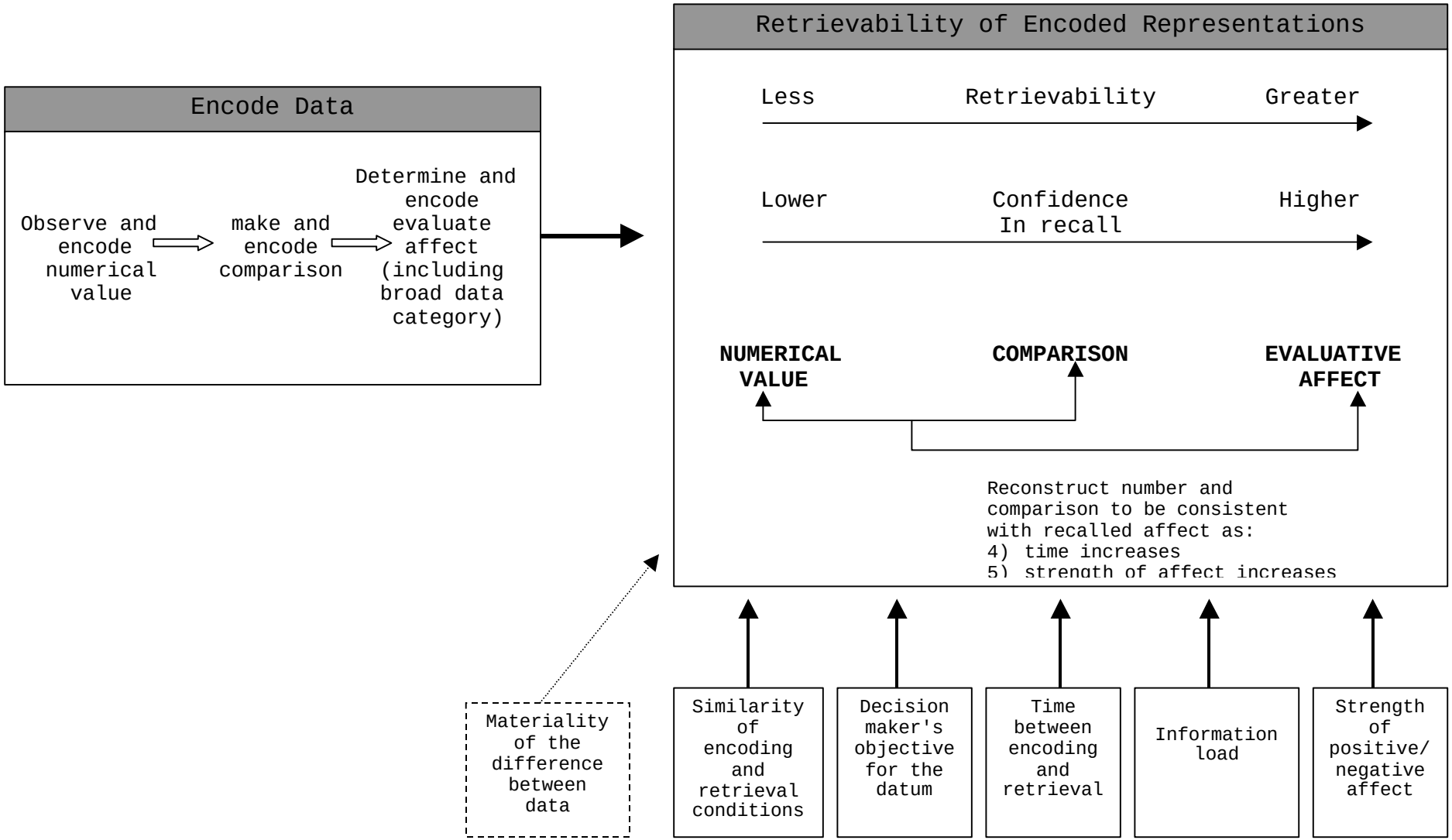

Figure 3
Revised model of encoding and retrievably of numerical data.

KIDA AND SMITH (1995) PROPOSITIONS	
1.	Numerical data may be initially encoded as numerical values, as comparisons between numerical values, and as affective (evaluative) reactions to those comparisons.
2a.	The retrievability of encoded representations increases from numerical values, to comparisons between numerical values, to affective reactions to those comparisons.
2b.	Affective reactions to underlying constructs or broad categories of data will have greater retrievability than affective reactions to a datum.
3.	Memory for a numerical value, comparison or evaluative reactions will be greater as the similarity between encoding and retrieval conditions increases.
4a.	Given differences in the retrievability of encoded representations, decisions makers will reconstruct numerical values and comparisons to be consistent with a recalled affect.
4b.	Reconstructing numerical and comparative data from affective representations is more likely to occur when a decision-maker has a strong positive or negative affect.
4c.	Reconstructing numerical and comparative data from affective representations is more likely to occur as the time between encoding and recall increases.
5a.	The encoding and retrieval of numerical data will depend upon the decision-maker's objectives for that data when they are first observed.
5b.	The retrievability of numerical values will increase if it is believed that they will be needed for future decisions.
6.	Decision-makers will be more confident in recalled affective responses than in recalled numerical values or comparisons.
7.	For most decision contexts, affective reactions to numerical data will be used to process (combine) data, and such processing will contribute to the greater relative retrievability of affect in future tasks.
8.	As the amount of numerical data increases, the relative difference in the retrievability of affective reactions to underlying constructs or broad data categories will increase as compared to other forms of encoded representations.
9.	As the numerical distance between previously viewed data and current data becomes more material, the influence of an affective response on the previously viewed data will decrease.

Figure 4

KIDA AND SMITH (1995) PROPOSITIONS with MATERIALITY PROPOSITION

PROPOSITION KIDA & SMITH (1995)		KIDA, SMITH, & MALETTA (1997)	McBRIDE (1998) DISSERTATION
P2a	The retrievability of encoded representations increases from numerical values, to comparisons between numerical values, to affective reactions to those comparisons.	Study 1 Support for 2a	
P4a	Given differences in the retrievability of encoded representations, decisions makers will reconstruct numerical values and comparisons to be consistent with a recalled affect.	Study 2 Support for 4a	Hypothesis 2 Not Supported
P4b	Reconstructing numerical and comparative data from affective representations is more likely to occur when a decision-maker has a strong positive or negative affect.	Study 3 Support for 4b	
P4c	Reconstructing numerical and comparative data from affective representations is more likely to occur as the time between encoding and recall increases.		Hypothesis 3 Not Supported
P7	For most decision contexts, affective reactions to numerical data will be used to process (combine) data, and such processing will contribute to the greater relative retrievability of affect in future tasks.		Hypothesis 4 Not Supported
P9	As the numerical distance Between previously viewed data and current data becomes more material, the influence of an affective response on the previously viewed data will decrease.		Hypothesis 1 Supported

Figure 5

RESULTS OF TESTED PROPOSITIONS

Exhibits

Exhibit 1

Hypotheses

H_1: In evaluating current financial information, an affective response on previously encoded data will become less influential in current decision making when the current data becomes more differentiated from the past data.

H_2: Numerical data will be inaccurately reconstructed to be consistent with an affective response on original data.

H_3: An increase in time between encoding and retrieval will increase the amount by which reconstructed numerical amounts are consistent with a retrieved affect (but inconsistent with the original values.)

H_4: In evaluating current financial information, an affective response on previously encoded data will be more influential in current decision making when the previous encoding of the affective response was done at a higher level of processing.

Exhibit 2

Design

First Experiment

		Short Time	Longer Time
Affect	Small Difference	Group 1	Group 3
	Large Difference	Group 2	Group 4

Second Experiment

		Low Processing	High Processing
Affect	Small Difference	Group 6	Group 8
	Large Difference	Group 7	Group 9

To test Hypothesis 1 - compares groups 1 and 3 to groups 2 and 4, and compares groups 6 and 8 to groups 7 and 9 on question one (Exhibit 4).

To test Hypothesis 2 - compares all groups to actual on question three (Exhibit 5).

To test Hypothesis 3 - compares groups 1 and 2 to groups 3 and 4 on question three (Exhibit 5).

To test Hypothesis 4 - compares groups 6 and 7 to groups 8 and 9 on question one (Exhibit 4).

Exhibit 3

First Task - Affect with Low Level of Processing

Instructions

Assume you are planning to invest in a company's common stock. Below, you will find financial ratios for five firms for the purpose of selecting a firm for investment. All five firms are in the same industry and the ratios represent three-year averages with no appreciable difference from the average in the current year. Study and evaluate the data.

	1	2	3	4	5	6	7
Firm	Return On Assets	Return On Equity	Debt To Equity	Net Profit Margin	Current Ratio	Earnings Per Share	Market Share
A	5.4	21.3	1.39	6.8	2.12	2.52	2.58%
B	9.5	17.3	1.70	3.2	1.80	3.63	1.46%
C	6.8	19.7	1.12	6.4	2.09	3.04	1.55%
D	12.4	25.1	.89	7.6	2.44	4.72	3.15%
E	9.7	18.4	1.07	5.9	2.21	3.69	1.22%

In which of the above firms would you be most likely to invest?

Circle one: A B C D E

Exhibit 4

Second Task - Small Difference

Instructions

Earlier you were given financial ratios for five firms to study and evaluate, and you selected a firm in which you would be most likely to invest. Before making your final selection, you are given the financial ratios for the five firms below to study and evaluate, and you consider them with the firm your selected earlier. The firms below are in the same industry as the first five and these ratios represent three-year averages with no appreciable difference from average in the current year.

	1	2	3	4	5	6	7
Firm	Return On Assets	Return On Equity	Debt To Equity	Net Profit Margin	Current Ratio	Earnings Per Share	Market Share
F	12.1	21.4	1.07	6.7	1.18	2.70	1.15%
G	11.7	23.7	1.02	6.4	1.40	3.12	2.92%
H	11.9	24.2	1.04	6.5	1.44	3.18	2.98%
I	12.3	21.2	1.06	7.0	1.19	3.21	1.25%
J	12.6	26.9	1.05	7.7	1.49	4.74	3.16%

1. If you could only invest in one firm, how likely are you to invest in the firm you selected earlier in the first decision task, compared to one of the five firms above? Indicate your response by placing an X on the number line below.

   Very Unlikely 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Likely

2. How confident are you in the investment judgment you just made?

   Very Unconfident 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Confident

Exhibit 5

3. For the firm you earlier selected in the first decision task, please try to remember the ratios and record them below. (Please provide ALL requested information.)

   a. Return On Assets _____

      How confident are you in your recollection or this ratio?

      Very Unconfident 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Confident

   b. Return On Equity _____

   How confident are you in your recollection or this ratio?

      Very Unconfident 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Confident

   c. Earnings Per Share _____

   How confident are you in your recollection or this ratio?

      Very Unconfident 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Confident

   d. Debt To Equity _____

   How confident are you in your recollection or this ratio?

      Very Unconfident 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Confident

   e. Net Profit Margin _____

   How confident are you in your recollection or this ratio?

      Very Unconfident 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Confident

   f. Current Ratio _____

   How confident are you in your recollection or this ratio?

      Very Unconfident 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Confident

   g. Market Share _____

      How confident are you in your recollection or this ratio?

      Very Unconfident 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Confident

Exhibit 6

Second Task - Large Difference

	1	2	3	4	5	6	7
Firm	Return On Assets	Return On Equity	Debt To Equity	Net Profit Margin	Current Ratio	Earnings Per Share	Market Share
F	14.5	25.7	1.02	8.0	2.02	3.24	1.38%
G	14.0	28.4	1.05	7.7	2.28	3.74	3.50%
H	14.3	29.0	1.07	7.8	2.33	3.82	3.57%
I	14.8	25.4	1.08	8.4	2.03	4.10	1.50%
J	15.1	32.3	1.01	9.2	3.00	4.45	3.79%

Exhibit 7

First Task - Affect with High Level of Processing

Instructions

Assume you are planning to invest in a company's common stock. Below, you will find financial ratios for five firms for the purpose of selecting a firm for investment. All five firms are in the same industry and the ratios represent three-year averages with no appreciable difference from the average in the current year. Study and evaluate the data.

	1	2	3	4	5	6	7
Firm	Return On Assets	Return On Equity	Debt To Equity	Net Profit Margin	Current Ratio	Earnings Per Share	Market Share
A	5.4	21.3	1.39	6.8	2.12	2.52	2.58%
B	9.5	17.5	1.70	3.2	1.80	3.63	1.46%
C	6.8	19.7	1.12	6.4	2.09	3.04	1.55%
D	12.4	25.1	.89	7.6	2.44	4.72	3.15%
E	9.7	18.4	1.07	5.9	2.21	3.69	1.22%

In the spaces provided below, please rank the firms in descending order (starting with the firm with the most favorable performance) based on each ratio. Provide the firm name (Letter).

	First	Second	Third	Forth	Fifth
Return On Assets	_____	_____	_____	_____	_____
Return On Equity	_____	_____	_____	_____	_____
Debt to Equity	_____	_____	_____	_____	_____
Net Profit Margin	_____	_____	_____	_____	_____
Current Ratio	_____	_____	_____	_____	_____
Earnings Per Share	_____	_____	_____	_____	_____
Market Share	_____	_____	_____	_____	_____

Which of the firms above would you be most likely to invest in?

Circle one: A B C D E

Exhibit 8

Experiment One - Demographic Questions Asked of Participants

PLEASE ANSWER THE FOLLOWING QUESTIONS ABOUT YOURSELF

1. What degree are you currently pursuing? (Circle one)

   MBA MA Other _____ (please specify)

2. Undergraduate Degree: _____

3. Undergraduate Major: _____

4. Do you have any other degree(s)? Yes No

   If yes, please specify.

   _____

5. Age: _____

6. Gender: Male Female

7. Have you had professional experience making investment decisions using accounting information? (Circle one) Yes No

   If yes, how much experience have you had? Years _____ Months _____

8. Have you had professional experience making other decisions using accounting information? (Circle one) Yes No

   If yes, how much experience have you had? Years _____ Months _____

Exhibit 9

Experiment Two - Demographic Questions Asked of Participants

PLEASE ANSWER THE FOLLOWING QUESTIONS ABOUT YOURSELF

1. Age: _____
2. Gender: Male Female
3. How much experience have you had making investment decisions using accounting information?

   Years _____ Months _____
4. How much experience have you had making other decisions using accounting information?

   Years _____ Months _____

Tables

Table 1

Demographic Information for Experiment One[20]
Graduate Students

Panel A. Continuous Measures:

Variable Description	N	Min	Max	Mean	Std. Dev.
Age	64	22	44	26.328	4.880

Panel B. Discrete Measures:

Variable Description	Level	N
Current Degree Program	MBA[21]	56
	MA[22]	6
	Other[23]	2
Undergraduate Major[24]	Accounting	9
	Other-Business	22
	Other-Non-Business	32
Gender	Male	45
	Female	19
Experience[25]	0 months	48
	3 months	1
	9 months	1
	12 months	1
	18 months	1
	24 months	3
	36 months	1
	48 months	2
	60 months	3
	96 months	1
	108 months	1
	120 months	1

[20] One participant did not provide demographic information.
[21] Master of Business Administration
[22] Master of Accounting
[23] Both Ph.D.
[24] Two participants did not indicate undergraduate degree.
[25] Experience is combined months in Questions 7 and 8, Exhibit 8.

Table 2

Demographic Information for Experiment Two[26]
Practitioners

Panel A. Continuous Measures:

Variable Description	N	Min	Max	Mean	Std. Dev.
Age	63	26	70	44.330	9.81
Experience 1[27]	60	0(14)[28]	360	129.700	118.70
Experience 2[29]	61	0(4)	420	192.800	110.40

Panel B. Discrete Measures:

Variable Description	Level	N
Gender	Male	46
	Female	20

[26] Sixteen participants did not provide complete demographic information.

[27] Experience making investment decisions using accounting information (in months), Exhibit 8, Question 3.

[28] There were 14 participants with zero months experience making investment decisions using accounting information and 4 participants with zero months experience making other decisions using accounting information.

[29] Experience making other decisions using accounting information (in months), Exhibit 8, Question 4.

Table 3

Experiment One - Graduate Students
Test of Hypothesis One: Effect of Difference in Magnitude of Numbers between Task One and Task Two on Likelihood of Investment
Dependent Measure - Question 1, Exhibit 4
Independent Variable - Difference (Small or Large)

Panel A. ANOVA Table: Likely

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F	P-value
Difference	1	5.8	5.8	0.50	0.484
Error	63	733.4	11.6		
Total	64	739.2			

Panel B. Treatment Means: Likely

Difference	N	Mean	Std. Dev.
Small	25	5.200	3.485
Large	40	4.588	3.366

Panel C. ANCOVA Table: with Confidence as Covariant

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F	P-value
Difference	1	8.49	8.49	0.73	0.397
Error	62	723.72	11.67		
Confidence	1	7.01	9.72	0.83	0.365
Total	64	739.22			

Panel D. ANCOVA Table: Expanded Model with Confidence as Covariant

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F	P-value
Difference	1	8.49	4.79	0.41	0.526
Time	1	1.11	2.53	0.22	0.644
Diff*Time	1	17.36	17.36	1.48	0.229
Confidence	1	7.01	5.61	0.48	0.492
Error	60	705.25	11.75		
Total	64	739.22			

Table 4

Experiment Two - Practitioners
Test of Hypothesis One: Effect of Difference in Magnitude of Numbers between Task One and Task Two on Likelihood of Investment
Dependent Measure - Question 1, Exhibit 4
Independent Variable - Difference (Small or Large)

Panel A. ANOVA Table: for Likely

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F	P-value
Difference	1	60.8	60.7	6.04	0.016
Error	74	743.4	10.0		
Total	75	803.9			

Panel B. Treatment Means for Likely

Difference	N	Mean	Std. Dev.
Small	38	5.500	3.304
Large	38	3.713	3.028

Panel C. ANCOVA Table: Expanded Model with Confidence as Covariant

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F	P-value
Difference	1	62.43	65.35	6.47	0.013
Processing	1	7.93	7.85	0.78	0.381
Diff*Processing	1	1.56	1.56	0.15	0.696
Confidence	1	14.97	21.73	2.15	0.147
Error	71	717.06	10.10		
Total	75	803.95			

Table 5
Experiment One - Graduate Students
Test of Hypothesis Two: Reconstruction of Ratios to be Consistent with Affective Response
(Exhibit 5)

N=61

Panel A

Ratio	Actual Value	**Sign Test**					
		Median value	Below	Equal	Above	%Above[30]	p-
ROA	12.40	12.60	26	1	34	56.6	0.366
ROE	25.10	25.00X	34	1	26	43.3	0.366
NPM	7.60	7.60	29	2	30	50.8	1.000
EPS	4.72	3.80X	54	0	7	11.5	0.000*
MS	3.15	3.50	15	3	43	74.1	0.000*

Panel B

Ratio	Actual Value	**T-Test**			
		Mean	SE Mean	T	p-value
ROA	12.40	13.010	0.537	1.14	0.260
ROE	25.10	22.030X	1.060	-2.89	0.005*
NPM	7.60	8.040	0.548	0.80	0.420
EPS	4.72	3.854X	0.117	-7.43	0.000*
MS	3.15	4.189	0.402	2.58	0.012**

X = Direction opposite to hypothesized direction.
* = Significant at .01 level.
**= Significant at .05 level.

[30] %Above is calculated by dividing the number above by the number above plus the number below.

Table 6
Experiment Two - Practitioners
Test of Hypothesis Two: Reconstruction of Ratios to be Consistent with Affective Response
(Exhibit 5)

N=67

Panel A

Ratio	Actual Value	Sign Test					
		Median	Below	Equal	Above	%Above[31]	p-value
ROA	12.40	12.00X	41	6	20	32.8	0.010*
ROE	25.10	20.00X	56	3	8	12.5	0.000*
NPM	7.60	7.60	33	10	24	42.1	0.289
EPS	4.72	4.00X	52	4	11	17.5	0.000*
MS	3.15	3.16	27	5	35	56.5	0.374

Panel B

Actual Ratio	Value	T-Test			
		Mean	SE Mean	T	p-value
ROA	12.40	12.700	0.643	0.47	0.640
ROE	25.10	17.414X	0.998	-7.70	0.000*
NPM	7.60	7.886	0.494	0.58	0.560
EPS	4.72	4.031X	0.128	-5.37	0.000*
MS	3.15	5.110	0.776	2.53	0.014**

X = Direction opposite to hypothesized direction.
* = Significant at .01 level.
**= Significant at .05 level.

[31] %Above is calculated by dividing the number above by the number above plus the number below.

Table 7

Experiment One - Graduate Students
Hypothesis Three - Effect of Time on Reconstruction of Ratios
Dependent Measure - Recalled Ratios Compared to Actual Ratios
Independent Variable - Time (Short or Longer)

Panel A. MANOVA for Time

Criterion	Test Statistic	F	DF	P
Wilk's	0.88380	1.446	(5, 55)	0.222
Lawley-Hotelling	0.13148	1.446	(5, 55)	0.222
Pillai's	0.11620	1.446	(5, 55)	0.222

Panel B. Means

	Short Time		Long Time		Univariate
Ratio	Mean	Std. Dev	Mean	Std. Dev	p-value[32]
ROA	13.442	0.680	12.296	0.874	0.305
ROE	20.761	1.328	24.130	1.707	0.125
NPM	8.051	0.670	8.023	0.899	0.980
EPS	3.917	0.148	3.750	0.191	0.493
MS	4.351	0.513	3.920	0.659	0.608

[32] From the univariate analysis of variance of each ratio with time as the factor.

Table 8

Experiment Two - Practitioners
Test of Hypothesis Four: Effect of Processing on Likely Judgement
Dependent Measure - Question 1, Exhibit 4
Independent Variable - Level of Processing (High or Low)

Panel A. ANOVA Table:

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F	P-value
Processing	1	1.0	1.0	0.09	0.763
Error	74	803.0	10.9		
Total	75	803.9			

Panel B. Treatment Means for Likely

Processing	N	Mean	Std. Dev.
Low	37	4.489	3.494
High	39	4.718	3.092

Panel C. Kruskal-Wallis Test on Likely

Processing	N	Median	Ave Rank	Z
Low	37	4.00	37.8	-0.28
High	39	5.00	39.2	0.28
Overall	76		38.5	

H = 0.08 DF = 1 P = 0.778 (adjusted for ties)

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APPENDIX A

TESTS OF ASSUMPTIONS

Tests of Assumptions

The planned statistical procedures to be utilized in the analysis of the data collected in the two experiments detailed in the paper are t-test, ANOVA, and MANOVA. This section discusses the testing of assumptions related to these procedures. These assumptions include (1) independence, (2) randomization, (3) normality, and (4) homogeneity of variance.

Independence.

The instruments were pre-ordered and randomly distributed to participants as part of the research design. Random assignment in this manner tends to ensure that error terms are independent.

Randomization.

Randomization tests were performed using the Groups as the independent measure and the demographic data as the dependent variables. The results of these tests are presented in Table A1 for graduate students and Table A2 for accounting practitioners. ANOVA was used to analyze the continuous variables and Chi Square to analyze discrete variables. These tests indicate no significant relationships. The variable Degree in the first experiment is a discrete variable but the Chi-Square test will not provide a significance level because several cells contained either no observation or less than six observations. The ANOVA was performed that produced a non-significant level (0.967) and a table showing the numbers and percentages of observations in the cells for each group is provided. There is no evidence that randomization was not achieved.

Normality.

The Kolmogorov-Smimov Normality Test was performed for Likely, Confidence, and each ratio. These results are presented in Tables A3 and A4. Table A3 for students shows that the hypothesis of normality can not be rejected of Likely ($p > 0.15$), Confidence ($p > 0.15$), and EPS ($p = 0.148$). Normality is rejected for ROA, ROE, D/E, NPM, CR, and MS (each $p < 0.01$). For practitioners, Likely is the only variable for which normality cannot be rejected at the 0.05

level (0.069). For this test, however, an alpha level of 0.1 may be more appropriate. At this higher level, the hypothesis of normality is rejected for all variables in the practitioner sample.

Homogeneity of Variance.

Leven's Test of Homogeneity of Variance is presented in Tables A5 and A6. Bartlett's Test was also performed but this test is not considered to be robust to departures form normality. Leven's Test is considered to be better when the data come from continuous, but not necessarily normal, distributions. Table A5 contains the results of test of the student sample. Panel A contains tests of Likely, Confidence, and the ratios on the two levels of Difference. Panel B contains the same information for the two levels of Time. Table A6 contains results of testing the practitioner sample: Panel A for Difference and Panel B for Processing. Homogeneity of Variance cannot be rejected for any of the variables in either the student or the practitioner sample using Levene's Test.

Table A1

Test of Randomization

First Experiment

Independent Measure - Group

Dependent Variable	Test	Significance Level
Degree[33]	ANOVA	0.967
Major	Chi Square	0.841
Age	ANOVA	0.289
Gender	Chi Square	0.605
Experience	ANOVA	0.385

Degree

Group	MBA (%)	MA (%)	Other (%)
1	10 (83.33)	2 (16.67)	0 (00.00)
2	13 (83.67)	2 (13.33)	0 (00.00)
3	11 (84.62)	1 (07.69)	1 (07.69)
4	10 (90.91)	1 (09.09)	0 (00.00)
5	13 (92.86)	0 (00.00)	1 (07.14)
Total	57 (87.69)	6 (09.23)	2 (03.08)

1 Chi-Square test would not provide a significance level for Degree due to low cell counts.

Table A2

Test of Randomization

Second Experiment		
Independent Measure - Group		
Dependent Variable	Test	Significance Level
Age	ANOVA	0.430
Experience 1	ANOVA	0.351
Experience 2	ANOVA	0.192
Gender	Chi Square	0.474

Table A3

Summary

Kolmogorov-Smimov Normality Test
First Experiment - Masters Students

N=61

Variable	Average	Std. Dev.	D+	D-	D	p-value
Likely	4.877	3.347	0.081	0.073	0.081	>0.15
Confidence	6.557	2.699	0.062	0.074	0.074	>0.15
ROA	13.010	4.194	0.137	0.124	0.137	<0.01
ROE	22.031	8.282	0.086	0.182	0.182	<0.01
D/E	0.990	0.348	0.179	0.158	0.179	<0.01
NPM	8.040	4.277	0.260	0.173	0.260	<0.01
CR	2.180	0.634	0.118	0.100	0.118	0.04
EPS	3.854	0.911	0.092	0.098	0.098	0.148
MS	4.189	3.141	0.319	0.257	0.319	<0.01

Table A4
Summary
Kolmogorov-Smimov Normality Test
Second Experiment - Practitioners

N=67

Variable	Average	Std. Dev.	D+	D-	D	p-value
Likely	4.807	3.247	0.105	0.101	0.105	0.069
Confidence	6.625	2.135	0.037	0.115	0.115	0.036
ROA	12.700	5.263	0.247	0.209	0.247	<0.01
ROE	17.414	8.166	0.109	0.153	0.153	<0.01
D/E	1.015	0.424	0.346	0.201	0.346	<0.01
NPM	7.886	4.041	0.250	0.165	0.250	<0.01
CR	2.216	0.883	0.202	0.147	0.202	<0.01
EPS	4.031	1.051	0.143	0.052	0.143	<0.01
MS	5.110	6.348	0.420	0.326	0.420	<0.01

Table A5

Summary

Levene's Test of Homogeneity of Variance
First Experiment - Masters Students

Panel A - Difference

Variable	Small Difference Variance	Large Difference Variance	Test Statistic	p-value
Likely	3.441	3.326	0.003	0.956
Confidence	2.784	2.593	0.029	0.865
ROA	3.688	4.437	1.145	0.289
ROE	8.173	8.196	0.010	0.920
D/E	0.264	0.365	0.402	0.528
NPM	1.523	5.211	1.495	0.226*
CR	0.508	0.661	1.649	0.204
EPS	1.002	0.868	1.164	0.285
MS	1.962	3.626	0.734	0.395*

Panel B - Time

Variable	Short Time Variance	Longer Time Variance	Test Statistic	p-value
Likely	3.307	3.488	0.097	0.757
Confidence	2.495	3.029	0.557	0.458
ROA	4.671	3.230	1.010	0.319*
ROE	8.451	7.717	0.561	0.457
D/E	0.340	0.245	0.723	0.399*
NPM	5.222	2.006	0.441	0.509*
CR	0.653	0.557	1.219	0.274
EPS	0.840	1.029	0.812	0.371
MS	3.702	2.889	0.439	0.510*

* Using Bartelett's Test (for normal distributions), the assumption of homogeneity of variance would be rejected for these variables.

Table A6

Summary

Levene's Test of Homogeneity of Variance
Second Experiment - Practitioners

Panel A - Difference

Variable	Small Difference Variance	Large Difference Variance	Test Statistic	p-value
Likely	3.146	3.086	0.060	0.807
Confidence	2.096	2.199	0.015	0.904
ROA	5.136	5.450	0.732	0.395
ROE	8.471	7.975	0.006	0.937
D/E	0.356	0.483	0.882	0.351
NPM	4.483	3.655	0.190	0.664
CR	1.121	0.587	0.795	0.376*
EPS	1.133	0.949	0.106	0.746
MS	8.210	3.981	0.777	0.381*

Panel B - Processing

Variable	Low Processing Variance	High Processing Variance	Test Statistic	p-value
Likely	3.415	3.131	0.999	0.321
Confidence	2.096	2.097	0.118	0.732
ROA	4.002	6.173	3.518	0.065*
ROE	7.298	8.922	2.208	0.142
D/E	0.415	0.433	0.031	0.861
NPM	3.675	4.390	0.165	0.686
CR	1.134	0.584	1.430	0.236*
EPS	1.132	0.983	1.493	0.226
MS	5.486	7.125	0.027	0.870

* Using Bartelett's Test (for normal distributions), the assumption of homogeneity of variance would be rejected for these variables.

APPENDIX B

INSTRUMENTS

INSTRUMENT FOR EXPERIMENT ONE

With

LOW PROCESSING

And

SMALL DIFFERENCE

SHORT-TIME LETTER

November 18, 1997

Dear Participant,

Thank you for agreeing to participate in this voluntary research project at Virginia Tech. Your responses are very important to on going research here at Virginia Tech on the use of accounting information in decision making. Your participation is vital to our research program and to maintaining Virginia Tech's high quality standards for the Department of Accounting and the College of Business.

Your participation is entirely voluntary and anonymous. There are no identification numbers or marks on the instrument, and please do not place your name on the instrument. Your sincere response is all we seek. Please answer all questions to the best of your ability.

At any time, you may discontinue your participation in this experiment; there will be no penalty, and your participation is totally anonymous. We would appreciate it, however, if you do take the time to completely answer all questions, as a complete questionnaire is essential to our successful conduct of the research.

You will find inside the attached envelope two smaller envelopes containing complete instructions for two tasks. **Open the envelope labeled "First Task."** The first task will take approximately ten (10) minutes. You will then be told to stop. Put the first task back inside the small envelope, put it inside the large envelope, and put it aside. Class will then resume with instruction over the regular class material. Approximately fifteen (15) minutes before the end of this class, you will be told to resume work on the questionnaire. At that time, please remove the small envelope labeled "Second Task" from the large envelope and complete the second task. When you finish, put both small envelopes inside the large envelope and return it to your instructor as you leave the classroom.

Thank you very much for your participation in this research experiment.

Sincerely,

Freda McBride, Doctoral Student in Accounting

LONGER-TIME LETTER

November 18, 1997

Dear Participant,

Thank you for agreeing to participate in this voluntary research project at Virginia Tech. Your responses are very important to on going research here at Virginia Tech on the use of accounting information in decision making. Your participation is vital to our research program and to maintaining Virginia Tech's high quality standards for the Department of Accounting and the College of Business.

Your participation is entirely voluntary and anonymous. There are no identification numbers or marks on the instrument, and please do not place your name on the instrument. Your sincere response is all we seek. Please answer all of the questions to the best of your ability.

At any time, you may discontinue your participation in this experiment; there will be no penalty, and your participation is totally anonymous. We would appreciate it, however, if you do take the time to completely answer all questions, as a complete questionnaire is essential to our successful conduct of the research.

You will find inside the attached envelope two smaller envelopes containing complete instructions for two tasks. **Open the envelope labeled "First Task."** The first task will take approximately ten (10) minutes. You will then be told to stop. Put the first task back inside the envelope, put it inside the large envelope, and put it aside. Class will then resume with instruction over the regular class material. Please return the envelope to your instructor when you leave the classroom. Approximately fifteen (15) minutes before the end of the next class, you will be told to claim your instrument and resume work on the questionnaire. At that time, please remove the envelope labeled "Second Task" from the large envelope and complete the second task. Put both small envelopes inside the large envelope and return it to your instructor as you leave the classroom at the next class.

Thank you very much for your participation in this research experiment.

Sincerely,

Freda McBride, Doctoral Student in Accounting

First Task

Instructions

Assume you are planning to invest in a company's common stock. Below, you will find financial ratios for five firms for the purpose of selecting a firm for investment. All five firms are in the same industry and the ratios represent three-year averages with no appreciable difference from the average in the current year. Study and evaluate the data.

	1	2	3	4	5	6	7
Firm	Return On Assets	Return On Equity	Debt To Equity	Net Profit Margin	Current Ratio	Earnings Per Share	Market Share
A	5.4	21.3	1.39	6.8	2.12	2.52	2.58%
B	9.5	17.5	1.70	3.2	1.80	3.63	1.46%
C	6.8	19.7	1.12	6.4	2.09	3.04	1.55%
D	12.4	25.1	.89	7.6	2.44	4.72	3.15%
E	9.7	18.4	1.07	5.9	2.21	3.69	1.22%

In which of the above firms would you be most likely to invest?

Circle one: A B C D E

Please turn to the next page.

You have now completed the First Task. Please stop here, put the instrument back into the First Task envelope and seal it. Put the small envelope inside the large envelope and put it aside. **Do not open the Second Task envelope** until you are told to do so by your instructor.

For approximately the next 45 minutes, you will have regular classroom instruction by your teacher, on your regular classroom material that is unrelated to this experiment.

Approximately 15 - 20 minutes before the end of class, your teacher will stop the classroom instruction and ask you to please resume work on the questionnaire.

It is very important that you not open the Second Task envelope until you are asked to by your teacher.

Now please return the First Task to the First Task envelope, seal it, put it inside the large envelope, and wait until your teacher resumes class instruction.

Your teacher will soon resume class instruction, and will tell you when you can open the Second Task envelope.

Thank you.

Second Task

Instructions

Earlier you were given financial ratios for five firms to study and evaluate, and you selected a firm in which you would be most likely to invest. Before making your final selection, you are given the financial ratios for the five firms below to study and evaluate, and you consider them with the firm you selected earlier. The firms below are in the same industry as the first five and these ratios represent three-year averages with no appreciable difference from average in the current year.

	1	2	3	4	5	6	7
Firm	Return On Assets	Return On Equity	Debt To Equity	Net Profit Margin	Current Ratio	Earnings Per Share	Market Share
F	12.1	21.4	1.07	6.7	1.18	2.70	1.15%
G	11.7	23.7	1.02	6.4	1.40	3.12	2.92%
H	11.9	24.2	1.04	6.5	1.44	3.18	2.98%
I	12.3	21.2	1.06	7.0	1.19	3.21	1.25%
J	12.6	26.9	1.05	7.7	1.49	4.74	3.16%

1. If you could only invest in one firm, how likely are you to invest in the firm you selected earlier in the first decision task, compared to one of the five firms above? Indicate your response by placing an X on the number line below.

   Very Unlikely 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Likely

2. How confident are you in the investment judgment you just made?

   Very Unconfident 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Confident

3. For the firm you selected earlier in the first decision task, please try to remember the ratios and record them below. **Please provide ALL requested information to the best of your ability. Do not leave ANY ratios blank.**

a. Return On Assets _____

How confident are you in your recollection of this ratio?

Very Unconfident 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Confident

b. Return On Equity _____

How confident are you in your recollection of this ratio?

Very Unconfident 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Confident

c. Debt To Equity _____

How confident are you in your recollection of this ratio?

Very Unconfident 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Confident

d. Net Profit Margin _____

How confident are you in your recollection of this ratio?

Very Unconfident 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Confident

e. Current Ratio _____

How confident are you in your recollection of this ratio?

Very Unconfident 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Confident

f. Earnings Per Share _____

How confident are you in your recollection of this ratio?

Very Unconfident 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Confident

g. Market Share _____

How confident are you in your recollection of this ratio?

Very Unconfident 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Confident

PLEASE ANSWER THE FOLLOWING QUESTIONS ABOUT YOURSELF

2. What degree are you currently pursuing? (Circle one)

   MBA MA Other _____ (please specify)

2. Undergraduate Degree: _____

3. Undergraduate Major: _____

4. Do you have any other degree(s)? Yes No

   If yes, please specify.

   _____

6. Age: _____

6. Gender: Male Female

7. Have you had professional experience making investment decisions using accounting information? (Circle one) Yes No

   If yes, how much experience have you had? Years _____ Months _____

8. Have you had professional experience making other decisions using accounting information? (Circle one) Yes No

   If yes, how much experience have you had? Years _____ Months _____

Please do not discuss this experiment with anyone before Thanksgiving.

THANK YOU FOR YOUR PARTICIPATION!

INSTRUMENT FOR EXPERIMENT TWO

With

HIGH PROCESSING

And

LARGE DIFFERENCE

First Task

Instructions
Assume you are planning to invest in a company's common stock. Below, you will find financial ratios for five firms for the purpose of selecting a firm for investment. All five firms are in the same industry and the ratios represent three-year averages with no appreciable difference from the average in the current year. Study and evaluate the data.

	1	2	3	4	5	6	7
Firm	Return On Assets	Return On Equity	Debt To Equity	Net Profit Margin	Current Ratio	Earnings Per Share	Market Share
A	5.4	21.3	1.39	6.8	2.12	2.52	2.58%
B	9.5	17.5	1.70	3.2	1.80	3.63	1.46%
C	6.8	19.7	1.12	6.4	2.09	3.04	1.55%
D	12.4	25.1	.89	7.6	2.44	4.72	3.15%
E	9.7	18.4	1.07	5.9	2.21	3.69	1.22%

In the spaces provided below, please rank the firms in descending order (starting with the firm with the most favorable performance) based on each ratio. Provide the firm name (Letter).

	First	Second	Third	Forth	Fifth
Return On Assets	_____	_____	_____	_____	_____
Return On Equity	_____	_____	_____	_____	_____
Debt to Equity	_____	_____	_____	_____	_____
Net Profit Margin	_____	_____	_____	_____	_____
Current Ratio	_____	_____	_____	_____	_____
Earnings Per Share	_____	_____	_____	_____	_____
Market Share	_____	_____	_____	_____	_____

Which of the firms above would you be most likely to invest in?

Circle one: A B C D E

Second Task

Instructions

Earlier you were given financial ratios for five firms to study and evaluate, and you selected a firm in which you would be most likely to invest. Before making your final selection, you are given the financial ratios for the five firms below to study and evaluate, and you consider them with the firm you selected earlier. The firms below are in the same industry as the first five and these ratios represent three-year averages with no appreciable difference from average in the current year.

	1	2	3	4	5	6	7
Firm	Return On Assets	Return On Equity	Debt To Equity	Net Profit Margin	Current Ratio	Earnings Per Share	Market Share
F	14.5	25.7	1.02	8.0	2.02	3.24	1.38%
G	14.0	28.4	1.05	7.7	2.28	3.74	3.50%
H	14.3	29.0	1.07	7.8	2.33	3.82	3.57%
I	14.8	25.4	1.08	8.4	2.03	4.10	1.50%
J	15.1	32.3	1.01	9.2	3.00	4.45	3.79%

1. If you could only invest in one firm, how likely are you to invest in the firm you selected earlier in the first decision task, compared to one of the five firms above? Indicate your response by placing an X on the number line below.

Very Unlikely 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Likely

2. How confident are you in the investment judgment you just made?

Very Unconfident 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Confident

3. For the firm you selected earlier in the first decision task, please try to remember the ratios and record them below. **Please provide ALL requested information to the best of your ability. Do not leave ANY ratios blank.**

a. Return On Assets _____

How confident are you in your recollection of this ratio?

Very Unconfident 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Confident

b. Return On Equity _____

How confident are you in your recollection of this ratio?

Very Unconfident 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Confident

c. Debt To Equity _____

How confident are you in your recollection of this ratio?

Very Unconfident 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Confident

d. Net Profit Margin _____

How confident are you in your recollection of this ratio?

Very Unconfident 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Confident

e. Current Ratio _____

How confident are you in your recollection of this ratio?

Very Unconfident 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Confident

f. Earnings Per Share _____

How confident are you in your recollection of this ratio?

Very Unconfident 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Confident

g. Market Share _____

How confident are you in your recollection of this ratio?

Very Unconfident 0…..1…..2…..3…..4…..5…..6…..7…..8…..9…..10 Very Confident

PLEASE ANSWER THE FOLLOWING QUESTIONS ABOUT YOURSELF

1. Age: _____
2. Gender: Male Female
3. How much experience have you had making investment decisions using accounting information?

   Years _____ Months _____
4. How much experience have you had making other decisions using accounting information? (Circle one) Yes No

   If yes, how much experience have you had? Years _____ Months _____

THANK YOU FOR YOUR PARTICIPATION!

VITA

Freda D. H. McBride

Freda McBride was born in Cleveland County, North Carolina on June 1, 1948. She graduated from Green Bethel High School in Boiling Springs, North Carolina in May 1965. She then attended Johnson C. Smith University in Charlotte, North Carolina.

She holds a Bachelor's degree in Business Administration with a concentration in Accounting from East Carolina University, Greenville, North Carolina, and a Master of Business Administration from Campbell University, Buies Creek, North Carolina.

She held teaching positions at Johnston Community College in Smithfield, North Carolina, and Johnson C. Smith University in Charlotte, North Carolina. She also held the position of Plant Cost Accountant at The Celotex Corporation in Goldsboro, North Carolina.

She is a Certified Public Accountant licensed by the state of North Carolina.