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ACCURACY, CONFIDENCE, AND CALIBRATION OF CONSUMER KNOWLEDGE: ROLES OF PRODUCT TYPE, PRODUCT INVOLVEMENT, AND GENERAL SELF-EFFICACY

By

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ABSTRACT

This dissertation sought to apply the construct of knowledge calibration to the domain of consumer research. Product involvement, product type, and general self-efficacy were postulated to influence calibration of consumer knowledge. Need for cognition was proposed as a moderator to the relationships between (a) product involvement and calibration, and (b) product type and calibration. Calibration, in turn, was proposed to affect decision-making accuracy.

The proposed model was informed by research in the streams of psychology and consumer behavior. Insurance and music were chosen as the two product categories based on pretests. The questionnaire, measuring the constructs under study, was developed based on literature review, expert interviews, and pretests among knowledgeable respondents.

Data was collected from 332 students enrolled in undergraduate business courses. Regression analysis was used to test the proposed effects. Moderation was examined using subgroup analysis.

Results show that four of the ten hypotheses were supported at the .05 level of significance. One hypothesis was partially supported (linear effect instead of the proposed curvilinear effect).

The key result of the study is the empirical validation of the calibration – decision-making relationship. It was also found that significant proportions of consumers are underconfident in their knowledge. As an early examination of knowledge calibration in the consumer domain, the findings are promising. Several avenues of possible research have been highlighted.

CHAPTER 1

INTRODUCTION

Consumer knowledge has been a topic of considerable research interest in marketing for the past three decades (Alba and Hutchinson 1987; Bettman and Park 1980; Brucks 1985; Mitchell and Dacin 1996; Nicosia 1966; Roy and Cornwell 2004). Analogous to the definition of knowledge as the body of facts and principles (i.e. information and understanding) accumulated by mankind about a domain (Delbridge and Bernard 1998), consumer knowledge is the body of facts and principles accumulated by consumers, that aid in decision making. The importance of consumer knowledge can be located in the fact that knowledge is central to understanding consumer behaviors such as information search and information processing. The information processing paradigm and the research focus on consumer information search contributed to scholarly attention on consumer knowledge. Several researchers have examined the antecedents and consequences of prior knowledge of consumers (Alba 1983; Chase and Simon 1973). Research has sought to examine different types of consumer knowledge such as product class knowledge, price knowledge, knowledge of World Wide Web, etc. (Brucks 1985; Page and Uncles 2004). Researchers have also attempted to distinguish between objective knowledge, which refers to the absolute knowledge possessed by the consumer, and subjective knowledge, which refers to consumers' perception of knowledge (Raju, Lonial, and Mangold 1995). Theoretical work on consumer knowledge has led to refinements in the construct of consumer expertise, where a multidimensional conceptualization was advanced (Alba and Hutchinson 1987).

An aspect of knowledge that has been omitted from the discourse in consumer research is knowledge calibration. Knowledge calibration refers to the correspondence

between accuracy and confidence in knowledge. For example, a shopper might be very confident that she has found an item at the lowest available price. If she subsequently finds that many other stores offer the same item at a lower price, we would say her knowledge is not well calibrated. Alternatively, if she finds that most other stores have higher prices, we would say she is well calibrated. It is to be noted that calibration or lack of it arises from the correspondence between accuracy and confidence. Notions of correct and incorrect knowledge tap into only the first dimension, i.e. accuracy. A person can be well calibrated even when possessing inaccurate knowledge. Hence, examination of this construct is likely to unravel processes that have not been brought to light by the research on consumer knowledge. The latter construct has attracted considerable research while research on calibration of consumer knowledge is relatively new. As Alba and Hutchinson (2000) note, "although much consumer research has examined the extent to which actual decision processes approximate optimal decision policies, there is relatively little research about calibration and miscalibration. Instead consumer research has focused on knowledge, per se" (p. 123). While the objective knowledge – subjective knowledge distinction mentioned earlier has attempted to capture the domains of accuracy and confidence, the focus in this stream of research has been on examining the similarities and differences and identifying the disparate antecedent and consequent factors. Knowledge calibration combines the two constructs of accuracy of knowledge and confidence in knowledge in a dynamic manner and offers a richer view of the processes behind consumer knowledge utilization.

Significant research in psychology, education, and meteorology has examined the causes and effects of calibration. Calibration of knowledge, comprehension, beliefs, etc. have been subjected to scholarly scrutiny in these areas. For example, research in forensic psychology examined the calibration of witnesses and found that confidence-accuracy relationship is weak, thus questioning the widely held belief that a confident witness is a credible witness, which often has a great impact on the outcome of the trial (Olsson 2000). In education, researchers have examined comprehension calibration, the correspondence between perceived and real comprehension. Well-calibrated students are realistic in their assessments and are in turn better at devising suitable remedies to improve comprehension (Lin and Zabrucky 1998). Research in these streams highlights

the role of this construct in improving our understanding of decision strategies and processes. Consequently, it is reasonable to infer that the omission of this important construct in consumer research has resulted in less than complete understanding of the domain of knowledge. If research in allied disciplines is any pointer, considerable insights stand to be gained in applying this construct to consumer research. In a seminal paper titled "Knowledge Calibration: What Consumers Know and What They Think They Know", Alba and Hutchinson (2000) recently reviewed the extant research on calibration and highlighted how calibration is important in consumer decision making in as much as it allows consumers to cope with incomplete and errorful information. These authors called for research on consumer knowledge calibration. This study responds to their call.

The following vignette, borrowed from Alba and Hutchinson (2000) illustrates the relationship between calibration and consumer behavior. Ms. Smith has a medical condition that is treatable, but not curable, with drug therapies. The condition spontaneously resolves itself in some people, and Ms. Smith feels that she has been getting better. Her doctor tells her about a relatively new surgical procedure that has been found to cure some patients and suggests that she consider this option. The side effects of the drugs she is taking are significant, but bearable. Initially, Ms. Smith decides not to consult a surgeon because she believes she will be one of the lucky ones who recover spontaneously. After a few years of intermittent improvement and decline she decides to visit a surgeon, Dr. Jones. Jones tells her that on the basis of her age and medical history he feels there is a 90% chance that the surgery will succeed. The surgery will require a week in the hospital and two to three months for full recovery. Of course, there is a very small chance of unexpected complications with any major surgery. All things considered, Dr. Jones recommends the procedure. Ms. Smith agonizes over the decision and finally agrees to have the surgery.

If we assume that both Smith and Jones are overconfident in all their beliefs, what are the implications? Overconfidence in the likelihood of spontaneous recovery may have delayed Ms. Smith's information search. Overconfidence may have caused Dr. Jones to state a 90% chance of success when the real chance was only 70%. Ms. Smith may have preferred her chances for spontaneous recovery if Jones had said 70%. It seems

reasonable to state that her final decision was affected by her confidence in all of the decision inputs.

This vignette illustrates several major ways in which calibration can affect consumer decision-making. First, it affects information search. Because the goal of information search is usually to reduce uncertainty, overconfidence will tend to inhibit search and underconfidence will increase search. Second, in many consumer situations both the overt and covert judgments of subjective probability are used directly as inputs to decision making. Third, calibration is likely to affect how consumers resolve any conflict that arises between two or more uncertain decision inputs. Finally, most decisions are based on specific information items; therefore, individual decisions will be affected by poor calibration even when over and under confidence tend to cancel out across items. That is, decision depends on which beliefs the decision maker is overconfident and on which beliefs the decision maker is underconfident- not the average level of over/underconfidence. Given all of the ways that calibration can potentially affect decision-making, there is a clear need for consumer oriented research examining these issues (Alba and Hutchinson 2000).

This dissertation examines some antecedents and consequence of consumer knowledge calibration. Consumer knowledge, as mentioned earlier, broadly refers to any type of knowledge that consumers possess, which will aid the process of consumer decision-making. Product knowledge, price knowledge, knowledge of markets/ retailing etc. will fall under the rubric of consumer knowledge. Research in marketing has focused on product class knowledge or product knowledge (Brucks 1985; Park and Moon 2003), which encompasses knowledge of price, retailing etc. specific to the particular product under consideration. We follow this tradition and define consumer knowledge as consumer's knowledge of the product. The study examines the effects of product type, involvement, and self-efficacy on consumer knowledge accuracy, confidence, and calibration.

Published empirical research on consumer knowledge calibration does not exist, and an early examination of an important construct poses the challenge of selection of a few antecedent variables from among several possible candidates. The choice of the above mentioned variables has been motivated by (a) their direct relationship to the

construct of calibration through potential overlap with the construct's domain, as in the case of self-efficacy which is closely related to confidence; (b) the importance of the construct in consumer research, whereby involvement, which is one of the more researched constructs in consumer research (Celsi and Olson 1988; Mantel and Kardes 1999) was selected; and (c) the relevance of the construct to the context of knowledge calibration, which led to the selection of product type, where recent research indicates potential implications to the study of calibration (Park and Moon 2003). The study also examines the moderating effect of need for cognition on the proposed relationships between product type and product involvement on the one hand, and accuracy, confidence, and calibration on the other. Finally, the study seeks to examine how calibration affects consumer decision-making.

To summarize the above discussion, knowledge calibration is an important area of enquiry that has been overlooked in consumer research. This study is one of first empirical examinations of consumer knowledge calibration. The main objectives of the study are:

(a) To examine how consumer's general self-efficacy, consumer's product involvement, and product type affect consumer knowledge calibration

(b) To examine the moderating effect of consumer's need for cognition on the relationship between (a) consumer product involvement and calibration and (b) product type and calibration

(c) To study how consumer knowledge calibration affects consumer decision making

The dissertation starts with a review of the research on consumer knowledge. The different types of knowledge and research in the area of information search and information processing are surveyed. This is followed by a review of the research on calibration in general, and knowledge calibration in particular. Then, the focal antecedent variables are introduced and hypotheses are drawn. The subsequent section details the methodology and this is followed by the results of the analyses. Finally the study discusses the findings, identifies the implications and offers the conclusions.

CHAPTER 2

LITERATURE REVIEW AND HYPOTHESIZED RELATIONSHIPS

Research on Consumer Knowledge

Consumer knowledge is an important construct in understanding consumer behaviors such as information search (Brucks 1985; Rao and Sieben 1992) and information processing (Alba and Hutchinson 1987; Bettman and Park 1980). Implicit acknowledgement of the role of consumer knowledge in the study of consumer behavior can be found in the works of scholars such as Howard and Sheth (1969), Nicosia (1966) and Engle, Kollat and Blackwell (1968) who tried to model consumer decision processes. The information-processing paradigm heightened the interest of researchers in this construct. According to this paradigm, cognitive processes that occur after exposure to a stimulus and before overt behavioral responses affect the responses. The information stored in memory – knowledge - acquires a crucial role in this paradigm. Several studies supported the view that prior knowledge affects information-processing activities (Chase and Simon 1973; Chi, Glaser and Rees 1981). In consumer research, studies examined the effects of variables related to prior knowledge (familiarity, experience etc.) on various information processing activities (e.g., Alba 1983; Bettman and Park 1980; Johnson and Russo 1984).

Early research treated knowledge as a unidimensional construct, most often referred to as product familiarity or prior knowledge. That is, consumers are assumed to have some amount of experience with or information about particular products. This construct was operationalized using several measures such as frequency of purchase (Bettman and Park 1980; Kiel and Layton 1981), formal training (Sujan 1985), and self report measures (Johnson and Russo 1984). The plethora of constructs and measures that variously tapped into the domain of consumer knowledge led to theoretical issues of non-

comparability and inability to build on previous findings. Brucks (1985) sought to remedy this situation by clarifying the meaning and measurement of consumer product class knowledge. In her seminal study that also proposed new methods to measure information search behavior, Brucks (1985) found that prior knowledge facilitates the acquisition of new information and increases search efficiency. The study also sought to clarify the distinction between subjective and objective knowledge. Since these two constructs are similar to accuracy and confidence, the key constructs in the research on calibration, we briefly discuss the research on subjective and objective knowledge in the subsequent section.

Alba and Hutchinson (1987) proposed a multidimensional conceptualization of consumer knowledge that proved to be a major theoretical advance. This conceptualization clarified the meaning of "knowledge" and "expertise" and spawned numerous studies (e.g., Mitchell and Dacin 1996; Park, Mothersbaugh, and Feick 1994). According to these authors, consumer knowledge has two major components- familiarity, defined as the number of product related experiences that have been accumulated by the consumer, and expertise, defined as the ability to perform product related tasks successfully. In general, increased product familiarity results in increased consumer expertise. Alba and Hutchinson (1987) identified five qualitatively distinct dimensions of expertise that can be improved as product familiarity increases. These dimensions are cognitive effort, cognitive structure, analysis, elaboration and memory. The authors provided several hypotheses pertaining to these dimensions, the broadest among which are as follows: (a) Simple repetition improves task performance by reducing the cognitive effort required to perform the task, and in some cases repetition leads to performance that is automatic. (b) The cognitive structures used to differentiate products become more refined, more complete, and more veridical as familiarity increases. (c) The ability to analyze information, isolating that which is most important and task-relevant, improves as familiarity increases. (d) The ability to elaborate on given information, generating accurate knowledge that goes beyond what is given, improves as familiarity increases. (e) Finally, the ability to remember product information improves as familiarity increases. Refinements of these basic propositions and their delineation resulted in several specific hypotheses that spurred research in this area.

Within the domain of knowledge, product knowledge or product class knowledge has attracted the most attention of researchers (e.g., Brucks 1985). Consumers with high product class knowledge have been found to have extensive general knowledge about a product category, including the brands and models available in the market, the attributes of different models and how the attributes affect performance (Mitchell and Dacin 1996). This generalized knowledge allows individuals with more knowledge to learn more new information about that domain than less knowledgeable consumers (Srull 1983) and to categorize the information with less effort (Alba and Hutchinson 1987; Pryor and Ostrom 1981). They are also able to comprehend and process information and see a wider problem space (Reingold et al. 2001) allowing them to encode information about brands from different subcategories. Product knowledge has also been found to influence the precision of price estimates (Biswas and Sherrell 1993; Frankerberger and Liu 1994) and processing of advertising messages (Maheswaran and Sternthal 1990).

Recent research on consumer knowledge has sought to examine the effects of consumer knowledge on responses to event sponsorships (Roy and Cornwell 2004). It was found that experts generate more total thoughts about a sponsor-event combination. Experts and novices do not differ in sponsor-event congruence for high brand equity sponsor, but event experts perceive less of a match between sponsor and event for low brand equity sponsors. Scholars have also sought to conceptualize and measure consumer knowledge of the World Wide Web (Page and Uncles 2004). Based on qualitative and quantitative analyses, four scales are developed to measure common declarative, common procedural, specialized declarative, and specialized procedural knowledge content of the web. These terms warrant a short discussion and they are discussed in the following paragraph.

Literature on knowledge distinguishes between declarative and procedural knowledge. Declarative knowledge is defined as "factual information that is somewhat static in nature which is usually describable" (Best 1989, p.7); for instance, information about attributes, terminology, evaluative criteria, facts, and usage situations of the domain of interest (Brucks 1986). Procedural knowledge, by contrast, refers to "the dynamic information underlying skillful actions" (Best 1989, p.7); that is, the knowledge of rules and procedures for taking action believed to be stored and organized into

production systems (Brucks 1986). Procedural knowledge, also known as behavioral scripts, contains information about the sequences of behavior appropriate to particular situations (Gioia and Manz 1985). In marketing, examinations of declarative and procedural knowledge structures and their consequences can be found in the literature on sales (Leigh and McGraw 1989; Sujan, Sujan, and Bettman 1988). The distinction between common and specialized knowledge is derived from the literature concerning expertise, whereby experts possess specialized knowledge defined as "skilled and/or extraordinary information about a domain of interest required to perform skilled domain related tasks successfully". Common knowledge, on the other hand, is the "general and/or publicly known information of the domain of interest required to perform general and common domain-related tasks successfully".

Recent research has also examined the moderating effects of consumer knowledge. For example, Cowley and Mitchell (2003) examine the moderating effect of product knowledge on the learning and organization of product information. These researchers found that lower knowledge consumers tend to retrieve the same set of brands regardless of the usage situation at retrieval while higher knowledge consumers retrieve brands appropriate for the usage situation at retrieval.

Objective and Subjective Knowledge

Research has sought to conceptually distinguish between objective and subjective knowledge. Objective knowledge refers to the knowledge the consumer possesses; i.e., the information stored in long term memory. Subjective knowledge refers to the individual's perception of his or her knowledge. Although self-assessed (subjective) and objective knowledge are related, researchers have expressed the need for consistency and clarity in the conceptualization and operationalization of the two facets of consumer knowledge (Brucks 1985; Spreng and Olshavsky 1990). Findings from previous research substantiated such a need. For instance, Park and Lessig (1981) asserted that subjective knowledge provides a better understanding of decision maker's systematic biases and heuristics than does objective knowledge. This is so because measures of subjective knowledge can indicate self confidence levels as well as knowledge levels. Perceived self confidence may affect decision strategies and tactics. Rudell (1979) compared the effects

of objective knowledge (quiz score) and subjective knowledge (self-rating) on information processing activities and concluded that objective knowledge facilitates deliberation and use of newly acquired information, while subjective knowledge increases reliance on previously stored information.

Two factors led to the interest in self-assessed knowledge as a distinct construct. First, research in subjective probability assessment (Fischoff, Slovic, and Lichtenstein 1977) and feeling-of-knowing (Schacter 1983) suggests that what people think they know and what they actually know often do not correspond. Second, as noted earlier, some research suggests that the mechanisms through which self-assessed knowledge and objective knowledge affect information search and processing might be different (Bettman and Park 1980; Park, Gardner, and Thukral 1988; Park and Lessig 1981).

Comparisons of objective and subjective knowledge have yielded a number of findings. The two constructs have been shown to be moderately to strongly correlated (R= .3-.6; Brucks 1985; Cole, Gaeth, Chakraborty, and Levin 1992; Goldsmith and Goldsmith 1997; Raju, Lonial and Mangold 1995). Park, Mothersbaugh, and Feick (1994) presented a structural equation model of subjective knowledge, objective knowledge and product-related experience. These authors found that product related experience has a greater effect on subjective knowledge, while stored product class information has a greater effect on objective knowledge. Brucks (1985) found that only objective knowledge is significantly related to the number of product attributes examined, and only subjective knowledge is significantly related to the tendency to request dealer opinions. She concluded that subjective and objective knowledge influence information processing in different ways. Raju, Lonial, and Mangold (1995) found that subjective knowledge is a better predictor of purchase decision satisfaction than is objective knowledge. In summary, the weight of empirical evidence suggests that subjective and objective knowledge can be distinguished both conceptually and empirically and that both constructs play unique roles in consumer behavior.

The following section briefly reviews the literature on information search and information processing, since these are related to the research in consumer knowledge.

Information search

Consumer information search is one of the most enduring literature streams in consumer research (Beatty and Smith 1987). Literature on information search draws a distinction between internal and external search. Internal search occurs when consumers use information already stored in memory, whereas external search involves seeking information from the environment because the required information was not previously acquired or is unable to be recalled from memory. Internal search has been studied by researchers examining memory and retrieval processes. Past research in external search has focused on developing typologies of consumer information strategies using nearly 60 variables that influence external information search (Schmidt and Spreng 1996). These typologies often include aspects of the environment (e.g., difficulty of the choice task, number of alternatives, complexity of alternatives), situational variables (e.g., previous satisfaction, time constraints, perceived risk), and consumer characteristics (e.g., education, prior knowledge, involvement). Studies by Punj and Staelin (1983), Maute and Forrester (1991) and Srinivasan and Ratchford (1991) attempted to model the interrelationships among these factors.

Research in this stream has also identified the sources of information search. Broadly they can be classified as follows: Marketer controlled (e.g. personal selling, advertising, product information on package, product brochures), reseller information (e.g., catalogs by reseller, information charts, consultants), third-party independent organizations (e.g., Consumers Union, J.D.Powers, newspaper and magazine articles), interpersonal sources (e.g., friends, acquaintances), and direct inspection (e.g., observation, inferencing) (Olshavsky and Wymer 1995; Schmidt and Spreng 1996).

Consumer knowledge has been treated as an antecedent of information search. It has been proposed that higher levels of objective and subjective knowledge increase one's perceived ability to engage in external search for information. At the same time, higher subjective knowledge decreases the perceived benefits of external information search (Schmidt and Spreng 1996).

Information Processing

The major research thrust in consumer information processing has been the experimental study of information acquisition. Jacoby, Chestnut, Weigl, and Fisher (1976) identified three main elements: depth of search, sequence of search, and information content, which they suggest should be affected by individual and task environment variables. Depth of search refers to the quantity of information acquired. Sequence of search refers to the acquisition order. Information content refers to the specific items of information searched. Previous research, employing methods such as eye movements (Russo and Dosher 1976), protocols (Payne 1976), and information boards (Bettman and Jacoby 1976), found that individual specific variables, product-class experience, and product importance influence depth of search (Jacoby, Chestnut and Fisher 1978), and that information presentation format influences both depth and sequence of search (Bettman and Kakkar 1977). Subsequent research examined the interrelationships between antecedent factors and how they jointly affect information processing (Capon and Burke 1980). An ability-motivation approach has also been employed to study information processing. For example, MacInnis and Jaworski (1989) proposed an integrative framework of information processing from advertisements that identified several variables as antecedents to motivation to process information. Information processing was studied in terms of attention, that is the general distribution of mental activity to the tasks being performed by the individual (Moates and Schumacher 1980), and processing capacity, the amount of working memory allocated to an attended stimulus. Following the resurgence of research on affective influences, recent research examines such influences in information processing. This stream of research concerns itself with affective influences on memory encoding and retrieval (Bower 1981), core processing activity (Shiv and Fedorikhin 1999) and mood effects on the motivation for processing information (Bless 1997).

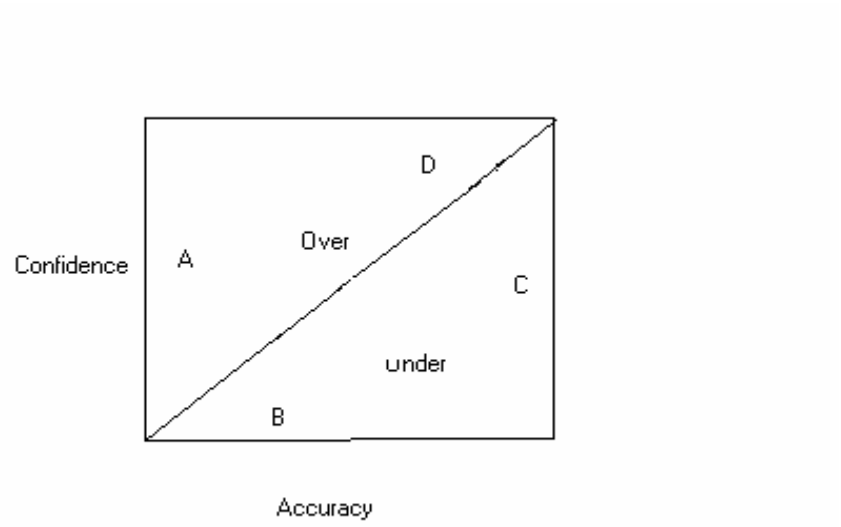
Information processing has attracted considerable research in other social science disciplines. Noteworthy among the recent theories in this area include Kramer's (1999) motivation to reduce uncertainty model and Afifi's (2004) theory of motivated information management.

Calibration

Calibration, as mentioned earlier, refers to the correspondence between accuracy and confidence. Knowledge calibration refers to the correspondence between accuracy and confidence in knowledge. A consumer who possesses accurate knowledge regarding a product domain and who is also very confident in his/ her knowledge can be said to be well calibrated. That is, high accuracy of knowledge along with high confidence leads to high calibration. Similarly, a consumer having very little knowledge but who is aware of his/ her ignorance and hence has low confidence in the knowledge, is also well calibrated. Miscalibration arises from a lack of correspondence between accuracy and confidence. High accuracy of knowledge along with low confidence leads to miscalibration arising from underconfidence. Low accuracy along with high confidence results in miscalibration arising from overconfidence.

Figure 1 shows the relationship between accuracy (x axis), confidence (y axis), and calibration. The diagonal line indicates perfect calibration since accuracy and confidence are equal on this line. The area above the diagonal indicates overconfidence, since confidence exceeds accuracy. Area below the diagonal line indicates underconfidence, since accuracy exceeds confidence.

Figure 1 depicts accuracy and confidence as continuous variable. It is possible to attempt a dichotomous division of the two variables, leading to a 2 by 2 matrix, two of whose cells denote overconfidence, while two cells denote underconfidence. Figure 2 presents the accuracy-confidence matrix. While the upper right cell indicates high calibration arising from high accuracy and high confidence, the lower left cell indicates high calibration arising from low accuracy and low confidence. The upper left cell indicates low calibration (miscalibration) arising from high accuracy and low confidence (underconfidence), while the lower right cell indicates miscalibration arising from low accuracy and high confidence (overconfidence).



Diagonal line indicates the line of perfect calibration

A-Area of low calibration characterized by low accuracy and relatively higher confidence

B-Area of low calibration characterized by low accuracy and lower confidence

C-Area of low calibration characterized by high accuracy and relatively lower confidence

D-Area of low calibration characterized by high accuracy and relatively higher confidence

Over- overconfidence

Under- underconfidence

Figure 1

Accuracy-confidence diagram

Accuracy	Low	High
Hi	Miscalibration (Underconfidence)	Calibration
Low	Calibration	Miscalibration (Overconfidence)

Confidence

Figure 2

Accuracy-confidence matrix

Research on Calibration

A variety of scientists, including meteorologists, statisticians, and psychologists, have been interested in measuring and explaining judgments of confidence and their relation to accuracy (e.g., Budescu, Erev, and Wallsten 1997; Gigerenzer, Hoffrage, and Kleinbolting 1991; Harvey 1997; Klayman, Soll, Gonzalez-Vallejo, and Barlas 1999; Lichtenstein, Fischoff, and Phillips 1982; McClelland and Bolger 1994; Yates 1990). Many of these studies report that people are systematically overconfident about the accuracy of their knowledge and judgment. Overconfidence can be defined as the

overestimation of the probability of an event. Thus, in a knowledge assessment task, if the subject estimates that 70% of his/her answers are correct, but only 50% are actually so, the subject is overconfident. According to the definition of calibration employed in this study, overconfidence is one type of miscalibration, the other being underconfidence.

Studies demonstrate that overconfidence in objective probability estimates is associated with events that are difficult to discriminate, and underconfidence is associated with events that are easier to discriminate, referred to as the hard/easy or discriminability effect (Baranski and Petrusic 1994, 1995; Lichtenstein and Fischoff 1977; Stratigakos 1994; Suantek, Bolger, and Ferrell 1996). With respect to problem characteristics, overconfidence is most apparent when solving difficult, as opposed to easy, questions (Lichtenstein and Fischhoff 1977). Time horizon has also been shown to affect decision quality. Overconfidence, for example, is lower for inherently unknowable future events than for potentially knowable past or current events (Ronis and Yates 1987). Researchers have also examined the effects of problem and environmental characteristics, as well as individual differences (e.g., Spence 1996). In terms of the causal origin of these effects, three broad accounts can be discerned in the literature: (1) a cognitive bias account, which suggests that miscalibration results from the inappropriate manner in which individuals process and evaluate information, perhaps resulting from employment of particular heuristics or arising from a particular risk attitude; (2) a methodological account, which argues that miscalibration is simply an artifact of the artificial and misleading tasks subjects are required to perform in experimental calibration studies; and (3) a combined account, which suggests a combination of individual and methodological sources of poor calibration.

The cognitive bias account of miscalibration warrants some discussion. Several processes have been identified as causal factors of miscalibration. Among them, with particular relevance to the consumer domain, are (1) failures of memory: Consumers may fail to consider (a) attribute information when making a brand choice (b) brands or other problem solving alternatives when deciding a course of action (c) predictive cues when making a forecast etc. Failure to consider such relevant information might lead consumers to have a false sense of confidence in their judgment. Thus, distorted memory (Wagenaar 1988) and incomplete memory (Dellarosa and Bourne 1984) might lead to

miscalibration. (2) Attentional failures and misweighting of evidence: Miscalibration may arise when decision inputs are not optimally incorporated into the decision process. Such errors may occur even when memory constraints have been lifted (e.g., Sanbonmatsu et al. 1998). For example, misweighting base rates have been reported in the literature (Griffin and Tversky 1992). Overreliance on the extremity of a cue, rather than its validity, will lead to false confidence. Similarly, incomplete generation and assessment of evidence also leads to miscalibration. (3) Inappropriate decision inputs: Miscalibration may arise when cues are misinterpreted and inappropriately influence decisions. For instance, people have been found to place greater confidence in decisions arrived at using greater amount of information, even when the data are nondiagnostic and do not enable improvements in accuracy that are commensurate with increase in confidence (Oskamp 1962). These and similar other biases account for miscalibration.

Spence (1996) provides an overview of research on calibration and states that much research indicates that individuals are overconfident, though certain professions have displayed high calibration in judgments. Weather forecasters and odd-makers have been shown to be well calibrated (Hoerl and Fallin 1974; Murphy and Winkler 1977), whereas doctors' diagnoses have not (Christensen-Szalanski and Busyhead 1981; Oskamp 1962). Theoretical explanations for this disparate finding include (a) the repetitiousness of forecasting with immediate, unambiguous feedback which enable validation and correction, facilitating calibration (Lichtenstein et al. 1982), (b) different payoff matrices or loss functions for forecasters and doctors, whereby doctors perceive the penalty for false negative as more devastating and hence state their opinions with greater conviction (Keren 1991; O'Connor 1989). Across the various domains, researchers report that high calibration is rarely achieved, moderate levels that include some degree of systematic bias (usually overconfidence, but sometimes underconfidence) are the norm, and confidence and accuracy are completely uncorrelated in some situations.

Studies have shown that calibration can be improved by feedback (Mahajan 1992; Russo and Schoemaker 1992). Mahajan (1992) examined the effect of non-evaluative feedback on marketing managerial predictions and found that such feedback reduces overconfidence. Since previous research identified overconfidence as rampant, we infer

that the reduction in overconfidence improves calibration. Stone and Opel (2000) highlighted the roles of training and feedback in improving calibration. Russo and Shoemaker (1992) cite the case of Royal Dutch Shell to illustrate how calibration improves decision-making. In the early 1970s, Royal Dutch/ Shell grew concerned that its young geologists too confidently predicted the presence of oil or gas, costing the company millions of dry-well dollars. For instance, they would estimate a 40% chance of finding oil, but when ten such wells were actually drilled, only one or two would produce oil. This overconfidence cost Shell lot of money. These judgment flaws puzzled senior Shell executives, as the geologists possessed impeccable credentials. In response, Shell designed a training program to help geologists develop calibration power. As part of this training, the geologists received numerous past cases that incorporated the many factors affecting oil deposits. For each case, they had to provide best guesses as well as ranges that were numerically precise. Then they were given feedback as to what had actually happened. The training worked wonderfully; now when Shell geologists predict a 40% chance of producing oil, four out of ten times the company averages a hit (Russo and Schoemaker 1992). Improved calibration, in the Royal Dutch example, resulted in cost savings for the company. We argue that a similar reasoning applies to consumer domain as well, where improved calibration enables consumers to make better choices. Alba and Hutchinson (2000) underscore the importance of calibration in consumer decision-making: "Calibration is important in consumer decision making because it allows consumers to cope with incomplete and errorful information. Normative theory describes optimal policies for factoring such uncertainties into current decisions and for investing resources to reduce the uncertainty. Clearly miscalibration is a barrier to implementing such policies" (p. 123).

Noteworthy among other domains that have examined the issue of confidence-accuracy relationship are forensic psychology and education. In crime investigations, witnesses often attempt to identify a culprit and give a statement about the certainty of the identification, expressed as a confidence judgment. It has been demonstrated that a confident witness is regarded as a credible witness, with a great impact on the outcome of a trial (Olsson 2000). Surveys have shown that jurors, police officers, prosecuting and defense attorneys and students believe that confidence and accuracy are positively related

(e.g., Brigham and Wolfskiel 1983). Yet many experimental studies of witness identification have shown that the confidence - accuracy relationship is not reliably different from zero (Loftus 1974; Narby, Cutler, and Penrod 1996). Consequently, the issue of calibration or "realism in confidence assessments" has attracted considerable scholarly attention in this field.

In education, researchers have examined calibration of self-efficacy and performance. Perceived academic self-efficacy has been one of the most studied constructs in the field of academic motivation research (Chen 2002). Research has shown that perceived academic self efficacy positively influences student academic choices, performance, effort, and persistence (Bong and Clark 1999). Since calibration captures the correspondence between perceived and real self-efficacy, it offers insights to improving student performance. Consequently, recent studies have examined calibration of self-efficacy (Chen 2002). Comprehension calibration, the correspondence between perceived and real comprehension is another area where considerable research has advanced the understanding of ways to improve comprehension (Lin and Zabrucky 1998). For example, research suggests that psychological factors and reading skills have strong effects on comprehension calibration. Further research in education explores the relationship between calibration and self regulated learning (Stone 2000), and the relationship between comprehension calibration and recall prediction accuracy (Gillstroem and Roennberg 1995). It is interesting to note that several studies in education assume the normative value of the construct, since it captures the realism in the judgment of the subject that can reasonably be expected to lead to optimal remedial measures, and focus on the examination of antecedent factors. It needs to be pointed out that, in this dissertation, the word optimal is used not formally or technically, but in a general sense.

Mental Models Versus Overconfidence

It is pertinent to discuss, at this point, a recent stream of thought on overconfidence that has its bases on the Brunswikian notion of reference class. Gigerenzer, Hoffrage, and Kleinbolting (1991) proposed that overconfidence might not

be the cause of errors that have been attributed to overconfidence, but that these could be explained by means of a Brunswikian theory of confidence termed probabilistic mental models (PMM). The theory deals with spontaneous confidence, that is, with an immediate reaction, not the product of long reflection. When presented with a two alternative confidence task, the typical task in studies on overconfidence, the subject first attempts to construct what is termed a local mental model of the task (LMM). This is a solution by memory and elementary logical operations. If this fails, a PMM is constructed that goes beyond the structure of the task in using probabilistic information from a natural environment.

A local MM simply matches the structure of the task; there is no use of the probability structure of an environment and, consequently, no frame for inductive inference in a PMM. Because memory can fail, the certain knowledge produced can sometimes be incorrect. These failures contribute to the amount of overconfidence to be found in 100% confidence judgment.

If no local MM can be activated, it is assumed that a PMM is constructed next. A PMM solves the task by inductive inference, and it does so by putting the specific task into a larger context. A PMM connects the specific structure of the task with a probability structure of a corresponding natural environment (stored in long-term memory). A PMM is different from a local MM in several respects. First it contains a reference class of objects that includes the objects a and b, the alternatives in a typical general knowledge task. Second, it uses a network of variables in addition to the target variable for indirect inference. Thus it is neither local nor direct. Probabilistic inference is part of the cognitive process and uncertainty is part of the outcome.

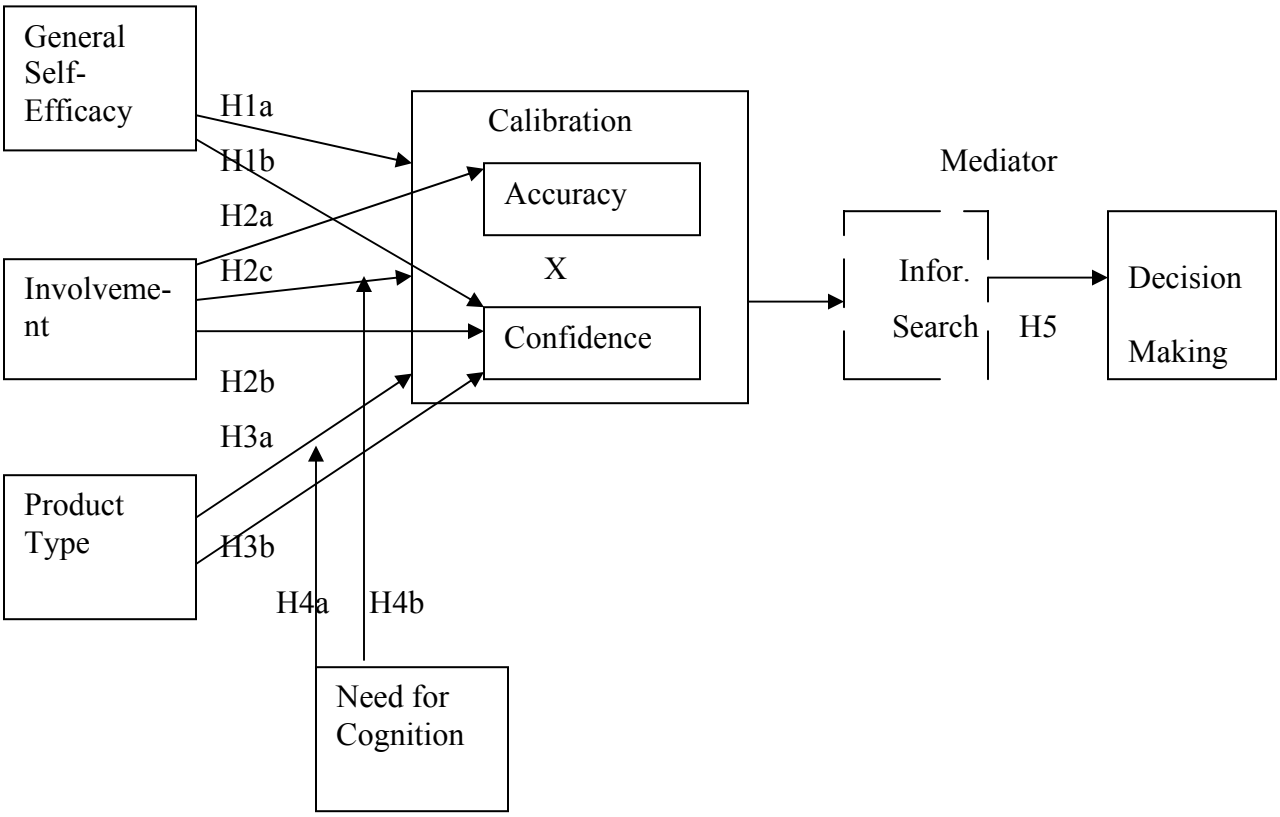
According to the theory, people can accurately estimate their success rate if they can reason using clear, unambiguous reference classes. To generate a reference class means to generate a set of objects known from a person's natural environment that contains objects a and b. Inconsistencies regarding prediction and performance arise not because of person's overconfidence, but because the person has misjudged the probability of the current situation being similar to a previous one in his or her PMM. For example, if a person did not know what vinegar tasted like, he or she might incorrectly infer that because it is a clear non-viscous liquid, it would taste like water. Without any further

reference cues, such as the smell of the liquid, there would not be more information on which the person could base a decision. When he is then asked to rate his confidence in his answer, his rating will be based on the probability of being right in his PMM based on the given information. It is then not a matter of overconfidence, but one of misjudging the similarity of a given situation to the PMM based on the existing reference cues. The theory discusses this point in terms of cues, cue validities, and ecological validities. The subject employs cues to make a choice. Cue validities are conditional probabilities, and can loosely be understood as the goodness of the cue in aiding decision-making. They correspond to ecological validities in the environment. If the hierarchy of cues and their validities correspond to that of the ecological validities, then the PMM is well adapted to the known environment. In the absence of such adaptation, overconfidence will be observed.

Much consumer decision making, especially the repetitive ones, might fall into the LMM category. Many decisions will use PMM, especially when various brands are tried and consumer forms inferences using reference classes (brands, company name, related products etc.). While this research follows the conventional paradigm of overconfidence, examinations of consumer knowledge and consumer's confidence in knowledge lend themselves to reasoning through the PMM route. Specifically, it can be argued that the ability to utilize appropriate reference classes is, in part, the function of the consumer's knowledge. Hence, assessments regarding one's knowledge and one's ability to estimate the correctness of one's knowledge (i.e., calibration) will facilitate better use of reference classes and probabilistic mental models, which in turn reduces misjudgments and overconfidence. That is, the prescriptive value of this research, in terms of the role of consumer knowledge calibration in facilitating optimal consumer decision-making, remains valid even if the conventional theory is substituted by the PMM theory.

Having briefly reviewed the literatures on consumer knowledge and calibration, we discuss the constructs relevant to the study. The proposed antecedents in the model (figure 1) are general self-efficacy, product type, and product involvement. The proposed consequent is decision making. Information search is treated as a mediator to the calibration – decision-making relationship, though it is not explicitly addressed in the

study. General self-efficacy is a relatively stable, trait-like, generalized competence belief (Chen, Gully, and Eden 2001). It is proposed that general self-efficacy enhances overconfidence and diminishes calibration. Involvement has been defined in terms of personal relevance of the product to the consumer. Involvement increases confidence and accuracy and hence it is proposed that while initial increase in involvement lead to increase in confidence more than that warranted by increase in accuracy, leading to miscalibration, further increase in involvement lead to better calibration. Product type refers to the categorization of consumer products into hedonic and utilitarian goods. Hedonic goods are those whose consumption is characterized by sensory and affective experiences and consumers often attach a subjective meaning to these products. Given the subjectivity, it is argued that consumers are likely to be more overconfident in their knowledge of hedonic products. Need for cognition is proposed to be a moderator of the relationship between (a) involvement and calibration and (b) product type and calibration. Need for cognition is a stable individual difference in people's tendency to engage in effortful cognitive activity. Since high need for cognition individuals are likely to consider relevant cues, their assessments might vary from low need for cognition individuals. Hence the proposed relationships between the two antecedent variables and calibration will differ between high need for cognition individuals and low need for cognition individuals. Each of the constructs is discussed below. Hypotheses are drawn after the discussion of the constructs.



*Dashed box indicates the fact that information search is not a focal construct in the study

Figure 3

Proposed Model

General Self-Efficacy

The concept of self-efficacy has proven to be relevant to many aspects of individual behavior, both consumer and organizational. Bandura (1986) defined self-efficacy as people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances. Self-efficacy is concerned not with the skills one has but with the judgments of what one can do with whatever skills one possesses. In organizational behavior, consistent relationships have been found between self-efficacy and performance (Barling and Beattie 1983). Self-efficacy has also been found to be related to academic performance (Wood and Locke 1987).

According to Bandura (1977), one's self-efficacy can affect his or her choice of activities and environmental settings. People choose to engage in activities in which they believe they can succeed. Self-efficacy also affects the amount of effort and length of time people will persist when they encounter challenging circumstances. For example, a person with high self-efficacy tends to put forth much effort on difficult tasks, works hard, and persists to overcome obstacles. By comparison, a person with low self-efficacy expresses doubts about his or her capability and is unwilling to expend effort and time on difficult tasks.

There are three dimensions of self-efficacy: magnitude, strength and generality (Bandura 1997). Magnitude is the level at which a person believes he or she can perform, whereas strength reflects the person's confidence that he or she can perform at that level. Generality is the extent to which self-efficacy in one situation extends to other situations. Much of the early research focused on capturing the magnitude and strength dimensions of self-efficacy. This is so because, following Bandura's (1977) emphasis on the domain specificity of self efficacy, researchers focused on the conceptualization and application of the construct in varied contexts. Recent research has focused on the domain generality dimension of self-efficacy, leading to the espousal of the construct of general self-efficacy (GSE). GSE is distinguishable from the concept of self-efficacy because, whereas self-efficacy is a relatively malleable, task specific belief, GSE is a relatively stable, trait-like, generalized competence belief (Chen, Gully, and Eden 2001). Judge,

Erez, and Bono (1998) defined GSE as individual's perception of their ability to perform across a variety of different situations. Thus, GSE captures differences among individuals in their tendency to view themselves as capable of meeting task demands in a broad array of contexts.

Several researchers have suggested that specific self efficacy (SSE) is a motivational state and GSE is a motivational trait (Eden 1988; Gardner and Pierce 1998; Judge, Locke, and Durham 1997). According to Eden, both GSE and SSE denote beliefs about one's ability to achieve desired outcomes, but the constructs differ in scope (i.e., generality and specificity) of the performance domain contemplated. As such, GSE and SSE share similar antecedents (e.g., actual experience, vicarious experience, verbal persuasion, psychological states) (Bandura 1997). However, GSE is much more resistant to ephemeral influences than is SSE. The most powerful antecedent of GSE is the aggregation of previous experiences (Shelton 1990). Shelton (1990) proposed that GSE emerges over one's life span as one accumulates successes and failures across different task domains. Discussing the generality of self efficacy beliefs, Bandura (1997) states: "Powerful mastery experiences that provide striking testimony to one's capacity to effect personal changes can also produce a transformational restructuring of efficacy beliefs that is manifested across diverse realms of functioning. Such personal triumphs serve as transforming experiences. What generalizes is the belief that one can mobilize whatever effort it takes to succeed in different undertakings." Thus, accumulation of successes in life, as well as persistent positive vicarious experiences, verbal persuasion, and psychological states, augment GSE.

According to Judge et al. (1997) GSE strongly relates to other self-evaluation constructs including self-esteem, locus of control, and neuroticism. Judge and colleagues (Judge, Bono, and Locke 2000; Judge, Thoresen, Pucik, and Welbourne 1999) have found particularly high correlations between GSE and self esteem. Chen, Gully, Whiteman, and Kilcullen (2000) have further shown that GSE is positively related to learning goal orientation, which refers to a desire for challenge and learning opportunities in a given performance domain.

Research by Kanfer and Heggestad (1997) distinguishes between trait and state individual differences in motivation and affect, and delineates relationships between

different types of individual differences and performance. These authors suggest that both trait and state individual differences can be classified as motivational (achievement/ approach oriented) or affective (anxiety/ avoidance oriented). Motivational individual differences involve the strength of motives to approach, pursue, and attain rewards or incentives. Research has shown that GSE is highly related to motivational variables (Chen et al. 2004).

Self-efficacy as a construct has not attracted much research in consumer sciences. In marketing, self-efficacy has found applications in sales research where the relationship between salesperson self-efficacy and performance as well the roles of autonomy, competitiveness, etc. on salesperson self-efficacy have been examined (e.g., Wang and Netemeyer 2002). Research in sales shows self-efficacy to be related to adaptive selling, goal setting, and performance (Brown, Cron, and Slocum 1998; Spiro and Weitz 1990; Sujan, Weitz, and Kumar 1994) and it has been suggested that the effect of self-efficacy will be stronger as sales tasks become more demanding (Chowdhury 1993). In fact, a recent meta-analysis shows a robust relationship between self-efficacy and performance across numerous work settings (Stajkovic and Luthans 1998). This study reported a corrected weighted average correlation of .38 between self-efficacy and work performance. Recent research has examined the role of self-efficacy in technology based self service. Dabholkar and Bagozzi (2002) found that self-efficacy with respect to technology moderates the relationship between antecedent factors such as ease of use, performance and fun, and the consequent attitude toward using technology based self-service. Specifically, with higher self-efficacy, the positive relationship between perceived ease of use and attitude toward using a technology-based self-service will be attenuated. Ellen, Bearden, and Sharma (1991) examined self-efficacy in the context of resistance to technological innovations and found that a person's self-efficacy affects his/her evaluative and behavioral response to the product. It should be noted that such applications were of specific self-efficacy. Our attempt to uncover the use of general self-efficacy in consumer research proved futile.

Apart from the business sciences, self-efficacy has found wide application in psychology, education etc. For instance, a recent dissertation examined mathematics self-efficacy among seventh graders (Chen 2002). Most of the research in this field has

focused on the dimensions of strength and level of self efficacy (Pajares and Miller 1994).

As mentioned earlier, the majority of research has focused on SSE. Scholars have pointed out the increasing relevance of GSE, consequent to the dynamism in the environment. For instance, given that jobs and roles are becoming increasingly broad, complex, and demanding (Ilgen 1994), high GSE is a valuable resource for organizations because it can maintain employees' work motivation throughout rapidly changing and stressful job demands and circumstances (Chen et al. 2001). Similarly, consumers in today's dynamic environment need to acquire knowledge about new products and new concepts in several product domains. Hence, the concept of general self efficacy finds increasing relevance in the consumer domain as well.

In this study, it is argued that higher self-efficacy leads to a heightened sense of confidence. Given that overconfidence is rampant, such an increase in confidence is likely to enhance overconfidence, leading to miscalibration. The process is discussed in the section detailing hypotheses.

Product Type

Consumer choices are driven by utilitarian and hedonic considerations (Batra and Ahtola 1990; Hirschman and Holbrook 1982). Consumers choosing among new automobiles, for example, may care about utilitarian features (e.g., gas mileage) as well as about hedonic attributes (e.g., sporty design). Research suggests that these different considerations map onto independent components of product evaluations and attitudes and enable people to distinguish between goods according to their relative hedonic or utilitarian nature (Batra and Ahtola 1990; Mano and Oliver 1993). Hedonic goods are those whose consumption is primarily characterized by an affective and sensory experience of aesthetic or sensual pleasure, fantasy, and fun (Dhar and Wertenbroch 2000; Hirschman and Holbrook 1982). Utilitarian goods are ones whose consumption is more cognitively driven, instrumental, and goal oriented and accomplishes a functional or practical task (Strahilevitz and Myers 1988). Empirical research supports the distinction between primarily hedonic and primarily utilitarian products (Laurent and Kapferer 1985;

Mittal 1989; Vaughn 1980, 1986). Function or performance is emphasized by one product type (utilitarian product) and pleasure or self-expression is emphasized by the other product type (hedonic product). For instance, Vaughn (1986) shows that products can be classified with the two dimensions of "think" and "feel." He uses two scales to operationalize the "think" dimension that corresponds to the function or performance dimension. He also uses three scales to operationalize the "feel" dimension that corresponds to the pleasure or self-expression dimension.

Consumers who buy or use a particular product to satisfy their utilitarian needs behave carefully and are efficiently oriented to problem solving (Babin, Darden, and Griffin 1994). To the contrary, the hedonic value of a product is decided based on the ability to provide feeling or hedonic pleasure rather than to solve a problem. Hirchman (1980) defines hedonic consumption as consumer behavior that is related to sensual, fantastic, and sensitive experience with a product. The definition implies that consumers attach a very subjective meaning, which is not explained by concrete or objective attributes, to some products. Hence, consumption of hedonic products is more based on an ideal that the consumer pursues than knowledge of objective reality.

Given the goal directed and instrumental nature of utilitarian products, which necessarily requires information search, consumers are expected to have good knowledge of utilitarian products in certain cases as, for example, when involvement is high. When the knowledge is low, the instrumental and objective nature of information associated with utilitarian products are likely to lead to more precise estimates of their knowledge by consumers. Involvement with hedonic products might also result in good knowledge regarding these products. But, given the subjectivity inherent in hedonic products, consumers are more likely to feel that they know about such products, even when their knowledge is limited. Hence they are likely to be overconfident. To the contrary, the more objective assessments regarding knowledge of utilitarian products are likely to result in less overconfidence. Hence, consumers are more likely to be overconfident in their knowledge of hedonic products compared to utilitarian products.

Involvement

Involvement has been defined in terms of personal relevance of the product or the advertisement to the subject. Zaichkowski (1985) defines involvement as a person's perceived relevance of the object based on inherent needs, values, and interests. An arousal perspective has been employed by researchers examining involvement in advertising. These researchers have defined involvement as an internal state of arousal comprised of three major properties: intensity, direction and persistence (Andrews, Durvasula, and Akhter 1990; Mitchell 1981). Intensity refers to the person's degree of involvement or motivation. Level of involvement ranges along a continuum from low to high (Antil 1984) and varies across products and situations as well as individuals. That is, although individually consumers exhibit different levels of involvement for different product classes and purchase situations, some products classes and purchase situations are generally perceived to be more highly involving than others (Hupfer and Gardner 1971). Direction is defined as the object or issue toward which an individual is motivated (Mitchell 1981), whereas persistence refers to the duration of the involvement intensity (Celsi and Olson 1988). Involvement is generally considered to be a function of (a) individual characteristics such as interests, values and goals, (b) situational factors such as the purchase occasion or perceived risk, and (c) characteristics of the object or stimulus (Laurent and Kapferer 1985). Outcomes associated with high involvement include more time and effort spent in search related activities (Bloch et al. 1986), more extensive decision making, greater perceived differences in product attributes, and a greater likelihood of establishing brand preferences (Zaichkowsky 1985, 1986).

The effects of involvement on the processes mediating the effects of a persuasive communication about an issue have been extensively investigated (Maheswaran and Sternthal 1990; Miniard et al. 1991). A robust finding of this literature is that uninvolved message recipients, compared to those who are highly involved are characterized by (a) less attention to and less cognitive elaboration of attribute information, and (b) more reliance on peripheral cues available in the message (Celsi and Olson 1988; Batra and Ray 1985). Starting with Ray et al. (1973), large numbers of studies have reported that consumers involved in a situation or product are more active processors of cognitive

information about it. Celsi and Olson (1988) tested several hypotheses concerning the effects of felt involvement on the amount of attention and comprehension effort, the focus of attention and comprehension processes, and the extent of cognitive elaboration during comprehension. These authors found that involved consumers attend to and comprehend more information about shopping situations and products and produce more elaborate meanings and inferences about them (Celsi and Olson 1988). Research in memory based product judgments has shown that individuals are cognitive misers who attempt to minimize search (Wyer and Srull 1986), and involvement during a memory based judgment influences this processing objective and affects search intensity (Park and Hastak 1994). Compared to uninvolved consumers, involved consumers are more motivated to form a relatively accurate judgment and hence they search more intensely for judgment relevant information.

The above discussion highlights the role of involvement in enhancing effort by consumers. Involvement can also be expected to increase familiarity with the domain, and practice in dealing with specific issues concerning the domain. Effort and practice are cues associated with performance, which refers to knowledge accuracy in a knowledge testing task, as in the case of this study. But research suggests that both factors produce dissociation between confidence and performance because of elevations in confidence that are unaccompanied by corresponding increases in accuracy (Paese and Sniezek 1991). Similar themes were echoed by Fischoff and Slovic (1980), who argued that even minimal familiarity with a task or tentative rules of performance in the task can produce surprising amounts of conviction, and by Heath and Tversky (1991), who noted that familiarity and knowledge are accompanied by feelings of competence. Hence, as involvement increases, we reason that confidence increases more than accuracy of knowledge, leading to miscalibration. But, unless the domain is inordinately difficult, or one where expertise is not easily acquired, at high levels of involvement, increase in accuracy is likely to match the increase in confidence. That is, initial increase in involvement leads to miscalibration and further increase in involvement leads to calibration. Hence we posit a U shaped relationship between involvement and calibration.

Need for Cognition

Early research by Cohen, Scotland, and Wolfe (1955) demonstrated that individuals differ "in their need to understand and make reasonable sense of the experiential world" (p. 291), and these authors called this difference the "need for cognition". The concept of need for cognition was distinguished conceptually by Cohen et al. (1955) from gestalt models of tendencies to structure the environment (c.f., Witkin, Dyk, Faterson, Goodenough, and Karp 1962) by postulating that "feelings of tension and deprivation arise from its frustration" (p. 291). Cohen et al. (1955) proposed that the resultant tension would lead to "active efforts to structure the situation and increase understanding" (p. 291). Thus, Cohen and his colleagues' conceptualization of need for cognition emphasized ambiguity tolerance and tension reduction and, as such, appears closer to contemporary scales that measure tolerance of ambiguity (Shaffer and Hendrick 1974) or need for structure (Neuberg and Newsom 1993).

Cacioppo and Petty (1982) conceptualized need for cognition somewhat differently, though they adopted the term in deference to the early work of Cohen and his colleagues on cognitive motivation in social and personality psychology. Cacioppo and Petty (1982) suggested that there are differences in individuals "in their tendency to engage in and enjoy thinking"(p. 116). These authors proposed that need for cognition was a stable individual difference in people's tendency to engage in and enjoy effortful cognitive activity. Interindividual variations in need for cognition were conceptualized as falling along a bipolar continuum (from low to high) because low need for cognition was defined as the relative absence of a person's chronic tendency to engage in and enjoy effortful cognitive activity. Need for cognition was conceptualized as reflecting a stable (although not invariant) intrinsic motivation that can be developed or changed rather than a true need. Furthermore, the emphasis was process oriented - on individual's enjoyment and tendency to engage in effortful cognitive activity - rather than outcome oriented (e.g., individual's need for an unambiguous, understandable, or well-organized world). According to Cacioppo, Petty, Feinstein, and Jarvis (1996), individuals with a high need for cognition are likely to "seek, acquire, think about, and reflect back on information to make sense of stimuli, relationships and events" as compared to those with a low need for

cognition, who are likely to rely on others (e.g., celebrities and experts), on cognitive heuristics, or on social comparison processes to provide structure (p. 198). Need for cognition is a key component in the development of the elaboration likelihood model of persuasion and attitude change where information is processed more deeply (i.e., elaborated on more extensively) by those in high need for cognition than by those in low need for cognition (Cacioppo and Petty 1982). Similarly, need for cognition has been positively correlated with other cognitive processes including academic performance (Sadowski and Guelgoez 1996) and problem solving (Nair and Ramnarayan 2000).

Studies have shown that individuals high in need for cognition engage in more thinking about a given task than those who are low in need for cognition and hold attitudes that are more persistent over time and resistant to persuasion attempts (Haugtvedt and Petty 1992). Research has also shown that high need for cognition individuals search for more information when making decisions (Verplanken, Hazenberg, and Palenewen 1992), are more influenced by argument quality in advertising (Inman, McAlister, and Hoyer 1990), and are more likely to seek out and elaborate on information, since they enjoy doing so (Luna and Peracchio 2002). They enjoy solving complex problems and report greater cognitive effort relative to low NFC individuals (Batra and Stayman 1990). Conversely, low need for cognition individuals are less motivated to study a message in depth. As a result, they are more influenced by humor (Zhang 1996), promotion signals (Inman, McAlister, and Hoyer 1990), and positive mood (Batra and Stayman 1990). Research in personality and group dynamics have shown that need for cognition moderates social loafing in group tasks. Individuals with a low need for cognition performed significantly better in the coactive rather than in the collective condition, whereas individuals with a high need for cognition worked just as hard collectively as coactively (Smith, Kerr, Markus, and Stasson 2001).

Given that individuals with high need for cognition (compared to individuals with low need for cognition) enjoy thinking as an activity, it is likely that these individuals have more organized knowledge structures and are better in extracting relevant information from memory. Also, they are more likely to consider more relevant cues, which enables them to form a more accurate picture of the reality, than individuals low in need for cognition. Since these remain true irrespective of the presence or absence of

other relevant variables such as product involvement or product type, the relationships between (1) product type and accuracy, (2) product type and confidence, and (3) product type and calibration will be moderated by need for cognition such that the proposed relationships will be stronger for low need for cognition individuals than for high need for cognition individuals. Similarly, need for cognition will moderate the relationship between involvement and the three focal constructs, such that the proposed relationships will be higher for individuals with low need for cognition than for individuals with high need for cognition.

Decision Making

Several studies in consumer research have examined decision-making. The influence of a multiplicity of variables on decision-making processes and outcomes has been examined. Drolet (2002), in a recent study, found that the idea of contingent decision-making applies not only to decision outcomes but also to decision processes. Inman and Zeelenberg (2002) examined the widely reported phenomenon that decisions to maintain the status quo tend to be regretted less than decisions to change it and found that this is moderated by decision justifiability. These researchers found that there are situations in which repeat purchasing (maintaining the status quo) may cause as much or even more regret than switching. Alba and Marmorstein (1987) examined the effects of frequency knowledge on consumer decision-making and found that frequency knowledge can influence judgment and choice, particularly when other types of information have been poorly encoded, poorly remembered, or poorly understood. Given the obvious importance of this construct in consumer research, a large number of studies examine this issue and any attempt at reviewing the literature is bound to result in errors of omission and fall short of doing justice to the work done by several scholars. The studies reported above are examples.

Hypotheses

Following the discussion of the key constructs in the study, we offer propositions in the following paragraphs. Certain assumptions underpin the reasoning behind the hypotheses. First, we assume that people are overconfident in the assessments of their product knowledge. This follows from the several research findings demonstrating the existence of overconfidence across a wide variety of contexts. The prevalence of overconfidence has been so ubiquitous that scholars have considered overconfidence as a stylized fact of human cognition (Alba and Hutchinson 2000).

Overconfidence implies that consumers' confidence in their knowledge exceeds their accuracy. Thus, overconfidence results in miscalibration. Miscalibration, in this situation, can be alleviated by (a) increasing accuracy of knowledge or (b) reducing confidence of consumers in their knowledge or (c) both simultaneously. Hence, the general reasoning adopted is that the focal variables that were discussed earlier help to increase/ decrease accuracy or reduce/increase confidence or both, and hence lead to better/lower calibration of knowledge of consumers.

General self-efficacy: As discussed earlier, general self-efficacy can be considered as a motivational trait. GSE arises from powerful mastery experiences that provide testimony to one's capacity to effect personal changes. Personal triumphs serve as transforming experiences and result in a restructuring of efficacy beliefs. The consequent generalization of the belief that one can succeed in different undertakings is likely to boost confidence ratings in the consumer domain as well. Given that overconfidence is rampant, such an increase in confidence is likely to enhance overconfidence, leading to miscalibration. Hence general self-efficacy leads to enhanced confidence and diminishes calibration.

H1a: Higher the general self-efficacy of individuals, higher their confidence in their product knowledge.
H1b: Higher the general self-efficacy, lower the calibration of consumer knowledge.

Involvement: More involved consumers are likely to collect more information about the product, since involvement arises from personal relevance. Hence more involved consumers are likely to possess more accurate knowledge about the product. Involvement also increases confidence, arising from familiarity with the domain. But often, increases in confidence are higher than that warranted by increases in accuracy. Hence as involvement increases, confidence increases more than accuracy of knowledge leading to miscalibration. But at high levels of involvement, increase in accuracy will match the increase in confidence, and hence we propose a U shaped relationship between involvement and calibration. The figure below portrays the U shaped relationship. Hence

H2a: Higher the involvement, higher the accuracy of consumer knowledge
H2b: Higher the involvement, higher the level of confidence
H2c: Relationship between involvement and calibration is U shaped such that initial increases in involvement leads to miscalibration (overconfidence) and further increase in involvement leads to calibration.

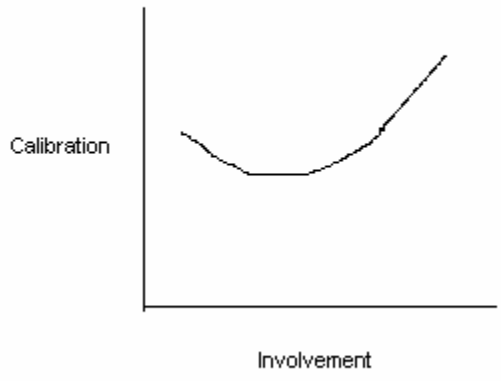


Figure 4
Proposed Involvement – Calibration Relationship

Product type: The discussion on product type delineated how consumers are likely to be overconfident to a greater extent regarding their knowledge of hedonic products compared to utilitarian products. Utilitarian products are instrumental by nature, and consumers are likely to collect information about them. The objectivity attached to these products are likely to produce more realistic confidence judgments regarding the knowledge that consumers possess, compared to hedonic products whose inherent subjectivity are likely to inflate the consumers' perception of their knowledge. Hence, consumers are likely to be overconfident to a greater degree with regard to hedonic products than they are with regard to utilitarian products.

H3a: Calibration of consumer knowledge will be better for utilitarian products compared to hedonic products.
H3b: Overconfidence will be higher for hedonic products compared to utilitarian products.

Need for cognition: Individuals with high need for cognition (compared to individuals with low need for cognition) enjoy thinking as an activity. Therefore it is likely that these individuals have more organized knowledge structures and are better in extracting relevant information from memory. Also, they are more likely to consider more relevant cues, which enables them to form a more accurate picture of the reality, than individuals low in need for cognition. As such, high need for cognition individuals tend to think about their knowledge and form more realistic perceptions irrespective of the presence or absence of the variables under consideration. Hence the relationships between product type and calibration will be moderated by need for cognition such that the proposed relationship will be stronger for low need for cognition individuals than for high need for cognition individuals. Similarly, need for cognition will moderate the relationship between involvement and calibration, such that the proposed relationship will be higher for individuals with low need for cognition than for individuals with high need for cognition.

H4a: Need for cognition moderates the relationship between calibration and product type such that the proposed relationship (higher calibration for utilitarian products compared to hedonic products) will be stronger among low need for cognition individuals than among high need for cognition individuals.
H4b: Need for cognition moderates the relationship between involvement and calibration such that the proposed relationship will be stronger among individuals with low need for cognition than those with high need for cognition. That is, low need for cognition individuals will display a more pronounced U shaped relationship than high need for cognition individuals.

Decision Making Accuracy: Higher calibration of knowledge implies better realism in the consumers' judgment. Hence consumers with well calibrated knowledge will take appropriate remedial measures, such as seeking more information, before they make the correct decisions. Overconfident consumers, on the other hand, are bound to act presumptively, leading to erroneous decisions. Underconfident consumers will delay decision-making or engage in redundant information search. As mentioned earlier, we discount the possibility of underconfidence in this study. Hence, consumers with well-calibrated knowledge will make more accurate decisions than consumers who are poorly calibrated in their knowledge. Information search mediates this process.

H5: Calibration of knowledge leads to more accurate decision-making.

CHAPTER 3

METHOD

Subjects

The study was conducted among student subjects. The propriety of using college students as subjects in social science research generally, and consumer research in particular, has been debated philosophically and addressed empirically numerous times (Lynch 1983; Weick 1967). Calder, Phillips, and Tybout (1981) argued eloquently for the use of college students as subjects in consumer research when the objective of the research is theoretical in nature. Since this research is primarily theoretical and, as noted earlier, one of the first empirical studies in examining consumer knowledge calibration, the use of student subjects is appropriate. Research has noted that the effect sizes derived from student subjects frequently differ from those derived from non-student subjects, pointing to the need to replicate research based on student subjects with non-student subjects before attempting generalizations (Peterson 2001). This issue is discussed further in limitations and future research.

Pretests

Pretests were conducted to identify utilitarian and hedonic products. The procedure for pretesting was adopted from previous research on hedonic and utilitarian products (Dhar and Wertenbroch 2000; Strahilevitz and Myers 1998). Student subjects categorized several consumer products as primarily utilitarian (defined as useful, practical, functional, something that helps achieve a goal, e.g., a vacuum cleaner) or primarily hedonic (defined as pleasant and fun, something that is enjoyable and appeals to the senses, e.g., perfume), as both utilitarian and hedonic or as neither. The majority of subjects classified auto insurance as primarily utilitarian (42 out of 43, chi squared = 80.16, $p < .01$) and music albums as primarily hedonic (38 out of 43, chi squared = 59.5, $p < .01$). Hence these two products were chosen for study.

Measures

Measuring calibration: A measure of knowledge calibration demands independent measurement of both components of calibration: accuracy of knowledge and confidence. Knowledge scales capturing consumer knowledge in both the product categories were devised to measure accuracy of knowledge. Literature surveys and expert interviews with researchers and aficionados in insurance and music fields were conducted to identify an initial set of 25 multiple choice knowledge items. Such experts included insurance professors for insurance, and sales managers in music stores such as Borders, for music albums. Care was taken to ensure that we address the aspects of product knowledge identified in previous research such as brands, terminology, available attributes, criteria for evaluating attributes, perceived covariance between attributes, and factors of usage situations that determine attribute importance (Brucks 1985).

The initial set of items was tested with subjects familiar with the field to identify relevance and difficulty. Professors and graduate students who rated themselves as very knowledgeable in music comprised the expert group for music albums while students enrolled for the capstone course in insurance comprised the insurance expert group. A total of 12 music experts and 25 insurance experts evaluated the initial set of questions. Apart from answering each item, the subjects were also asked to indicate the relevance of the question in a task to assess knowledge accuracy among general populace using a 9-point scale. In addition, the subjects were asked to rate each item on objectivity (is the answer objectively verifiable or based on opinion), ambiguity (the existence of multiple interpretations), and discriminability (discriminates well between experts and novices). Those items found not relevant by a majority of the subjects were deleted from consideration. Items rated poorly on the other criteria were also omitted. Among the remaining items, sets of 16 questions each for insurance and music albums were chosen such that difficult (fewer than 30% got it right), easy (more than 70% got it right) and neither difficult nor easy (between 30 and 70% got it right) items found representation in the scales. This was done to ensure that some correspondence is maintained in the difficulty level between the two scales. Research in calibration has recorded the prevalence of hard-easy or discriminability effect, whereby difficult items lead to

overconfidence and easy items lead to underconfidence. The inclusion of items with varying difficulty levels controls the hard-easy effect. At the same time, we refrained from imposing a strict correspondence, since that would have the effect of smoothening out naturally occurring differences in knowledge, thus detracting from the external validity of the study. Appendix A shows the list of questions for music albums and insurance.

Accuracy was measured as the percentage of correct items to total items, and ranged between 0 and 100. Confidence was measured at the item level and the scale level (Schneider and Laurion 1993). At the item level, the subjects rated their confidence that their answer was correct as they answered each multiple-choice item. This was done using a continuous scale ranging from 0 to 100. At the scale level, confidence was measured using a 2-item scale comprising the following items: (a) How confident are you about the correctness of your answers for the above set of questions? measured on (0) not at all confident to (10) completely confident, and (b) What do you think is the percentage of questions that you answered correctly? measured on (0) 0% to (10) 100%. The average of the two items indicated the subject's confidence. The item level measurement would help understand the relationship between consumer confidence at the item level and the scale level. This was deemed worthy of exploration. Similarly, subjective knowledge was also measured to explore the relationship between confidence and subjective knowledge. The subjective knowledge scale proposed by Flynn and Goldsmith (1999) was used for this purpose.

A common index for measuring the relationship between accuracy and confidence is correlation and several studies have employed this measure (e.g., Lin, Moore, and Zabrucky 2001). Recent literature has identified some weaknesses of correlation measure, such as its inability to provide diagnostically useful information (Weber and Brewer 2003). Scholars discuss three methods to assess calibration: calibration curves, calibration index and the overconfidence/ underconfidence statistic. Calibration curves plot accuracy and confidence and enables visual inspection of calibration at various levels of accuracy. Indices such as Brier score are used to measure calibration in meteorology. Here, the calibration measure is a component of the overall measure of external correspondence,

the mean probability (or Brier) score, introduced by Brier (1950) to measure the goodness of weather forecasts. The score is defined by

$$PS = 1/N \quad \Sigma (x_i - d_i)^2 \qquad (1)$$

where N is the number of probability assessments, x_i (i = 1 to N) is the subjective probability assigned at occasion i, and d_i (i = 1 to N) is an outcome index that takes the value 1 if the event occurs and 0 otherwise. The mean probability score is perfect (0) for an assessor that assigns probability 1 to all events that occur, and 0 to all events that do not occur. According to the Murphy partition of the mean probability score (Murphy 1973), failures of meeting this criterion can be traced to three components of performance,

$$PS = c\,(1\text{-}c) + 1/N \quad \Sigma \; n_t(x_t - c_t)^2 \quad - 1/N \quad \Sigma \; n_t(c_t - c)^2 \qquad (2)$$

Where the first component is the variance of the outcome index and expresses the assessor's knowledge. The second component measures calibration. Here, N is the total number of questions answered (which is the same as the total number of probability assessments), T is the number of confidence categories used, x_t (t = 1 to T) is the confidence response in category t, c_t (t = 1 to T) is the proportion correct in category t, and n_t (t = 1 to T) is the number of times the response category t was used. An assessor is said to be well calibrated if, out of all events (questions) assigned a probability .XX, a proportion XX% do occur (are correct) (i.e., $x_t = c_t$). The measure of calibration is often accompanied by a measure of over/ underconfidence. This measure equals the difference between the overall mean subjective probability and the overall outcome index, x-c. In contrast to calibration, over/underconfidence is a directional measure.

Variants of the above-discussed measures have also been used. For example, Bradlow, Hoch, and Hutchinson (2002) employ a measure of calibration for each respondent, defined as the squared difference between self-rated (confidence) and tested computer knowledge (accuracy). In effect, this would be a measure of miscalibration.

One practical disadvantage of calibration index such as Murphy partition score is the requirement of a large sample. To achieve a stable estimate of calibration, upward of 200 participants are necessary per condition (Weber and Brewer 2003).

Given the practical disadvantage of sample size, we employed the correlation measure (referred to in the calibration literature as gamma correlation), as well as the

squared difference measure. Analyses were conducted using both measures and discrepancies are reported.

Involvement

Involvement was measured using the 10 item bipolar adjective scale developed by Zaichkowsky (1994). The responses were obtained on a 7-point scale. Previous research has confirmed the reliability and construct validity of this scale across various contexts (Park and Moon 2003).

General Self-Efficacy

General self-efficacy was measured using Chen et al.'s (2001) 8 item NGSE (New General Self Efficacy) scale. Sample items include "I will be able to achieve most of the goals that I have set for myself" and "when facing difficulties, I am certain that I will accomplish them". Responses were obtained on a 5-point agree-disagree scale.

Need for Cognition

Need for cognition was measured using need for cognition scale developed by Cacioppo and Petty (1982). This scale has been extensively used in marketing and psychology (e.g., Haugtvedt and Petty 1992; Inman et al. 1990). This scale consists of 18 semantic differential scales wherein subjects rate the extent to which various statements are characteristic of themselves. One half of the items are reverse scored. For each item, a 7-point scale with endpoints strongly agree and strongly disagree was presented.

Decision Making Accuracy

Decision making accuracy was measured only among a subsample of respondents who answered the insurance questionnaire. Several characteristics of insurance make it ideal for the study of choice. Insurance is an information rich product. Quality of the company, its reputation, solvency characteristics, marketing methods, claims handling

procedures etc make the insurance product different from firm to firm (Schlesinger and Schulenburg 1993). Also, there is a significant body of work on choice and decision-making in the insurance context that we could draw upon (Briys and Louberge 1985; Puelz 1991; Schlesinger 1987; Schlesinger 1998, Schlesinger and Schulenburg 1993).

Among the paradigms that have been adopted by researchers examining consumer choice are (a) assessing choice based on their agreement with the best choice, the latter identified through Bayesian distributions, (b) assessing the presence or absence of dominated alternatives, etc. (Bettman and Zins 1979; Johnson and Payne 1985; Keller and Staelin 1987; Malhotra 1982). Auxier (1976) studied the insurance buyers' ability to discriminate between life insurance policies by determining whether students in a life insurance class could discriminate among selected $10,000 straight life policies better than on a chance basis. For this test it was assumed that the Linton method, which ranks policies based on the net rate of compound interest that must be earned on an investment fund that duplicates the insurance policy, correctly discriminated among the policies. In this study we use experts' choices as the frame of reference against which subjects' choices were compared. Paired comparisons were inferred from rankings of respondents and these were compared with experts' choices. The use of paired comparisons is a common method for the study of choice (e.g., Auxier 1976; Keller and Staelin 1987).

A set of 5 insurance policies that varied on key characteristics was developed and the subjects were required to rank them in their attractiveness for a certain individual with specified characteristics. Judgemental selection of insurance samples to suit the study's purpose has been employed by insurance scholars (Auxier 1976). Appendix A shows the details of the policies. In a pretest, a group of 21 experts ranked the policies. An analysis of the rankings of 21 experts showed that there was near unanimity in 5 of the 10 possible paired comparisons, inferred from rankings. Decision making accuracy was operationalized as the number of paired comparisons, out of the chosen 5, in which the subjects' choice agrees with the experts' choice. The score ranged from 0 to 5.

Procedure

The planned sample size of the study was 300, divided equally between the hedonic and utilitarian products. Student subjects were recruited from undergraduate business classes. They were assigned randomly to either of the two manipulated conditions (hedonic or utilitarian), and asked to fill out the questionnaire. The questionnaires contained the measures of involvement, knowledge accuracy and confidence, general self efficacy, and need for cognition.

A random sample of the subjects who completed the utilitarian product questionnaire was recruited for the second part of the study. This part was conducted in individual sessions in the lab where only the experimenter was present. The subjects were presented with a set of 5 insurance policies. They were asked to rank the policies according to their attractiveness to a person of specified characteristics, such as low income and in possession of an old car. In order to add more objectivity to the decisions, it was also specified that the person attached 70% weight to price and 30% weight to service while choosing the insurance policy. Subjects were told that they could ask questions if they need more information to make their decisions. The experimenter, in consultation with an insurance expert, had prepared a list of possible questions and written answers for them. Hence standard answers were provided for the questions, which controlled for variability in information provision. The list of questions and answers are shown in appendix B. The subjects were free to ask any number of questions before making their decision. The number of questions asked by each subject was recorded.

The subjects were told that if their rankings corresponded to that of experts, their name would be included in a lottery with a few $15 reward. It was also made clear that for every question they ask of the experimenter, there would be a deduction of one dollar from the prize amount, in case they won. These two provisions enhance the external validity of the study by (a) providing motivation for correct choice (Auxier 1976) and (b) attaching a cost to information search.

CHAPTER 4

RESULTS

This chapter reports the results of the analyses. It starts with sample description, followed by preliminary analyses that details descriptive statistics of each construct. Subsequently, the results of the hypotheses tests are presented. Additional analyses that present the results of hypotheses tests across the two subsamples (insurance and music) concludes the chapter.

Sample Description

Data were collected from 337 students enrolled in undergraduate business courses, after obtaining the approval of the human subjects committee of the Florida State University. Of the 337 questionnaires, 5 were found unusable because of noncompletion. The achieved sample, hence, was 332. Whereas 167 students completed the insurance questionnaire, 165 students completed the music questionnaire.

From among those who completed the insurance questionnaire, a subsample of 61 students, randomly selected, participated in the second part of the study, where the effects of calibration on decision-making were tested. As detailed earlier, this was accomplished with the aid of a vignette.

Further analysis revealed that 14 questionnaires had a negative correlation between accuracy and confidence. Since calibration is defined as ranging from 0 to 1, these questionnaires with negative correlations were excluded from further analysis. Thus the total sample came down to 318. Of the 14 questionnaires with negative correlation values, 13 belonged to the insurance sample. The achieved samples for insurance and music, hence, were 154 and 164. Further, the sample for the second part of the study came down to 53.

All the respondents were students enrolled for undergraduate business courses at the College of Business, Florida State University. The age of respondents ranged from 18 to 37, with the mean being 21.61. The sample comprised 42.5% males and 57.5% females.

Preliminary Analysis

In this section, the descriptive statistics of all constructs and scale reliabilities are reported. A correlation matrix, showing intercorrelations of all constructs is also presented. The section also presents t-tests for gender on all variables.

Descriptive Statistics and Scale Reliabilities

Independent Variables

General self-efficacy: General self-efficacy was measured using an 8-item scale (Chen, Gully, and Eden 2001). Responses were obtained on a 5-point agree-disagree scale. General self-efficacy was computed as the average of the scores of the 8 items. The descriptive statistics show that general self-efficacy ranged from a minimum of 1 to a maximum of 5, with the mean being 4.41. Thus, on the average, the respondents perceived themselves to be self-efficacious.

Table 1
Descriptive Statistics - General Self Efficacy

	N	Minimum	Maximum	Mean	Std. Deviation
GSE	318	1.00	5.00	4.412	.495

Reliability analysis using the coefficient alpha method indicated that the scale has acceptable reliability (above .7).

Table 2
Reliability Analysis – General Self Efficacy

N of Cases =	318.0	N of Items =	8
Alpha =	.895		

Involvement: Product involvement was measured using a 10-item scale (Zaichkowsky 1994). Responses were obtained on a 7-point scale. The scale measures the involvement of the person with the product category. Hence involvement with insurance was measured in the insurance sample, whereas involvement with music albums was measured in the music sample. Involvement was computed as the average of the ten items scores, after recoding the six negatively framed items. The descriptive statistics for the scale are as shown below. For the sample as a whole, involvement ranged from 2.2 to 7, with the mean being 5.31.

Table 3
Descriptive Statistics - Involvement

	N	Minimum	Maximum	Mean	Std. Deviation
INVOLVEMENT	318	2.20	7.00	5.313	.934

Reliability analysis using the coefficient alpha method indicated that the scale has acceptable reliability (above .7).

Table 4
Reliability Analysis – Involvement

N of Cases =	318.0	N of Items =	10
Alpha =	.797		

The descriptive statistics for involvement for insurance and music groups are given below. It can be seen that the first group's involvement in insurance (4.98) was lower than the second group's involvement in music (5.62) ($t = 6.51$, $df = 316$, $p = .006$).

Table 5
Descriptive Statistics - Involvement (Insurance)

	N	Minimum	Maximum	Mean	Std. Deviation
INVOLVEMENT	154	2.20	6.50	4.982	.761

Table 6
Descriptive Statistics - Involvement (Music)

	N	Minimum	Maximum	Mean	Std. Deviation
INVOLVEMENT	164	2.50	7.00	5.623	.976

Moderator

Need for cognition: Need for cognition was measured using an 18-item scale (Cacioppo and Petty 1982). Responses were obtained on a 7-point agree-disagree scale. Need for cognition was computed as the average of the 18 items, after recoding the 9 reverse scored items. The descriptive statistics for the scale are as follows. The mean of 4.66 is indicative of a positive need for cognition among the sample.

Table 7
Descriptive Statistics – Need for Cognition

	N	Minimum	Maximum	Mean	Std. Deviation
NfC	318	1.28	6.67	4.659	.830

Reliability analysis using the coefficient alpha method indicated that the scale has acceptable reliability (above .7).

Table 8
Reliability Analysis - Need for cognition

N of Cases =	318.0	N of Items =	18
Alpha =	.877		

Dependent Variables

Accuracy: Accuracy was measured as the percentage of items that the respondents answered correctly, from among the 16 knowledge questions. The following table shows the descriptive statistics of this variable. As can be seen, the mean accuracy for all respondents was 58.69%. Accuracy was higher in the music sample (65.51%) compared to the insurance sample (51.42%). It is possible that the difficulty level varied between the music and insurance questions. It could also be that the greater familiarity, as indicated by the higher involvement, of respondents with music leads to higher accuracy.

Table 9
Descriptive Statistics - Accuracy

	N	Minimum	Maximum	Mean	Std. Deviation
ACCURACY	318	12.50	87.50	58.687	13.494

Table 10
Descriptive Statistics - Accuracy (Insurance sample)

	N	Minimum	Maximum	Mean	Std. Deviation
ACCURACY	154	12.50	81.25	51.421	13.050

Table 11
Descriptive Statistics - Accuracy (Music sample)

	N	Minimum	Maximum	Mean	Std. Deviation
ACCURACY	164	25.00	87.50	65.511	9.875

Confidence: Confidence was measured as the average of all confidence responses given by the respondent. Respondents indicated their confidence rating for each question on a continuous scale ranging from 0 to 100 and confidence was calculated as the mean of the 16 confidence ratings. The following table shows the descriptive statistics for this variable. The mean confidence level of respondents was 57.64%.

Table 12
Descriptive Statistics - Confidence

	N	Minimum	Maximum	Mean	Std. Deviation
CONFIDENCE	318	.00	92.81	57.645	14.999

Comparison between music and insurance samples showed that the average confidence is similar between insurance and music samples, although the variance is higher in the former.

Table 13
Descriptive Statistics- Confidence (Insurance sample)

	N	Minimum	Maximum	Mean	Std. Deviation
CONFIDENCE	154	.00	89.06	57.819	17.827

Table 14
Descriptive Statistics- Confidence (Music sample)

	N	Minimum	Maximum	Mean	Std. Deviation
CONFIDENCE	164	23.44	92.81	57.480	11.799

General confidence: Confidence was also measured using a two-item scale, which assesses the overall confidence the respondent has in the correctness of his/her answers. The average of the two items (measured on an 11 point scale ranging from 0 to 10) provides an index of the confidence, referred to as general confidence, to distinguish it from the other confidence measure. The descriptive statistics for this measure are given below. Multiplication by 10 makes this index comparable to the confidence measure, and it can be seen that this measure is marginally less than the average confidence ratings. Comparison between music and insurance samples reveals that, unlike the confidence measure, the general confidence varies between insurance and music samples, with the latter being higher than the former ($t = 4.5$, $df = 316$, $p = .002$).

Table 15
Descriptive Statistics - General Confidence

	N	Minimum	Maximum	Mean	Std. Deviation
General Confidence	318	.00	9.00	5.483	1.821

Table 16
Descriptive Statistics – General Confidence (Insurance sample)

	N	Minimum	Maximum	Mean	Std. Deviation
General Confidence	154	.00	8.50	5.023	1.945

Table 17
Descriptive Statistics – General Confidence (Music sample)

	N	Minimum	Maximum	Mean	Std. Deviation
General Confidence	164	.50	9.00	5.915	1.585

Calibration: Calibration was measured using the point biserial correlation method (e.g. Lin, Moore, and Zabrucky 2001). The correlation between the accuracy (1 or 0, depending on whether the answer is correct or incorrect) and confidence (expressed in percentage terms) for the 16 knowledge items was calculated. Point biserial correlation, which measures the correlation between a continuous (confidence) and a dichotomous (accuracy) variable, is conceptually similar to Pearson correlation coefficient. As mentioned earlier, 14 questionnaires that had negative correlation values were excluded from further analysis. The descriptive statistics for calibration are given below. The mean calibration is marginally higher than .5. Comparison between insurance and music groups show that the latter group (mean = .61) is significantly better calibrated ($t = 10.514$, $df = 316$, $p = .017$) than the former group (mean = .41). A squared difference measure (Brier score component) was also used to calculate calibration scores. Appendix C provides the descriptive statistics and correlation of this measure with the point biserial correlation measure of calibration.

Table 18
Descriptive Statistics - Calibration

	N	Minimum	Maximum	Mean	Std. Deviation
Calibration	318	.000	.914	.512	.199

Table 19
Descriptive Statistics – Calibration (Insurance sample)

	N	Minimum	Maximum	Mean	Std. Deviation
Calibration	154	.000	.810	.407	.182

Table 20
Descriptive Statistics - Calibration (Music sample)

	N	Minimum	Maximum	Mean	Std. Deviation
Calibration	164	.151	.914	.610	.162

Overconfidence: Overconfidence was measured by subtracting accuracy from confidence. The descriptive statistics for this variable are as follows:

Table 21
Descriptive Statistics - Overconfidence

	N	Minimum	Maximum	Mean	Std. Deviation
Overconfidence	318	-54.69	57.81	-1.043	17.716

It can be seen that the mean overconfidence is close to zero indicating the prevalence of over and underconfidence. A frequency count showed that 56.6% of the respondents had some level of underconfidence (mean confidence lower than accuracy), whereas 1.9% had zero overconfidence and 41.5% of the respondents had some level of overconfidence. The histogram below shows the distribution of overconfidence.

Comparison between insurance and music groups shows that whereas the former group, on the average, is overconfident (mean = 6.40), the latter, on the average is underconfident (mean = -8.03). Frequency count of underconfident and overconfident

individuals indicated that 33.8% of respondents within the insurance sample had some level of underconfidence, .6% had neither overconfidence nor underconfidence, and 65.6% had some level of overconfidence. Corresponding figures for the music sample were 78%, 3% and 19%. The difference between the two groups can be attributed to hard-easy effect, according to which people tend to be overconfident on difficult questions, and underconfident on easy questions (Lichtenstein and Fischoff 1977). Because the accuracy level, which indicates ease, was higher in music, according to hard-easy effect, underconfidence should be more prevalent in this group. The histograms on the distributions of overconfidence in music and insurance groups, clearly show the prevalence of underconfidence in the music group.

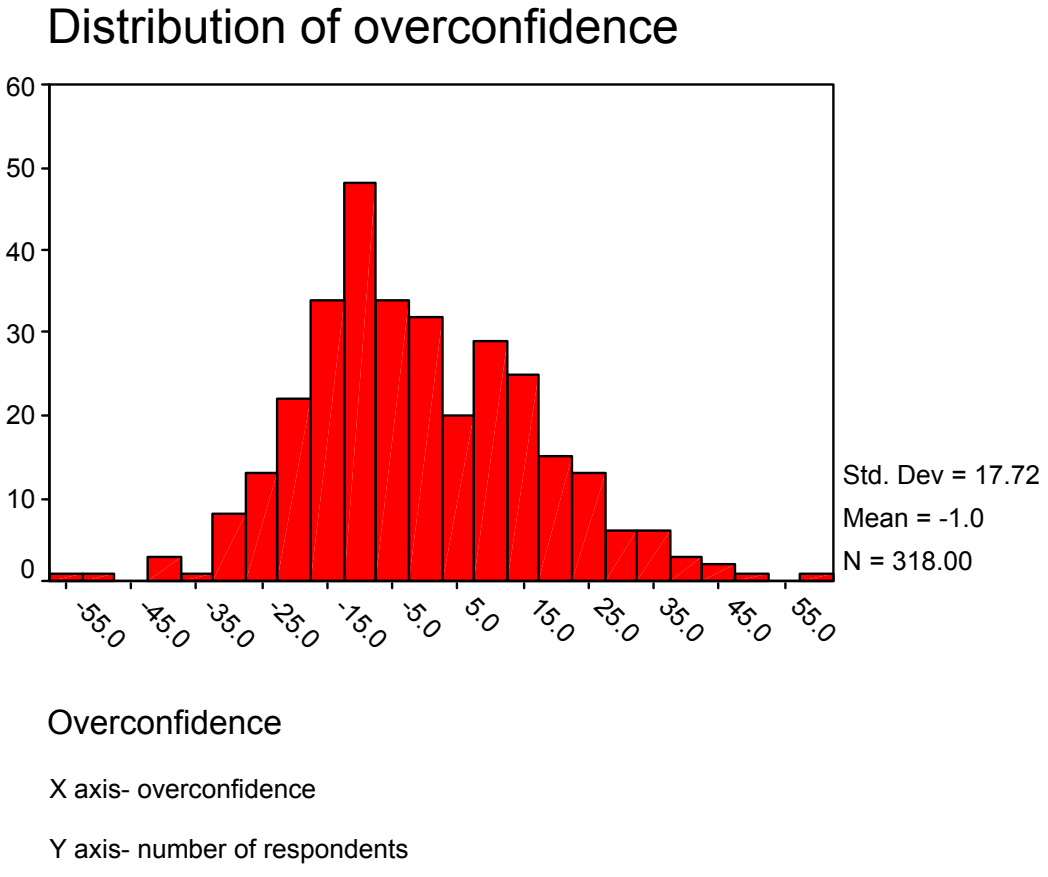


Figure 5
Distribution of overconfidence

Table 22

Descriptive Statistics - Overconfidence (Insurance sample)

	N	Minimum	Maximum	Mean	Std. Deviation
Overconfidence	154	-54.69	57.81	6.399	19.808

Table 23

Descriptive Statistics - Overconfidence (Music sample)

	N	Minimum	Maximum	Mean	Std. Deviation
Overconfidence	164	-32.19	31.25	-8.031	11.859

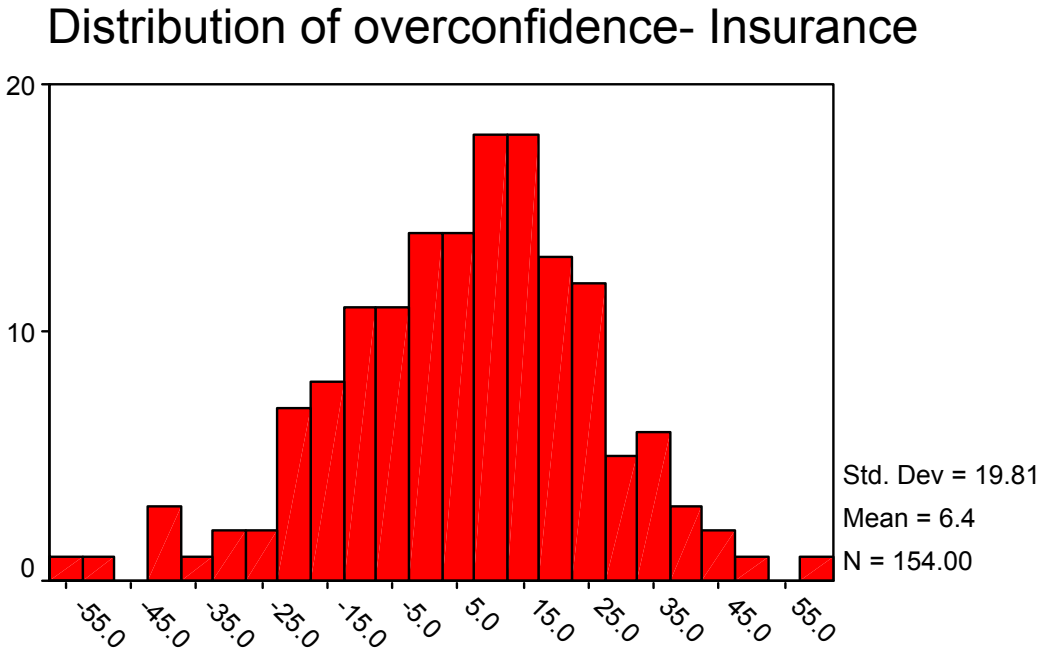


Figure 6
Distribution of overconfidence - Insurance

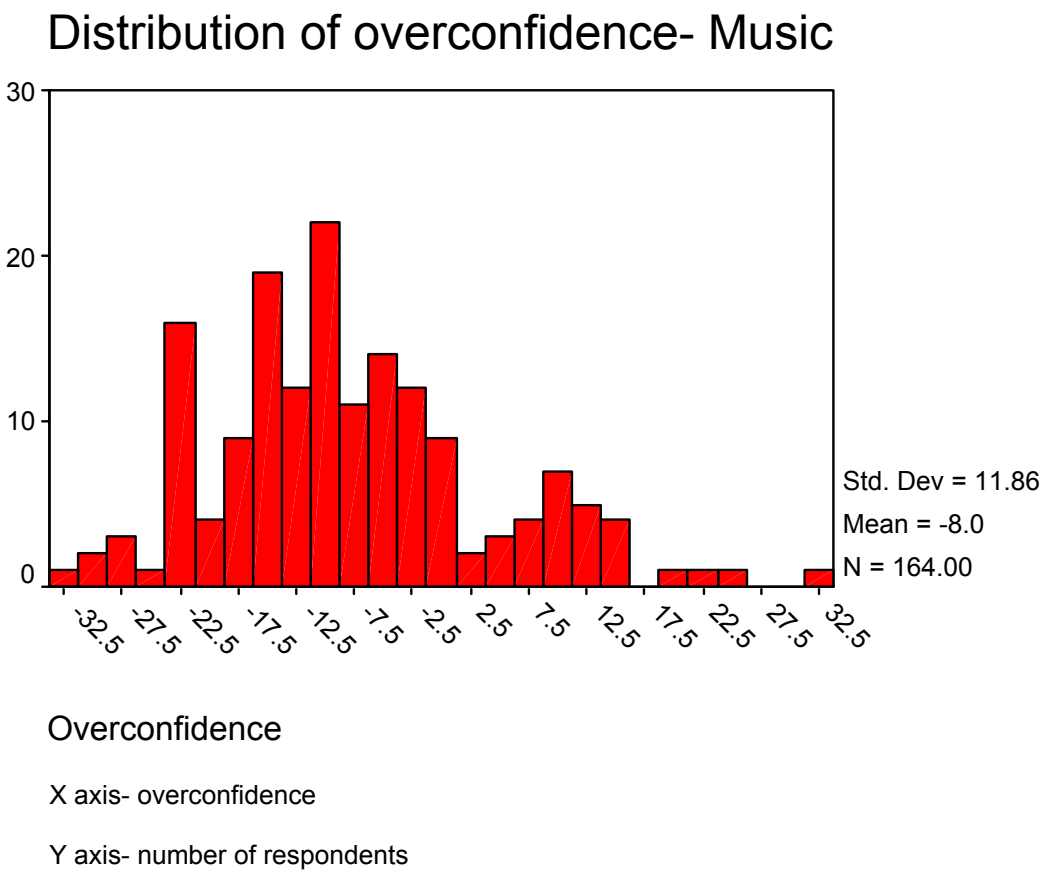


Figure 7
Distribution of overconfidence- Music

Another measure of overconfidence (referred to as Overconfidence II) was computed by subtracting accuracy from general confidence multiplied by 10 (since the latter was measured on a scale ranging from 0-10, multiplication by 10 was required to make it correspond to percentage figures). General confidence measured the overall confidence of the respondent in the correctness of the answers, as distinguished from the item level confidence values, the mean of which (confidence) was used to compute the earlier index of overconfidence. The frequency counts for underconfidence, neither overconfidence nor underconfidence, and overconfidence for insurance and music groups were computed for this index of overconfidence (overconfidence II). The figures were

52.6%, 2%, and 45.4% for insurance group and 64.6%, .6%, and 34.8% for music group. The table below shows the frequency counts of underconfidence, neither underconfidence nor overconfidence, and overconfidence for both groups using both indices of overconfidence. It can be seen that across both groups, considerable proportion of respondents are underconfident.

Table 24
Frequency of overconfidence and underconfidence (Percentages)

	Overconfidence		**Overconfidence II**	
	Insurance	**Music**	**Insurance**	**Music**
Underconfidence	33.8	78	52.6	64.6
Neither / nor	.6	3	2	.6
Overconfidence	65.6	19	45.4	34.8
Total	100	100	100	100

Decision Making Accuracy: Decision making accuracy was measured in the second part of the study conducted within a random sample of the insurance group. Respondents were asked to rank 5 insurance policies based on their attractiveness to a person with certain specified characteristics. Paired comparisons were inferred from the rankings. Of the possible 10 paired comparisons, 5 were chosen after scrutiny of experts' rankings. It was found that there was near unanimity in the choice of over 20 experts on these paired comparisons. Decision making accuracy was measured as the number of paired comparisons (out of 5) where the respondent's choice matched that of the experts. If none of the rankings matched the experts' rankings, the respondent was assigned a score of zero. If all rankings matched the experts' rankings, the respondent was assigned a score of 5. Thus, a respondent could score 0,1,2,3,4, or 5 on this measure. The descriptive statistics are given below. The mean score is 3.49.

Table 25
Descriptive Statistics – Decision making accuracy

	N	Minimum	Maximum	Mean	Std. Deviation
DMA	53	.00	5.00	3.491	1.203

Other variables

Age: Respondents were asked to specify their age. The descriptive statistics of age is given below. The mean age is 21.61.

Table 26
Descriptive Statistics - Age

	N	Minimum	Maximum	Mean	Std. Deviation
Age	318	18.00	37.00	21.610	2.269

Gender: Respondents were asked to specify their gender. The frequency distribution of gender is shown below. The sample comprised 42.5% males, and 57.5% females.

Table 27
Frequency - Gender

	Frequency	Percent
Males	135	42.5
Females	183	57.5
Total	318	100.0

Subjective knowledge: Subjective knowledge was measured for exploratory purposes. The construct was measured using a 5-item scale (Flynn and Goldsmith 1999). Separate scales (with product category worded as "insurance" or "music albums") were employed for the two groups. Subjective knowledge was computed as the average of the 5 items, after recoding the 3 reverse-scored items. The descriptive statistics for the scale are as follows:

Table 28
Descriptive Statistics – Subjective Knowledge

	N	Minimum	Maximum	Mean	Std. Deviation
SK	318	1.00	7.00	3.961	1.410

Reliability analysis using the coefficient alpha method indicated that the scale has acceptable reliability (above .7).

Table 29
Reliability Analysis- Subjective Knowledge

N of Cases =	318.0	N of Items =	5
Alpha =	.888		

Correlation matrix

The intercorrelations of all variables are shown in the correlation matrix below.

Table 30
Correlation matrix

	GSE	INV	NfC	ACC	CON	GC	OVC	CAL	SK	AGE	GEND	DMA
GSE	1	.04	.26**	.14*	.18**	.13*	.05	.13*	.07	.00	-.05	.10
INV	.04	1	.01	.24**	.11*	.27**	-.08	.15**	.48**	-.14*	.09	.06
NfC	.26**	.01	1	.01	.07	-.07	.06	-.01	-.03	.17**	-.06	.16
ACC	.14*	.24**	.01	1	.23**	.33**	-.57**	.25**	.32**	.07	.06	.07
CON	.18**	.11*	.07	.23**	1	.72**	.67**	.10	.48**	.11	-.16**	.39**
GC	.13*	.27**	-.07	.33**	.72**	1	.36**	.14*	.61**	.17**	-.20**	.29*
OVC	.05	-.08	.06	-.57**	.67**	.36**	1	-.11	.16**	.03	-.18**	.30*
CAL	.13*	.15**	-.01	.25**	.10	.14*	-.11	1	.26**	.04	.02	.30*
SK	.07	.48**	-.03	.32**	.48**	.61**	.16**	.26**	1	.07	-.14*	.06
AGE	.00	-.14*	.17**	.07	.11	.17**	.03	.04	.07	1	-.14*	.12
GEND	-.05	.09	-.06	.06	-.16**	-.20**	-.18**	.02	-.14*	-.14*	1	-.04
DMA	.10	.06	.16	.07	.39**	.29*	.30*	.30*	.06	.12	-.04	1

*- Significant at .05 level
**- Significant at .01 level

GSE- General Self Efficacy INV- Involvement NfC- Need for Cognition
ACC- Accuracy CON- Confidence GC - General Confidence
OVC - Overconfidence CAL - Calibration
SK - Subjective Knowledge AGE – Age GEND – Gender
DMA – Decision Making Accuracy

T tests

The following tables show the results of t tests of gender on all variables. It can be seen that gender has an effect on all confidence variables- confidence, overconfidence, and general confidence, with males recording higher confidence than females. This is in agreement with previous studies that have found males to be more confident than females (Estes and Hosseini 1988; Goldsmith and Goldsmith 1997; Goldsmith, Goldsmith, and

Heaney 1997; Kalaian and Freeman 1994). Estes and Hosseini (1988) examined confidence in investment decisions in stock market and found that men are more confident than women. Sutton's (1987) research on illusion of control in insurance also corroborates these findings. Sutton (1987) found that women are better prospects than men for auto insurance because of a more realistic perception of their risk of auto accidents. On subjective knowledge, which refers to a perception of knowing, also males score higher than females. Interestingly, gender has no effect on any of the other variables under study.

Table 31
Group Statistics – T tests of gender on other variables

	Gender	N	Mean	Std. Deviation	Std. Error Mean
CALIBRATION	Males	135	.508	.201	.017
	Females	183	.514	.199	.015
DMA	Males	28	3.536	1.036	.196
	Females	25	3.440	1.387	.277
ACCURACY	Males	135	57.824	12.816	1.103
	Females	183	59.324	13.973	1.033
CONFIDENCE	Males	135	60.418	14.181	1.220
	Females	183	55.598	15.294	1.131
OVERCONF-	Males	135	2.594	17.395	1.497
IDENCE	Females	183	-3.725	17.516	1.295
GSE	Males	135	4.439	.539	.046
	Females	183	4.391	.459	.034
GENERAL	Males	135	5.915	1.598	.138
CONFIDENCE	Females	183	5.164	1.912	.141
INVOLVEME-	Males	135	5.211	.981	.085
NT	Females	183	5.387	.893	.066
NfC	Males	135	4.714	.864	.074
	Females	183	4.619	.805	.059
SK	Males	135	4.184	1.292	.111
	Females	183	3.797	1.473	.109

Table 32
Independent Samples T Test – Gender

	t-test for Equality of Means				
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
CALIBRATION	-.268	316	.789	-.006	.023
DMA	.287	51	.776	.096	.334
ACCURACY	-.980	316	.328	-1.499	1.531
CONFIDENCE	2.864	316	.004	4.819	1.683
OVERCONFIDENCE	3.189	316	.002	6.319	1.981
GSE	.846	316	.398	.048	.056
GENERAL CONFIDENCE	3.707	316	.000	.751	.203
INVOLVEMENT	-1.669	316	.096	-.176	.106
NfC	1.011	316	.313	.095	.094
SK	2.438	316	.015	.387	.1587

Results of Tests of Hypotheses

In this section, the results of the hypotheses tests are detailed. Hypotheses were tested using simple regression analyses. The level of significance used was .05.

Hypothesis 1a predicted that higher the general self-efficacy of individuals, higher would be their confidence in their product knowledge. Simple regression analysis was used to test this hypothesis. Confidence was regressed on general self-efficacy. The results show that the hypothesis is supported because the coefficient of general self-efficacy is positive (.181) and is significant at .05 level (p = .001). The table below shows the regression results. This finding is in consonance with that of previous studies that

found correlations between GSE and self esteem (Judge, Bono, and Locke, 2000). As discussed earlier, GSE has also been related to other self-evaluations constructs such as locus of control (Judge et al. 1997).

Table 33
Results of regression of confidence on general self-efficacy

Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	33.481	7.450		4.494	.000
GSE	5.477	1.678	.181	3.264	.001

Dependent Variable: CONFIDENCE

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.181(a)	.033	.030	14.777

Predictors: (Constant), GSE

Hypothesis 1b predicted that higher the general self-efficacy, lower is the calibration of consumer knowledge. The hypothesis was tested by regressing calibration on general self-efficacy. The following tables show the results of this regression analysis. As can be seen, the results indicate an effect opposite to that hypothesized, since the coefficient of general self-efficacy is positive (.129) and is significant at the .05 level ($p = .02$). The hypothesis is not supported.

Table 34
Results of regression of calibration on general self-efficacy

Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	.282	.100		2.821	.005
GSE	.052	.023	.129	2.315	.021

Dependent Variable: CALIBRATION

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.129(a)	.017	.014	.198

Predictors: (Constant), GSE

Hypothesis 2a predicted that higher the involvement, higher the accuracy of consumer knowledge. The hypothesis was tested by regressing accuracy on involvement. The results of the regression show that the hypothesis is supported, since the coefficient of involvement is positive (.236) and is significant at the .05 level (p = .000). This finding is supportive of the observation that consumers involved in a situation or product are more active processors of cognitive information about it (Ray et al. 1973).

Table 35
Results of regression of accuracy on involvement

Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	40.563	4.260		9.522	.000
Involvement	3.411	.790	.236	4.320	.000

Dependent Variable: ACCURACY

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.236(a)	.056	.053	13.133

Predictors: (Constant), INVOLVEMENT

Hypotheses 2b stated that higher the involvement, higher the confidence. The hypothesis was tested by regressing confidence on involvement. Results indicate that this hypothesis, too, is supported (coefficient of involvement = .113; p=.044).

Table 36
Results of regression of confidence on involvement

Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	47.999	4.842		9.914	.000
Involvement	1.816	.898	.113	2.023	.044

Dependent Variable: CONFIDENCE

Table 36 continued

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.113(a)	.013	.010	14.927

Predictors: (Constant), INVOLVEMENT

Hypothesis 2c stated that the relationship between involvement and calibration is U shaped such that initial increases in involvement leads to miscalibration, and further increase in involvement leads to calibration. To test the U shaped relationship,a two-step hierarchical regression procedure using OLS estimation was used. In the first model, calibration was regressed on involvement. In the second model, calibration was regressed on (a) involvement and (b) square of involvement. The first model represents the linear model, whereas the second represents the curvilinear model, where the term square of involvement will be entered to test for curvilinearity. The curvilinear model will be supported if the R-squared associated with the curvilinear model is significantly higher than the linear model and the coefficient of the squared term for involvement is positive and significant. It can be seen that the results support a positive linear relationship between involvement and calibration (coefficient of involvement = .151; p = .007). At the same time, it is worthwhile to note that there is some indication that the curvilinear model fits the data as evidenced by (a) increase in adjusted R squared from .020 to .027, (b) negative sign for the coefficient of linear term and positive sign for the coefficient of quadratic term in the second model, though these are not significant at the .05 level. The graph shows the fit of linear and curvilinear models. Suffice it to note here that this issue merits further investigation.

Table 37
Results of regression of calibration on involvement – Linear model

Coefficients- Linear model

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.340	.064		5.309	.000
Involvement	.032	.012	.151	2.718	.007

Dependent Variable: CALIBRATION

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.151(a)	.023	.020	.198

Predictors: (Constant), INVOLVEMENT

Table 38
Results of regression of calibration on involvement – Curvilinear model

Coefficients- Curvilinear model

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.767	.245		3.129	.002
Involvement	-.138	.095	-.647	-1.450	.148
Square of involvement	.016	.009	.805	1.803	.072

Dependent Variable: CALIBRATION

Table 38 continued
Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.181(a)	.033	.027	.197

Predictors: (Constant), SQUARE OF INVOLVEMENT, INVOLVEMENT

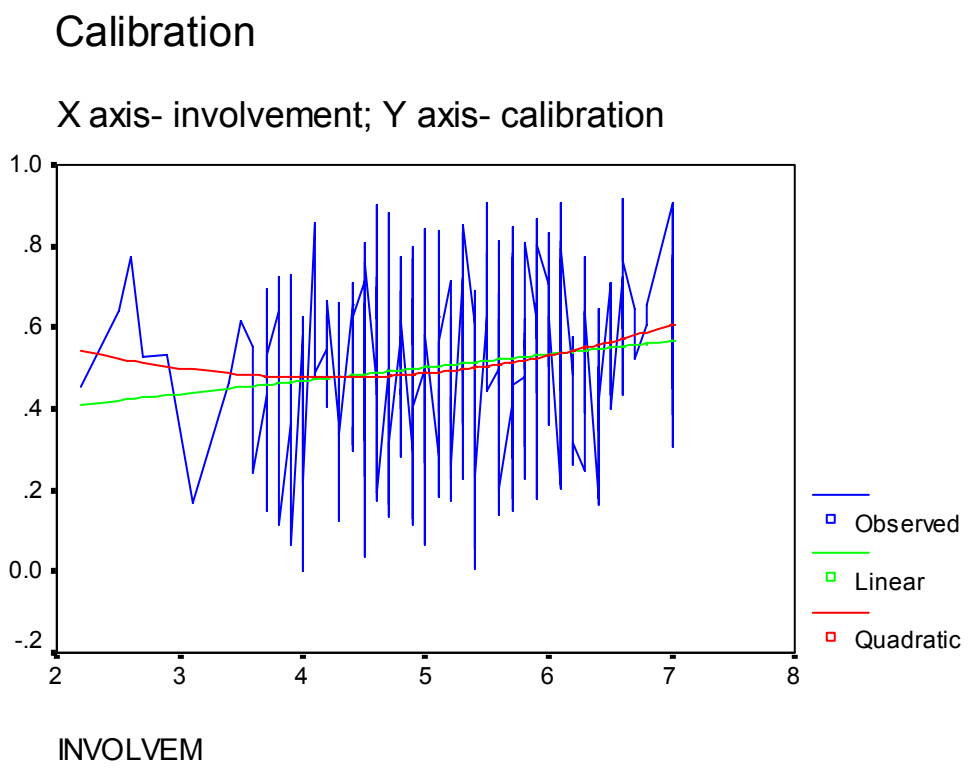


Figure 8
Linear and curvilinear models in involvement – calibration relationship

Hypothesis 3a states that calibration of consumer knowledge will be better for utilitarian products compared to hedonic products. An independent samples T test was used to test the difference. It can be seen that there is a significant effect in the opposite direction (p = .000). That is, calibration is higher in the hedonic product category. Hypothesis 3a is not supported.

Table 39
Group Statistics – Calibration of utilitarian versus hedonic products

	Category	N	Mean	Std. Deviation	Std. Error Mean
Calibration	Utilitarian	154	.407	.182	.015
	Hedonic	164	.610	.162	.013

Table 40
Independent Samples Test - Calibration of utilitarian versus hedonic products

	t-test for Equality of Means				
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Calibration	-10.514	316	.000	-.203	.019

Hypothesis 3b states that overconfidence will be higher for hedonic products compared to utilitarian products. An independent samples T test was used to compare the mean calibration among subjects responding to the hedonic (music) and utilitarian (insurance) products. It can be seen that the hypothesis is not supported. In fact there is a significant effect in the opposite direction ($p = .000$). That is, the mean overconfidence is higher in the utilitarian product sample. Hypothesis 3b is not supported.

Table 41
Group Statistics – Overconfidence in utilitarian versus hedonic categories

	Category	N	Mean	Std. Deviation	Std. Error Mean
Overconfi-dence	Utilitarian	154	6.399	19.808	1.596
	Hedonic	164	-8.031	11.859	.926

Table 42
Independent Samples Test – Overconfidence in utilitarian versus hedonic categories

	t-test for Equality of Means				
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Overconfidence	7.937	316	.000	14.429	1.818

Hypothesis 4a states that need for cognition moderates the relationship between calibration and product type such that the proposed effect (higher calibration for utilitarian products compared to hedonic products) will be stronger among low need for cognition individuals than among high need for cognition individuals. Subgroup analysis was used to test for moderation. Sharma, Durand and Gur-Arie (1981) prescribe a four-step procedure to test for moderation, which combines moderated regression analysis (MRA) and subgroup analysis. In the absence of proposed effect in the original hypothesis, it was decided to use only subgroup analysis to test for moderation.

Respondents were divided into low need for cognition and high need or cognition groups based on a median split. Median split resulted in two groups- low need for cognition and high need for cognition respondents. Each group comprised 159 respondents each. The low need for cognition group had an average need for cognition of

4.00 while the high need for cognition group had an average need for cognition of 5.32. T tests revealed the difference to be significant (p = .000). Mean calibration for utilitarian and hedonic products were compared across low need for cognition and high need for cognition respondents, using independent samples T test. It can be seen that in both cases, the scores vary similarly, and the differences are significant at the .000 level, indicating no moderating effect. The mean calibration scores are also comparable between high and low need for cognition individuals and the difference between them is not significant (p=.36). Thus, need for cognition does not moderate the observed effect that is opposite to the one hypothesized.

Table 43

Group Statistics – High and low need for cognition groups

	nc median split	N	Mean	Std. Deviation	Std. Error Mean
NC	Low NC	159	4.003	.546	.043
	High NC	159	5.315	.468	.037

Low Need for Cognition

Table 44
Group Statistics – Calibration of utilitarian versus hedonic products in low need for cognition group

	Category	N	Mean	Std. Deviation	Std. Error Mean
Calibration	Utilitarian	72	.389	.190	.022
	Hedonic	87	.595	.169	.018

Table 45
Independent Samples Test - Calibration of utilitarian versus hedonic products in low need for cognition group

	t-test for Equality of Means				
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Calibration	-7.213	157	.000	-.206	.029

High Need for Cognition

Table 46
Group Statistics – Calibration of utilitarian versus hedonic products in high need for cognition group

	Category	N	Mean	Std. Deviation	Std. Error Mean
Calibration	Utilitarian	82	.423	.174	.019
	Hedonic	77	.627	.153	.018

Table 47
Independent Samples Test - Calibration of utilitarian versus hedonic products in low need for cognition group

	t-test for Equality of Means				
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Calibration	-7.844	157	.000	-.204	.026

Hypothesis 4b states that need for cognition moderates the relationship between calibration and involvement such that the proposed effect will be stronger among low need for cognition individuals than among high need for cognition individuals. Subgroup analysis was used to test for moderation. As mentioned earlier, respondents were divided into low need for cognition and high need for cognition groups. Calibration was regressed on involvement for each group separately to study differences. Hierarchical OLS procedure using linear and quadratic models was used in both cases, since the proposed relationship between involvement and calibration was curvilinear. The results show that the curvilinear model is not supported in either case. Visual inspection of the data suggests that the proposed effect (low need for cognition individuals having a more pronounced curvilinear effect) seems to occur, though at a statistically nonsignificant level.

Low Need for Cognition Individuals

Table 48
Involvement – Calibration relationship: Linear and curvilinear models among low need for cognition group

Coefficients – Linear model

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.374	.096		3.880	.000
Involvement	.024	.018	.106	1.340	.182

Dependent Variable: CALIBRATION

Coefficients- Curvilinear model

		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
	(Constant)	.959	.387		2.477	.014
	Involvement	-.208	.150	-.929	-1.389	.167
	Square of involvement	.022	.014	1.043	1.559	.121

Dependent Variable: CALIBRATION

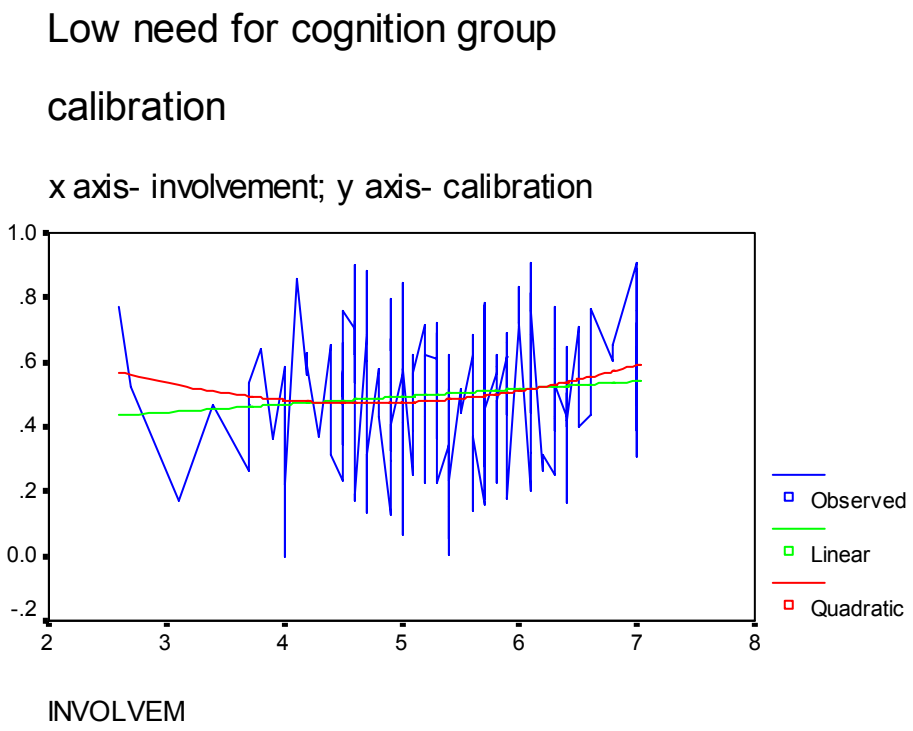


Figure 9
Involvement – calibration relationship: Low need for cognition group

High Need for Cognition Individuals

Table 49
Involvement – Calibration relationship: Linear and curvilinear models among high need for cognition group

Coefficients- Linear model

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	.303	.085		3.561	.000
Involvement	.041	.016	.204	2.607	.010

Dependent Variable: CALIBRATION

Table 49 continued

Coefficients- Curvilinear model

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.626	.314		1.997	.048
Involvement	-.089	.123	-.436	-.723	.471
Square of involvement	.013	.012	.646	1.069	.287

Dependent Variable: CALIBRATION

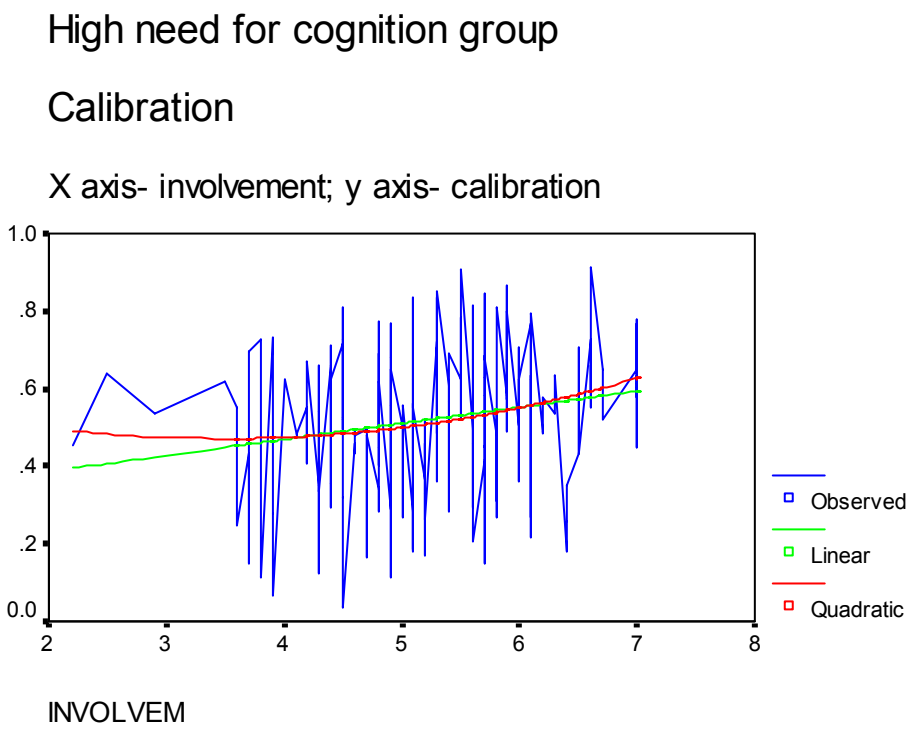


Figure 10
Involvement – calibration relationship: High need for cognition group

Hypothesis 5 stated that calibration of knowledge leads to more accurate decision making. OLS regression was used to test this hypothesis. Decision making accuracy was regressed on calibration. The test supports the hypothesis, as indicated by the positive beta coefficient (.303) and the significance level of .02.

Table 50
Regression of Decision Making Accuracy on Calibration

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.303(a)	.092	.074	1.158

a Predictors: (Constant), Calibration

Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.673	.394		6.790	.000
Calibration	2.016	.888	.303	2.269	.028

a Dependent Variable: DMA

Additional Analyses

In this section, the results of tests of hypotheses 1a, 1b, 2a, 2b,and 2c, across the insurance and music groups are presented. Hypothesis 1a stated that higher general self-efficacy leads to higher confidence in product knowledge. This hypothesis was supported, for the whole sample. It can be seen that the hypothesis finds support in the insurance sample (beta = .216; p = .007). For the music sample, there is directional support (beta = .120; p = .125).

Table 51
Regression of confidence on general self-efficacy – Insurance

Model Summary - Insurance

R	R Square	Adjusted R Square	Std. Error of the Estimate
.216(a)	.047	.041	17.462

a Predictors: (Constant), GSE

Coefficients- Insurance

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	27.515	11.184		2.460	.015
GSE	6.934	2.539	.216	2.731	.007

a Dependent Variable: CONFIDENCE

Table 52
Regression of confidence on general self-efficacy – Music

Model Summary- Music

R	R Square	Adjusted R Square	Std. Error of the Estimate
.120(a)	.014	.008	11.749

a Predictors: (Constant), GSE

Table 52 continued
Coefficients- Music

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	42.687	9.637		4.429	.000
GSE	3.324	2.156	.120	1.542	.125

a Dependent Variable: CONFIDENCE

Hypothesis 1b stated that higher the general self-efficacy, lower the calibration of product knowledge. The sample as a whole demonstrated an effect opposite to the one hypothesized. That is, general self-efficacy was found to contribute to calibration. It can be seen that neither insurance (beta = .153; p = .058) nor music (beta = .034; p = .670) samples support the hypothesis, though the p value of the former approaches the significance level.

Table 53
Regression of calibration on general self-efficacy - Insurance

Model Summary- Insurance

R	R Square	Adjusted R Square	Std. Error of the Estimate
.153(a)	.023	.017	.180

a Predictors: (Constant), GSE

Coefficients- Insurance

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	.189	.115		1.634	.104
GSE	.050	.026	.153	1.909	.058

a Dependent Variable: CALIBRATION

Table 54
Regression of calibration on general self-efficacy - Music

Model Summary- Music

R	R Square	Adjusted R Square	Std. Error of the Estimate
.034(a)	.001	-.005	.163

a Predictors: (Constant), GSE

Coefficients- Music

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	.553	.134		4.143	.000
GSE	.013	.030	.034	.427	.670

a Dependent Variable: CALIBRATION

Hypothesis 2a stated that higher the involvement, higher the accuracy of knowledge. This hypothesis finds support in the music sample (beta = .187; p = .017), but not in the insurance sample (beta = -.045; p = .582). The counterintuitive finding for insurance could be attributed to the fact that the questions were relatively difficult, and this in turn evened out the difference between more involved and less involved respondents, since the latter too could obtain some correct responses by choosing randomly.

Table 55
Regression of Accuracy on Involvement – Insurance

Model Summary- Insurance

R	R Square	Adjusted R Square	Std. Error of the Estimate
.045(a)	.002	-.005	13.079

a Predictors: (Constant), INVOLVEMENT

Coefficients- Insurance

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	55.235	7.000		7.891	.000
Involvement	-.766	1.389	-.045	-.551	.582

a Dependent Variable: ACCURACY

Table 56
Regression of Accuracy on Involvement – Music

Model Summary- Music

R	R Square	Adjusted R Square	Std. Error of the Estimate
.187(a)	.035	.029	9.731

a Predictors: (Constant), INVOLVEMENT

Coefficients- Music

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	54.874	4.458		12.310	.000
Involvement	1.892	.781	.187	2.422	.017

a Dependent Variable: ACCURACY

Hypothesis 2b stated that higher involvement leads to higher confidence in product knowledge. In both samples, the p values approach the threshold level of significance (p = .13 for insurance and p = .07 for music) with positive beta coefficients. For the sample as a whole, the hypothesis was supported.

Table 57
Regression of Confidence on Involvement – Insurance

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.122(a)	.015	.008	17.752

a Predictors: (Constant), INVOLVEMENT

Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	43.562	9.500		4.586	.000
Involvement	2.862	1.885	.122	1.518	.131

a Dependent Variable: CONFIDENCE

Table 58
Regression of Confidence on Involvement – Music

Model Summary- Music

R	R Square	Adjusted R Square	Std. Error of the Estimate
.142(a)	.020	.014	11.716

a Predictors: (Constant), INVOLVEMENT

Table 58 continued
Coefficients- Music

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	47.858	5.367		8.917	.000
Involvement	1.711	.940	.142	1.820	.071

a Dependent Variable: CONFIDENCE

Hypothesis 2c stated that there is a curvilinear relationship between involvement and calibration. The sample as a whole provided support to a linear relationship, with some suggestions of a curvilinear relation. Neither a linear, nor a curvilinear model is supported by subsamples.

Table 59
Regression of Calibration on Involvement – Insurance

Model Summary- Insurance

R	R Square	Adjusted R Square	Std. Error of the Estimate
.039(a)	.002	-.005	.182

a Predictors: (Constant), INVOLVEMENT

Coefficients- Insurance

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	.454	.098		4.654	.000
Involvement	-.009	.019	-.039	-.484	.629

a Dependent Variable: CALIBRATION

Table 60
Regression of Calibration on Involvement – Music

Model Summary- Music

R	R Square	Adjusted R Square	Std. Error of the Estimate
.022(a)	.000	-.006	.163

a Predictors: (Constant), INVOLVEMENT

Coefficients- Music

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	.631	.075		8.458	.000
Involvement	-.004	.013	-.022	-.284	.776

a Dependent Variable: CALIBRATION

Subjective Knowledge

Subjective knowledge is significantly correlated with involvement (.48), accuracy (.32), confidence (.48), general confidence (.61), overconfidence (.16) and calibration (.26). Also, males have higher subjective knowledge than females (.14). Simple regression models will yield beta coefficients of magnitude and sign equal to the respective correlations.

Age

Age was found to be negatively correlated with involvement (-.14) and positively correlated with need for cognition (.17).

CHAPTER 5

SUMMARY AND CONCLUSION

The primary objective of this study was to contribute to consumer research by empirically examining the construct of knowledge calibration in a consumer behavior context. Although much consumer research has examined the extent to which actual decision processes approximate optimal decision policies, there is relatively little research on calibration and miscalibration and how these phenomena influence decision outcomes. Consumer research on metaknowledge has largely been restricted to assessment of the correspondence between objective and subjective knowledge. This study attempted an extension to the research on consumer knowledge and metaknowledge. The results indicate that the attempt was fruitful.

Calibration of knowledge has been the subject of several studies in psychology and allied fields. But the extensive literature on calibration and calibration – related processes often fail to make a direct contact with the world of consumer behavior because the task and/or the stimuli are far removed from everyday experience. The standard knowledge questions in calibration assessments are dichotomous questions of the nature – "what is the capital of country x?" etc. This study, by examining consumer knowledge of two widely used product categories, provides an externally valid test of consumer knowledge calibration. To the best of our knowledge, this is the first study to do so.

One of the important insights from the study is the unexpected result that all consumers are not overconfident. This goes against the oft-repeated finding that people are overconfident. This finding has been so commonplace that scholars have considered overconfidence as a stylized fact of human cognition (Alba and Hutchinson 2000). Hence the significance of the result that all consumers are not overconfident. Overconfidence was obtained by subtracting mean accuracy (percentage of responses that are correct) from mean confidence (average of all 16 confidence ratings) for each respondent. When the mean confidence was substituted by general confidence (general confidence

multiplied by 10 since it was obtained on a scale ranging from 0 to 10), another measure of overconfidence was obtained. Using this measure it was found that 59% of the respondents exhibited some level of underconfidence, 1.5% had zero overconfidence, and the remaining had some level of overconfidence. These percentage figures are quite similar to those obtained with the mean confidence rating as the measure of confidence. Thus, two indices of overconfidence provided the same result, enhancing the validity of this finding. Table 24, which specifies percentages of overconfident and underconfident respondents in insurance and music groups, clearly indicates that significant proportions of respondents were underconfident. Although it can be argued that music albums as a product category presented easy questions that led to underconfidence, it is equally possible that insurance as a relatively hard product category, especially for college students with only a few years of driving experience, led to overconfidence. At this stage, the reasons for this divergent finding that consumers are not overconfident with regard to their assessments of their own knowledge are not clear. Possibly, when faced with questions about product categories to which they relate to on a day-to-day basis as consumers (insurance and music), people are more realistic in their assessments of knowledge and confidence. The standard questions in calibration testing employed in prior research are rather removed from immediate relevance to the average consumer. This speculation leads to the proposition that greater personal relevance leads to lower overconfidence. This needs to be tested. Other variables could have played a role in this finding. The study was conducted among a relatively homogeneous set of students (undergraduates taking business courses). Their education and age are not representative of the population of consumers. Examining whether these variables contributed to the observed effect and generalizing the effect to consumers at large shall be fruitful avenues for further research.

Theoretically, the above finding challenges the conviction with which scholars have espoused the case for overconfidence. At any rate, it does so in the specific domain of consumer knowledge. Future researchers on consumer knowledge calibration need to take this into account and suitably alter their frames of reference. Also, this finding alludes to the very interesting possibility that some of the results in psychology might not apply in toto to consumer research. This calls for circumspection in deductive theory

building efforts in consumer research that accept established findings in related fields as points of departure.

Another interesting finding pertains to the role of general self-efficacy. General self-efficacy leads to confidence in knowledge and calibration of knowledge. (While the latter finding is supported by the sample as a whole, it is very close to significance in the insurance sample). This finding adds to the growing body of literature on general self-efficacy. As detailed earlier, the construct is relatively new and little empirical work has been done on its antecedents and consequences. Since general self-efficacy arises from life experiences, it is plausible that higher levels of general self-efficacy are grounded on some real life experiences that lead the respondents to believe in themselves, and this efficacy translates into more realistic perceptions regarding their product knowledge. This, in turn, leads to better calibration.

The relationships between involvement and accuracy, involvement and confidence, and involvement and calibration, found support in the study. In the third case, a linear relationship was supported. The fact that the involvement-calibration relationship was not supported in the subsamples raises some issues. It is possible that the sample sizes were not large enough and hence the effect of respondents with varying response patterns nullified the effect. Alternatively, it is possible that calibration and miscalibration exists at high and low levels of involvement (as evidenced by the staggered pattern on involvement - calibration curves in figures 8, 9 and 10) and the observed effect for the sample as a whole was an artifact of grouping together two data sets that systematically varied on the dependent and independent variables. This issue needs further exploration. To start with, the subsample sizes need to be enhanced and the patterns reexamined.

Research has indicated that the 10-item involvement scale may be broken into two subscales representing a cognitive and affective grouping, the former capturing importance and the latter involvement (Zaichkowski 1994). Given the high levels of involvement recorded for both product categories (4.98 for insurance and 5.62 for music on a 7 point measure), we sought to reexamine the construct using the pared down version of the scale. The five items that captured involvement were anchored on (a) interesting, (b) exciting, (c) appealing, (d) fascinating, and (e) involving. It was found

that involvement, for the sample as a whole, came down from 5.313 to 4.746. Music albums registered an increase from 5.62 to 5.74, while insurance registered a drop from 4.98 to 3.69. This seems logical because people are likely to consider insurance important but may not consider it involving. Regression results with involvement as the antecedent variable follow a similar pattern. For the sample as a whole, involvement - accuracy relation is supported ($p = .000$). A linear relationship between involvement and calibration also elicits support ($p = .000$). These relationships are not supported in the subsamples, although the relationship between involvement and accuracy approaches the threshold value in the music sample ($p = .057$). Whereas the use of the pared down scale brought down the mean level of involvement for insurance, the pattern of observed relationships between involvement on the one hand, and accuracy, confidence, and calibration on the other, remained similar.

Product type has an effect opposite to that hypothesized. That is, hedonic product (music) has lower overconfidence and better calibration. Generalization of this finding to the spectrum of hedonic versus utilitarian products needs further validation. This is so because the result could have been confounded by other variables. Specifically, the questions pertaining to music were declarative in nature, where the respondents could easily verify whether they know or don't know the answer. But the questions pertaining to insurance were, to a large extent, procedural in nature, where such verifiability was not so easy as in the case of declarative items. Also, as mentioned earlier, the music questions were relatively easier which prevented overconfidence. Examination of overconfidence shows that mean underconfidence in the music group (8.031) is slightly higher than overconfidence in the insurance group (6.399) (Tables 22 and 23). The issue of why underconfidence of a magnitude higher than overconfidence should lead to higher calibration is perplexing. This could be the result of a few easy questions appearing in the music questionnaire that elicited a high percentage of correct responses, but confidence in the near 100 % range (75%-100%). This will likely lead to some underconfidence but will still result in high calibration, provided the confidence levels associated with wrong answers are low.

Need for cognition does not seem to have any effect on the constructs under scrutiny. The correlation matrix shows that need for cognition is significantly correlated

only with general self-efficacy and age. Need for cognition is not correlated with accuracy, confidence, or overconfidence. Thus this construct may not be relevant in future studies on calibration of consumer knowledge.

Perhaps the most significant result of the study is the calibration - decision making relationship. The model hypothesized that information search mediates the calibration - decision making relationship. It was found that only six respondents asked for more information before taking a decision (only 5 for the relevant sample since one respondent was among those excluded due to negative calibration). The small number of respondents precludes any informed comment. Apart from information search, other factors such as deliberation, response latency, etc. could mediate such a relationship. Such factors were not measured in this study. It is also possible that calibrated individuals are more able to appropriately weight the inputs in their choice process. This issue needs further investigation. Irrespective of the causal mechanism, the fact that calibration - decision making relationship has been supported is of considerable significance in the study of consumer knowledge. As detailed in the literature review section, calibration is important in consumer decision-making because it allows consumers to cope with incomplete and errorful information. Normative theory describes optimal policies for factoring such uncertainties into current decisions. Miscalibration is a barrier to implementing such policies. Consumers will benefit from improving calibration of their knowledge. Knowing what they know or don't know will let them make better choices.

Implications for Managers

The study offers several implications for managers. For one, consumer knowledge calibration enhances optimal decision making which in turn can be expected to reduce post purchase dissonance and regret. The latter phenomena dilute the brand equity in customers' perceptual space and negatively affect repeat purchase. Hence it is in the company's interest to promote calibration of product knowledge among consumers at large.

Previous literature has noted the effect of training and feedback in improving calibration. These variables lend themselves to effective use by companies. The

constructs examined in this study, general self-efficacy and involvement, are related to the consumers' personality and psychological make up and might not lend themselves to effective management by organizations. Hence attempts to improve calibration might have to rely on consumer training through communication and demonstrations and provision of adequate feedback. For policy makers, the findings highlight the role of calibration of knowledge in improving consumers' welfare. Also, by demonstrating another positive consequence of general self-efficacy, the study underscores the need to pay attention to its development through exposure to a wide variety of experiences.

Limitations and Future Research

One of the key limitations of the study is the reliance on cross sectional data and the survey method. None of the variables, knowledge, involvement, or general self-efficacy was manipulated. Moreover, in the second part of the study that measured the calibration-decision making relationship, the former was not manipulated. Replication of the study with appropriate manipulations will provide a more stringent test of the hypotheses. Also, more experimental controls will lead to the proper explication of causal influences.

The hypothesis that tested the effect of calibration on decision making proposed a mediating effect of information search. As mentioned earlier, this was measured by counting the number of questions that respondents asked. The variable was not included in the analysis, because it is not a focal construct in the proposed model. A more stringent test of the hypothesis will employ better measures of information search. In addition, it will also measure response latency. Future research can incorporate these into the test.

It was observed earlier that the weighting of inputs by calibrated individuals might approximate the true/ optimal weights more than those of miscalibrated individuals. People who know what they know and what they don't know are more likely to attach correct weights to decision inputs than those who are not able to distinguish between what they know and what they don't know. Examining this issue is an interesting line of research that merits consideration, especially in the light of prior research that has been undertaken regarding the weighting of attributes in the choice

process (e.g. Bettman, Luce, and Payne 1998; Luce, Bettman, and Payne 2000). Also, research on calibration can make use of insights from prospect theory that seeks to replace probabilities by decision weights. Decision weights measure the impact of events on the desirability of prospects, and not merely the perceived likelihood of these events. Decision weights are generally lower than the corresponding probabilities, except in the range of low probabilities (Kahneman and Tversky 1979). Confidence measurement in calibration typically is probabilistic in nature, as what is being elicited is the perceived likelihood of the correctness of knowledge. Given the importance of calibration to decision making, decision weights can be incorporated into the current paradigm. Future research needs to look into this issue as well.

As discussed earlier, the generalization of findings to the entire spectrum of utilitarian and hedonic products can be attempted only after further validation. An improvement over the current study will be the selection of hedonic and utilitarian product categories that lend themselves to knowledge tests comprising both procedural and declarative items.

The issue of student subjects also needs addressing. The rationale for using student subjects for theory development has been outlined earlier. In order to enhance the external validity of the findings, the study needs to be replicated among real consumers. Do their experience, level of education etc play a role in calibration? Does the calibration – decision-making relationship holds among them? These are some of the questions that could be answered in the replicatory exercise. Such an exercise in imperative before the findings of this study can inform managers and policy makers regarding strategy formulations on consumer education.

Further research on knowledge calibration can examine the calibration of choice processes. Decision makers often lack insights into their choice processes (Christenfield 1995). It is not clear whether high confidence is regularly placed in erroneous rationales. Even when particular heuristics are knowingly used, the appropriateness of consumer confidence in the ability of the heuristic to produce a favorable outcome at a predicted level of processing cost is an unexplored issue.

APPENDIX A

Scales Used in the Study

New General Self Efficacy Scale (Chen et al. 2001)

1. I will be able to achieve most of the goals that I have set for myself.
2. When facing difficult tasks, I am certain that I will accomplish them.
3. In general, I think that I can obtain outcomes that are important to me.
4. I believe I can succeed at most any endeavor to which I set my mind.
5. I will be able to successfully overcome many challenges.
6. I am confident that I can perform effectively on many different tasks.
7. Compared to other people, I can do most tasks very well.
8. Even when things are tough, I can perform quite well.

Measured on a 5 point Likert scale from strongly disagree (1) to strongly agree (5)

Need for Cognition (Cacioppo and Petty 1982; Cacioppo, Petty and Kao 1984)

1. I would prefer complex to simple problems
2. I like to have the responsibility of handling a situation that requires a lot of thinking.
3. Thinking is not my idea of fun.*
4. I would rather do something that requires little thought than something that is sure to challenge my thinking abilities.*
5. I try to anticipate and avoid situations where there is likely chance I will have to think in depth about something.*
6. I find satisfaction in deliberating hard and for long hours.
7. I only think as hard as I have to.*
8. I prefer to think about small, daily projects to long-term ones.*
9. I like tasks that require little thought once I have learned them.*
10. The idea of relying on thought to make my way to the top appeals to me.
11. I really enjoy a task that involves coming up with new solutions to problems.
12. Learning new ways to think doesn't excite me very much.*
13. I prefer my life to be filled with puzzles that I must solve.
14. The notion of thinking abstractly is appealing to me.
15. I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought.
16. I feel relief rather than satisfaction after completing a task that required a lot of mental effort.*
17. It is enough for me that something gets the job done; I don't care how or why it works.*

18. I usually end up deliberating about issues even when they do not affect me personally.

* indicates reverse scored items.

Involvement (Zaichkowsky 1994)

important	_: _: _: _: _: _: _	unimportant*
boring	_: _: _: _: _: _: _	interesting
relevant	_: _: _: _: _: _: _	irrelevant*
exciting	_: _: _: _: _: _: _	unexciting*
means nothing	_: _: _: _: _: _: _	means a lot to me
appealing	_: _: _: _: _: _: _	unappealing*
fascinating	_: _: _: _: _: _: _	mundane*
worthless	_: _: _: _: _: _: _	valuable
involving	_: _: _: _: _: _: _	uninvolving*
not needed	_: _: _: _: _: _: _	needed

* indicates reverse scored items

Subjective knowledge (Flynn and Goldsmith 1999)

I know pretty much about ____
I do not feel very confident about ____*
Among my circle of friends, I am one of the experts on ___
Compared to most other people, I know less about ___*
When it come to ___, I really don't know a lot*

* indicates reverse scored items.
Response format: 1= strongly disagree, 7 = strongly agree

Knowledge measurement

Insurance Knowledge – Items measuring Accuracy and Confidence

(1) An insurance policy terminated at the end of the grace period because of nonpayment of premium is known as _____

Cancelled policy
Lapsed policy
Discontinued policy
Terminated policy

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

(2) _____ insurance covers you if you are injured in an accident with others who themselves carry insufficient or no liability insurance.

Collision
Comprehensive
General liability
Uninsured/ underinsured

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

(3) Insurer stability is a key consideration that customers need to take into account while buying insurance. It reflects the financial stability of the company. Insurer stability is rated by well-known insurance rating companies. Which of these is a well-known rating company?

Equus
Cox and Smith

Standard and Poor
Instarate

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

(4) Which of the following factors do not determine the price of your policy?

Your age
Number of miles you drive
Your driving record
Your race

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

(5) In case of grievances or unhappiness with the company providing you the service, which is the organization that you should contact?

State insurance department
Federal insurance department
National consumer Affairs department
Insurance customer complaints cell

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

(6) In auto insurance, the amount of each loss that you agree to pay is known as ____

Personal share

Co-payment
Deductible
Out of pocket expense

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

(7) The term PIP refers to

Personal Injury Protection
Personal Insurance Protection
Property Insurance Plan
Personal Insurance Plan

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

(8) Which of these companies has the largest market share for auto insurance?

All State
State Farm
Progressive
AIG

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

(9) What is liability insurance?

Insurance that will pay for any damage to your car, should you get into accident
Coverage that the insurance companies require you to have if you own a car
Insurance that will pay for any damage to the other person's car, in an accident
An insurance policy that only covers accidents on gravel roads

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

(10) Which of these will **not** result in a cancellation of insurance policy that has been in force for more than 60 days?

If you fail to pay a premium
You have committed a fraud or made serious misrepresentation on your application
Your driver's license has been revoked or suspended
You have been imprisoned after a criminal conviction

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

(11)There may be several reasons why you can't get insurance through *traditional private insurance companies*. Following, except one, are such reasons. Which is NOT a reason for being denied for insurance?

You have a poor driving record
You own a special high performance car
You live in a very upmarket area
You have not driven long enough

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you

have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

(12) A sensible person who owns a very old and inexpensive car and whose objective is to save money but take care of reasonable risks, will have

No collision or comprehensive insurance
Have collision but no comprehensive insurance
Have comprehensive but no collision insurance
Have both collision and comprehensive insurance

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

(13) What happens to your insurance premium if you marry someone with a poor driving record?

It will stay the same because you are not the one with the poor record
Your premium will go down because you are getting married
An increase will occur because the insurance covers you, your spouse, and any other family member listed in the policy
You will probably lose your insurance

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

(14) When should you notify your insurance agent if you have been in an accident?

Immediately, regardless of the amount of damage or the amount of insurance you have
Within one week of the accident
Within one week of the accident, but only if you have full coverage on your car
Immediately, but only if you are injured or your car is damaged

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

(15) If a friend borrows my car, whose auto insurance would most likely cover a loss to the car?

My auto insurance
My friend's auto insurance
Both of our insurance policies would equally cover her
None of the above

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

(16) You may be eligible for a discount if you _____

Participate in a car pool
Are a full time student with a B average or higher
Are a homeowner
All of the above

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you

have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

Music Knowledge – Items measuring Accuracy and Confidence

1.Which of these is George Michael's most famous album?

Listen without prejudice
Faith
Hello I must be going
All the best

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

2. Bootylicious was a top pop single of recent years. Who/ which band is the song associated with?

Destiny's child
Enrique Iglesias
Jennifer Lopez
Brtiney Spears

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

3. Askmen.com rates “Thriller” as the best of the top 20 pop albums of all time. The album is the greatest selling album in recording history and is known for songs such as “Beat it” and “Billie Jean”. Who is the artist?

Madonna
Lionel Ritchie
Michael Jackson
Tina Turner

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

4. Which of the following is not a hip hop/ rap albums?

Wutang Forever
The Slim Shady LP
Life after Death
Piano man

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

5. This singer is well known for his distinct voice. His famous songs include “Mr Tambourine man” and “The Times they are a Changing”. Who is the singer?

Billy Joel
Bob Dylan
Bruce Springsteen
Elvis Presley

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

6. Which of the following Latin singers sang “To be with you”?

Santana
Ricky Martin
Enrique Iglesias
Marc Anthony

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

7. A recent trend in music is the fusion of popular music with older, pre-pop forms of music such as jazz, swing, gospel or classical music. Which of the following singers exemplify the fusion of jazz and popular music?

Whitney Houston
Norah Jones
Brian Setzer orchestra
Cece Winans

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

8. Loretta Lynn and Dolly Parton are famous singers who mainly sang _____ music.

Swing
Gospel
Jazz

Country

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

9. In the year 2000, "The Marshall Mathers LP" sold over nine million copies in the US. Who was the artist?

Tupac Shakur
Eminem
Nelly
Notorious B.I.G.

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

10. Who wrote "where have all the flowers gone?"

Bob Dylan
Peter, Paul and Mary
Pete Seger
Woodie Guthrie

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

11. Three of Beethoven's more popular piano sonata's are named

Moonlight, starlight, candlelight
Moonlight, mystique, magnifique
Appassionata, moonlight, pathetique
Pathetique, fantastique, boutique

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

12. What number was Schubert's "Great" symphony?

9^{th}
7^{th}
8^{th}
6^{th}

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

13. Who was NOT one of the Beatles?

Davie Jones
Paul McCartney
John Lennon
George Harrison

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

14. Who is Georgios Kyriacos Panayiotou better known as?

George Michael
Boy George
George Harrison
George Benson

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

15. Whose first album was titled "Wide Open Spaces"?

Lila McCann
Dixie Chicks
Deana Carter
Shania Twain

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

16. What was Backstreet Boys' first single in Americ a?

As Long As You Love Me
Quit Playing Games (With My Heart)
I Want It That Way
Set Adrift On Memory Bliss

Please indicate your level of confidence in the above answer in the scale below. Level of confidence refers to your belief that the answer is correct. If you are not sure at all, you have 0% confidence. If you are absolutely sure of your answer, you have a 100% confidence. You may check any point on the line.

0% 25% 50% 75% 100%

Insurance choice vignette

Please read the following paragraph and answer the questions below.

(1) Mr X owns an old Pontiac, whose market value today will be less than 2000 dollars. He has a wife and two kids and his job pays just over 3500 dollars per month. Consequently, he has been looking for ways to save a few extra bucks. His car insurance is due for renewal, and he has asked an insurance agent to give him a few options. Apart from price, Mr X is also concerned about service and wishes to have some assurance regarding this. (Roughly, we can say that Mr X puts 70% weight on price and 30% weight on service while choosing the policy). The insurance agent presented 5 options, which are as follows.

(a) Rank these policies in terms of their attractiveness to Mr X, given his objectives. If you don't know about insurance and insurance issues, or would like to have more information before you make the decision, please feel free to ask the person in charge. If your ranking corresponds to that of an expert, your name will be included in a lottery with a few $15 rewards. For every question you ask, there will be a deduction of one dollar from the price amount, in case you win.

	Option 1	**Option 2**	**Option 3**	**Option 4**	**Option 5**
Company's service rating	A	A+	A-	A-	B-
Liability	25000/ 50000/ 10000	25000/ 50000/ 10000	25000/ 50000/ 10000	50000/ 100000/ 25000	25000/ 50000/ 10000
Personal Injury Protection	50,000	100,000	50,000	100,000	50,000
Medical payments	25000	25,000	25,000	50,000	25,000
Physical damage – Comprehensive coverage	2000 (100 deductible)	2000 (100 deductible)	None	2000 (100 deductible)	2000
Physical damage- Collision coverage	2000 (100 deductible)	5000 (500 deductible)	None	2000 (250 deductible)	2000
Premium (6 months)	550	800	500	750	400
Rank (highest 1, lowest 5)	____	_____	_____	_____	_____

APPENDIX B

Insurance questions and answers

1. What is company's service rating?

   Company's service rating is a rating given to the level of service of a company by an independent rating agency. A+ is the best, A, A-, B+, B, B-, C+ etc follows in that order.

2. What is liability?

   Liability coverage protects you or another driver insured under your policy if either of you are found legally responsible to pay for someone else's injuries or loss arising from an accident.

3. What does each number in liability clause mean?

   Maximum for bodily injury for one person in a single accident / Maximum for bodily injury for all persons in a single accident / Maximum for all property damage in an accident.

4. What is personal injury protection?

   Personal Injury Protection pays for medical expenses and wage loss for you and other passengers in your car regardless of who caused the accident. PIP usually includes benefits for medical expenses, loss of work income, essential services, accidental death and funeral expenses.

5. What are medical payments?

   Pays for the treatment of injuries to the driver and passengers of the policyholder's car.

6. What is physical damage –comprehensive coverage?

   Comprehensive coverage protects your vehicle from damage caused by fire, theft, vandalism, weather, glass breakage, and contact with an animal.

7. What is physical damage-collision coverage?

   Collision coverage pays for damage to your vehicle from an accident or collision regardless of who may be at fault. Collision coverage pays for repair or replacement of a vehicle, up to the fair market value of the vehicle, subject to a deductible.

8. What is deductible?

   Deductible is the part that you pay.

9. How large a deductible should a person have?

   The larger the deductible, the greater the savings and risk. Select a deductible based on the largest amount that the person is comfortable paying for repairs to the vehicle in the event of an accident.

APPENDIX C

Alternative Measure of Calibration – Squared Difference Measure (Brier Score Component)

Calibration was calculated using the squared difference measure in equation (2). The descriptive statistics of this measure is given below. The correlation of this measure with the point biserial correlation measure is also shown.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
BRIER	332	.649	.999	.923	.058

Correlations of Brier score measure and point biserial correlation measure

		BRIER	CORRELAT
BRIER	Pearson Correlation	1	.481(**)
	Sig. (2-tailed)	.	.000
	N	332	332
CORRELAT	Pearson Correlation	.481(**)	1
	Sig. (2-tailed)	.000	.
	N	332	332

** Correlation is significant at the 0.01 level (2-tailed).

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