# Risky choice in the ecommerce environment: A test of probabilistic mental modeling

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**ABSTRACT**

Concerns of potential online consumers over privacy and security of their financial and other personal information is an impediment to the growth of ecommerce. These concerns are often addressed through the use of assurance structures placed on a website. Prior research has found that the effect of assurance structures is most pronounced when the vendor is unknown to the consumer and they have no prior interactions from which to judge the trustworthiness of the vendor. Another important factor to decision making under uncertainty in any context is the perceived problem domain of the decision maker. Probabilistic Mental Modeling (Gigerenzer, 1991) was used in this study to examine the behavior of individuals in decisions under uncertainty in the ecommerce context. A major proposition in this study was that since consumers are risk-averse in the gain domain; the risk relieving properties of assurance structures may moderate their decisions and induce more trust and purchase intentions and ultimately, behavior. However, in the perceived loss domain little to no effect was expected since the reduction of risk is not a driving factor of the purchase decision for potential consumers. This study was a 2 x 2 fully crossed factorial design. Two factors, perceived problem domain and the presence of assurance structures were manipulated with a dependent variable of purchase behavior. The data provided evidence of framing effects in the ecommerce environment. The study also demonstrates that assurance structures moderate choice shifts attributed to the framing effect in the ecommerce environment.

Keywords: ecommerce, trust, behavioral decision theory, decision making, assurance

## INTRODUCTION

According to Forrester Research, Inc., online retail sales will grow to $335 billion by 2012. (Strategic Ecommerce Solutions, 2011) Prior research has found that the major impediments to the growth of ecommerce are the concerns of the consumer that impede the development of trust. Odom et al. (2002) identified seven specific concerns of the consumer: security of the transaction, privacy of information, legitimacy of seller, quality of the product/service, documentation adequacy, price fairness and customer service availability. (Odom et al., 2002). Glover and Benbasat (2010/2011) studied perceived ecommerce risk. They found that the construct had three dimensions: risk of functionality inefficiency, risk of information misuse, and risk of failure to gain product benefit. McCole et al. (2010) found that the "fears" surrounding the Internet as a place to do business still hinder the use of it for e-commerce purposes. These concerns must be addressed by the online retailers in order to increase their market share in this time of explosive growth of the business-to-consumer (B2C) ecommerce.

Studies have shown that trust in an online retailer is enhanced by brand equity. (Ambler, 1997; Grewal, Munger, Iyer and Levy, 2003) While established "brick and mortar" retailers that extend to the online environment can rely partly on their prior experience and reputation to help expand to online retail sales, the new or unknown vendor must find other ways to address the concerns of the consumers on their websites and foster trust with the potential online consumer. McKnight et al. (2002) defined trust between unknown parties as initial trust. In this study, assurance structures will refer to statements, promises, guarantees, logos, symbols and any other structural components of a website intended by the vendor to reduce perceptions of risk in transacting on their website. The model of initial trust formation outlined in McKnight et al. (2002) drew from the institutional-based trust theory of Shapiro. (Shapiro, 1987)

In institutional-based trust theory, structural assurance provided a means by which unfamiliar actors were able to participate in cooperative exchanges without the benefit of prior experience. The study of assurance structures is particularly important in the framework of unfamiliar vendors in that consumers do not have experience with the vendor in which to formulate prospects of outcomes from the transaction. In this study, assurance structures will refer to statements, promises, guarantees, logos, symbols and any other structural components of a website intended by the vendor to reduce perceptions of risk in transacting on their website.

Several studies have demonstrated that assurance structures on websites have a positive effect on trust and/or purchase intentions. (Gefen, Karahanna and Straub, 2003; Grazioli and Jarvenpaa, 2000; Grewal et al., 2003, Houston and Taylor, 1999; Huang, Potoker and Yang, 2001; Kaplan and Nieschwietz, 2003; Mauldin and Arunachalam, 2002; Murphy and Blessinger, 2003; Pavlou, 2002) The findings of these studies have been particularly robust. However, while these studies have shown that assurance structures on websites result in higher trust and/or greater intentions toward trusting behaviors, they do not introduce actual risk to the subject in the form of potential gain or loss outcomes. Some studies in this stream of research have used incentives to entice subjects to participate in the study. While incentives help to recruit volunteers for the study, they do not introduce risk to subject in the form of alternative outcomes based on buyer behavior (gain or loss outcomes). These studies ask subjects about their intentions to purchase online and about

the trustworthiness of a vendor without recording actual risk-taking behavior based on a risky choice (to buy or to not buy). The outcome to the subject is not dependent upon the actions of the subject as it is in the online purchasing environment. The uncertainty about outcomes that arises from risk in the online environment leads to vulnerability and the need for trust. Assurance structures are hypothesized to act as risk-relievers by addressing the concerns of the online consumer. Although these studies have concluded that the assurance structures reduced risk and resulted in increased trust and purchase intentions, the lack of risk to the subject draws the conclusions of these studies into question.

Any attempt to understand the decision-making behavior of individuals under conditions of uncertainty or risk must include a study of Behavioral Decision Theory (BDT). According to BDT, the decision maker's perception of the problem domain as either loss or gain can predict the choices made in a risky context due to effects of framing of the problem and the subsequent shifts in the reference point from the status quo. Whether or not a decision maker's perception of the problem domain is loss or gain depends on which characteristics of the problem are relevant for forming the domain. Three theories, Prospect Theory (PT)(Kahneman, 1979), Probabilistic Mental Modeling (PMM)(Gigerenzer, 1991), and Fuzzy-Trace theory (FTT)(Kuhberger, 1995), have proposed differing viewpoints as to how the perceived problem domain is formulated by the decision maker. These theories have been tested in a variety of contexts and the findings have been robust in support of framing effects. (Chang, 2002; Kessler, 1996; Kuhberger, 1995; Kuhberger, 1999; Lim, 1995; Olsen, 1997; Quiggin, 1993; Rose, Spring 2004; Tversky, 1986; Van Schie, 1995).

Given the perceived risky nature of ecommerce transactions, the testing of this theory of risky choice, or choice under uncertainty, would increase understanding of purchasing behavior in ecommerce. According to BDT, when the problem domain is perceived to be a gain domain, the consumer should be more risk-averse and less likely to make a purchase. (Kahneman and Tversky, 1979) The presence of assurance structures on the website could reduce perceived risk and the risk adverse tendencies of consumers may be moderated such that the choice shifts attributed to framing are reduced or eliminated. However, when the problem is framed as a loss, BDT would predict that consumers would be risk seeking so assurance should be less effective.

Retailers on the web can influence frames by the use of certain words and marketing techniques. When a website markets a product with a limited availability or implies that not buying this product will produce some type of harm, injury or loss to the potential consumer, they are employing a negative message. These are negative aspects of the problem and this negative prospect is intended to influence the consumer such that the consumer will perceive that they will incur a loss relative to some reference point if they don't buy this product. Sales messages on websites that stress the positive aspects of the product such as an attractive price and other positive aspects of the transaction are intended to influence the consumer such that the consumer will perceive that failing to make a purchase would mean forgoing a potential gain. (Puto, 1987) Puto (1987) found that when a sales message simply contained the key words of "gain" or "loss", it produced shifts in the reference points of decision makers such that choice shifts attributed to the framing effect were demonstrated. According to BDT, this perceived

problem domain of loss would cause the consumer to become more risk seeking by shifting of the reference point for the decision to a loss position from the status quo.

The perceived problem domain of gain will cause a risk-aversion by shifting the reference point for the decision to a gain position from the status quo. This will be important to ecommerce retailers to understand the importance of heuristics on websites and the potential effects of small changes in wording on perceived risk, purchase intentions and, ultimately, purchase behavior.

The purpose of the study is to determine whether assurance structures on websites moderate choice shifts attributed to the framing effect in an ecommerce environment. This research will test the effects of a risk-reliever (assurance structures) on framing effects in the ecommerce context. The addition of risk to the subject and measurement of behavior with transaction related consequences to the subject are extensions and contributions to the research in e-assurance. This research will increase our understanding of the role of both framing and assurance structures in the ecommerce context.

## LITERATURE REVIEW OF ECOMMERCE RESEARCH IN PURCHASE INTENTIONS AND ASSURANCE STRUCTURES

### Risk relievers in E-commerce

A major complaint of both potential online consumers and their respective online retailers is that there is too much uncertainty associated with purchasing goods and services online. There is a fear of the loss of privacy or even worse, that information will be stolen via electronic means that will incur a financial loss. This fear may prevent many sales from taking place as consumers fear putting their private information into the online forms needed to make a purchase. The major way that retailers have addressed these concerns is through the use of risk relievers on their websites. The use of these risk relievers is intended to increase trust, and increase purchase intentions and purchase behaviors. According to institutional-based trust theory, these structures on the website provide assurance that the retailer will perform as agreed and increase trust in the website. (McKnight et al., 2002)

### Assurance structures

Prior research on the impact of assurance structures on ecommerce have investigated both the effect of third-party certifications (Noteberg et al., 2003; Odom et al., 2002; Lala, Arnold, Sutton and Guan, 2001; Kovar et al., 2000; Portz et al, 2000; Pennington et al., 2003-4) and retailer disclosures (Mauldin and Arunachalam, 2002; Houston and Taylor, 1999; Kaplan and Nieschwietz, 2003b) on the online consumer's purchase intentions, trust and trusting intentions. Both third-party certifications and retailer disclosures are assurance structures intended to relieve risk to the online consumer and increase purchase intentions and trust. Assurance structures are defined as statements, promises, guarantees, logos, symbols and any other structural components of a website intended by the vendor to reduce perceptions of risk in transacting on their website. Some examples of third-party certifications would be the BBB online and the WebTrust seals. Security, privacy and cookies usage policies, among others, are

examples of retailer disclosures. Assurance structures are proposed to decrease the risk associated with an unknown vendor and increase both trust and trusting behaviors such as making a purchase on a website. Prior research has concluded that assurance structures do increase trust and purchase intentions.

Prior research has tested both trust and purchase intentions among subjects without potential variability in outcomes to the subjects. Outcome variability takes the form of potential losses or gains to the online consumer. When subjects face variability in outcomes, uncertainty and risk is introduced. It is this uncertainty in outcomes that necessitates trust in the ecommerce purchase decision.

**Institutional-based trust theory**

McKnight et al. (2002) proposed and tested a model of initial trust in ecommerce. McKnight et al. defined initial trust as trust between unknown parties. Unknown parties would not have prior experience upon which to base expectations for possible outcomes. McKnight et al. (2002) proposed that trust plays a central role in helping consumers overcome perceptions of risk and insecurity in the ecommerce environment. The propositions of McKnight et al.'s work were supported by institutional-based trust theory.

Institution-based trust reflects the security that one feels in a situation because of guarantees, safety nets, and other trust structures. (Shapiro, 1987; McKnight et al., 1998) Institution-based trust can be used to explain the paradox of 'swift trust' between unknown parties. (McKnight et al., 1998) Institution-based trust consists of two components of trusting beliefs: situation normality beliefs and structural assurance beliefs. Situation normality beliefs arise when trust is formed by the impression that the situation is normal or that 'things are properly ordered'. (Lewis and Weigert, 1985) Shapiro refers to structural safeguards in terms of regulations, guarantees and legal recourse. (Shapiro, 1987) Structural assurance beliefs signal the potential trustor that structures exist in the situation that relieves some of the risk with undesirable outcomes. In the context of ecommerce, both third-party certifications and retailer disclosures would provide structural assurance and thus, in this study, they are referred to as assurance structures.

McKnight et al. (2002) proposed that structural assurance beliefs would lead to increased trusting beliefs and trusting intentions. The results of the initial sample evaluation did not support this proposition. Additional analysis with the holdout sample did show that structural assurance beliefs did increase trusting intentions significantly. McKnight et al. offered a plausible explanation to the lack of results in the original sample. According to McKnight et al., the result was that dispositional-based trust factors were more influential in forming the subjects' trusting beliefs and intentions than institution-based trust beliefs. McKnight et al. defined disposition to trust as the extent to which a person displays a tendency to be willing to depend on others across a broad spectrum of situations and persons. This construct consists of two subconstructs: "faith in humanity" and"trusting stance". Faith in humanity means that one assumes that others can generally be trusted. Trusting stance means that, regardless of what one believes about the intentions of others, it is better to just act as though others will behave in such a way as to be deserving of trust. According to McKnight et al., these constructs together form the construct of faith in humanity, which has a direct positive effect on institution,

based trust beliefs, trusting beliefs and trusting intentions. This would be similar to giving someone the benefit of the doubt and not being suspicious of others until they give one a reason to be suspicious. McKnight et al.'s reasoning is that the lack of experience of the subjects in the advice giving type websites left them with little institution based knowledge with which to form beliefs about situation normality and structural assurance. Therefore, the basis for their trusting beliefs and intentions were based on dispositional characteristics of the individuals that, through the process of randomization, lead to insignificant results for the influences on trust in the vendor.

However, given the evidence that assurance structures have been found to influence trust and/or purchase intentions in several studies (Kovar et al., 2000; Mauldin and Arunachalam, 2002; Odom et al., 2002; Pennington et al., 2003-4), this seems quite unlikely. The McKnight et al. study gives little information about the design of the website and so it is difficult to determine what assurance, if any, was provided on the website. Therefore, it is difficult to ascertain to what extent the assurance structures on the website itself were the basis for the trusting beliefs and intentions of the subjects.

Two other influences on these findings can be considered. First, the questions pertaining to institutional based trust were worded in order to make generalizations about beliefs about the Internet and conducting business online and not specific to the website used in the study. This type of trust is conceptually similar to the 'system trust' outlined by Pennington et. al. (2003). Pennington et al.'s work was based on that of McKnight et al. (1998) and defines system trust as a belief that the proper impersonal structures have been put into place enabling one party to anticipate successful transactions with another party. Yet, McKnight et al. (2002) designed the questions about situation normality and structural assurance referred to the Internet in general rather than the website evaluated by the subjects. It is important to understand that when conducting a transaction with a vendor in the ecommerce context, it is the subjects overall assurance with that particular vendor that is important since trust is situation specific. The questions in McKnight et al.'s study answered questions that pertained to generalizations about their concerns about doing business online but not the specific transaction at hand.

Secondly, the risk to the subjects, albeit not transaction based, introduced a loss frame to the subjects in that if they did not answer the questions 'correctly' they would lose extra credit points. This loss frame may have induced risk-seeking behavior on the part of the subjects and exacerbated the lack of correlation between institution- based trust beliefs and trusting beliefs/intentions.

**Theory of Reasoned Action as it relates to purchase intentions**

Although this study is not an attempt to test the Theory of Reasoned Action (TRA) or its sister theory, the Theory of Planned Behavior (TPB), it is prudent to include some reference to these theories as they have been used in prior research to demonstrate the link between purchase intentions and purchase behavior. In Figure 1, the dependent variable in the research model is 'risk preference'. This risk preference is operationalized in this study as a purchase decision. Many of the studies that serve as the theoretical foundation to this study use purchase intentions as the dependent variable. In many studies in various disciplines, purchase intentions are used as a proxy for a purchase

decision or choice. Both the TRA and the TPB test intentions but they propose to predict decisions.

Ajzen and Fishbein (1980) formulated the (TRA) to help predict human behavior. The TRA suggests that a person's behavior is determined by their intention to perform the behavior. This intention is a function of their attitude toward the behavior and the subjective norm. With respect to framing effects, it could be surmised that the framing effects on purchase intentions are similar to the link between the constructs of attitude and intention in the TRA. It is not hard to make the leap that the risk-averse tendencies or the risk-seeking tendencies are attitudes that were influenced by framing effects.

Subjective norm is not addressed due to the fact that in the controlled atmosphere of a laboratory experiment, it is not expected to exhibit significant influence over purchase intentions. Subjective norm refers to how the individual perceives that the people that they care about will view this action or behavior on their part. In the experimental setting, this is not a realistic concern on the part of the subject. Intention is the cognitive representation of the readiness of the individual to perform the behavior and is the immediate antecedent to the performance of the behavior.

The purchase intentions of individuals are often used as a proxy for behavior. Due to the desire to actually measure behavior in this study, the link between purchase intentions (intention in the TRA) and purchase behavior (Behavior in the TRA), links prior research in intentions with respect to trust and website purchasing to the actual behaviors that will be measured in this study.

The preference in this study to collect data about specific behavior in lieu of intentions was not intended to dissuade the reader of the voracity of the propositions of the TRA. Instead, some evidence exists that use of intention is not always a perfect substitute for the actual variable of interest. The key to the use of intention is the ability to estimate the amount of error that the use of intention, instead of the actual variable of interest, creates. Dalton, Johnson and Daily (1999) conducted an analysis of the use of 'intent to turnover' via meta-analysis. Their purpose was to determine how much error is omitted from consideration when the intent variable is simply a surrogate for the specific variable of interest that is generally unavailable. In their study, the specific variable of interest was actual turnover. They found that reliance on intent variables could lead to potential misinterpretation of the relationship with the variable of specific interest and that the problem was particularly relevant when the correlation between the surrogate variable and actual variable of interest was low. The study of purchase intentions in ecommerce is a new area and estimation of the error between purchase intentions and purchase behavior is difficult to determine given the relatively few studies available to conduct a meta-analysis. Therefore, having the subjects actually make a decision about a purchase from a website is an important step forward in the study of ecommerce decision-making.

**Relationship between purchase intentions and assurance**

For the purposes of this study, several empirical articles that outline the effects of assurance on purchase intentions in the ecommerce environment were reviewed. Bhattacherjee (2002) used willingness to transact as a dependent variable in an empirical investigation of the effect of familiarity and trust as assurance mechanisms. Willingness

to transact is a similar construct to purchase intentions. In the Bhattacherjee (2002) study, familiarity was found to positively affect willingness to transact and trust. One of the major flaws of the Bhattacherjee (2002) research study was that, on the conceptual level, it was hard to understand how the independent variables and dependent variables were not tautological. For example, if trust is high, ceteris parabis, how can one conceptually justify willingness to transact as low and vice versa? The model sets up and tests a tautological model and the favorable results are not surprising.

Jarvenpaa and Tractinsky (2003) studied several factors and their influences on trust and risk in an Internet store. Independent variables in the study were store size and reputation. This study supported a positive relationship between risk and trust towards an Internet store. The study found that reputation had a stronger effect on trust than did merchant size. However, since the authors are specifically trying to measure and test the effects of independent variables on initial trust, the use of the store reputation indicates that a familiar vendor was used. Thus, initial trust was not the type of trust tested. Any prior interaction or knowledge of the individuals with the vendor means that any measurement of trust could not conceptually be 'initial'.

Mauldin and Arunachalam (2002) studied the affects of product and vendor familiarity, web assurance, and information risk on intent to purchase online. They found that web assurance only affected intent to purchase when familiarity was low. This is an interesting finding for the present study because it demonstrates that web assurance is not significant in increasing purchase intentions where the consumer is familiar with the vendor. Mauldin and Arunchalam (2002) do not study initial trust; instead, the type of trust that is being studied is the same as the trust being studied in both Bhattacherjee (2002) and Jarvenpaa and Tractinsky (2003). This argument is based on the logical conclusion that web assurance is needed in cases where the parties to the potential transaction do not have prior interactions with one another. Without prior interactions with one another, they have no basis for determining the level of trust warranted and therefore, web assurances are naturally more effective.

Other studies of web assurance have focused on the use of unfamiliar vendors and testing the effects of purchase intentions. Kovar, Burke and Kovar (2000) specifically studied the WebTrust seal and its effect on intent to purchase online and found the seal to be significant. This study used an unfamiliar vendor and increases the evidence that web assurance must be more highly associated with increased trust and intention to purchase online when initial trust is measured through the use of an unknown vendor.

Houston and Taylor (1999) tested both retailer disclosures and the WebTrust seal on willingness to purchase. Their study found that the WebTrust seal provided no additional assurances with respect to business and security practices and willingness to transact when retailer disclosures were present. Since the retailer disclosures demonstrated the willingness and ability of the retailer to meet the desires for product and service of the potential online consumer, the WebTrust seal did not increase purchase intentions significantly. This study further demonstrates the relationship between assurance and purchase intentions.

## LITERATURE REVIEW OF BEHAVIORAL DECISION THEORY

### Introduction to Framing Effects in Risky Choice

Kahneman and Tversky (1979) introduced the concept of framing and its effects in the risky choice context. Tversky and Kahneman (1981) define framing very broadly as referring "to the decision maker's conception of acts, outcomes, and contingencies associated with a particular choice. The frame that a decision-maker adopts is controlled partly by the formulation of the problem and partly by the norms, habits, and personal characteristics of the decision maker" (p. 453). Kahneman and Tversky's (1979) prospect theory is widely accepted as a behavioral model of risky decision-making.

Framing effects occur when individuals are risk-adverse when the perceived problem domain is gain and risk seeking when the perceived problem domain is loss. When individuals are faced with two choices: one with certain outcomes and another with uncertain or risky outcomes, the individuals based their evaluation of the choices based on an initial reference point, which is usually the status quo. Consider the situation where you are playing poker. You have lost 100 dollars and are considering a 50-dollar bet. You can make the bet, and incur the risk of another loss (a risky option) or not make the bet, therefore staying at the current level of loss (certain option). Since you have lost money, you are in a loss domain. Therefore, you might be risk-seeking in order to attempt to shift your reference point to a position of fewer losses. In this case, the possible reference point (losing less than 100 dollars) is more desirable than the current reference point, a loss of 100 dollars.

Now, reverse the scenario, and you are playing poker and you have won 100 dollars. Your initial reference point is a gain of 100 dollars. You now are considering a bet of 50 dollars. Therefore, you might be risk-averse since you do not want to move to a less desirable position of fewer dollars won than the initial reference point of 100 dollars won. In this case, the possible reference point (winning less than 100 dollars) is less desirable than the current reference point, a winning position of 100 dollars. This is not to say that personal characteristics of the decision maker do not influence the setting of reference points or the desirability of differing reference points but that the possible shifts of the reference points from desirable positions to undesirable positions creates the perception of the problem domain for the individual and is responsible for the framing effects found in the literature in many different contexts. (Kuhberger, 1998) The interesting aspect of these phenomena is that the wording of the choices given to the subject can influence the perceived problem domain of the subjects. Although the actual problem domain may be loss or gain, the manipulation of the actual problem domain and the framing of the problem may influence the perceived problem domain of the subject jointly. Consider the following "Asian disease problem" used by Tversky and Kahneman (1981, p. 453).

Problem 1:

Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows:

If Program A is adopted, 200 people will be saved.
If Program B is adopted, there is 1/3 probability that 600 people will be saved and 2/3 probability that no people will be saved.
Problem 2:
Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows:
If Program C is adopted, 400 people will die.
If Program D is adopted, there is a 1/3 probability that nobody will die and a 2/3 probability that 600 people will die.

Both choices are logically and probabilistically identical except for the wording of the choices using saved in problem 1 and die in problem 2. However, for the ”Asian disease problem”, Tversky and Kahneman, (1981) reported that 72 percent of subjects using this scenario with the ”Asian disease problem” chose Program A for Problem 1, and preferred the certain option that 200 will be saved. The use of the wording “will be saved” manipulates the perceived problem domain to a gain domain although this is clearly an actual problem domain of loss since the outcome most probably will be that of some deaths occurring. In the second problem, the use of the wording “will die” created a perceived problem domain of loss and should foster risk-seeking behavior. For problem 2 in the “Asian disease problem”, the subjects were more risk seeking and chose option D (78 percent). (Tversky and Kahneman, 1981)

This example is demonstration of the ”framing effect” because the actual problem domain is not manipulated; just the wording of the problem choices, positively for problem 1 (saved) and negatively for problem 2 (will die). Similarly, Tversky and Kahneman (1981) define a second effect, the ”reflection effect”, which refers to changes in the actual problem domain (gain or loss). Fagley and Miller (1993) stated that the reflection effect ”refers to having opposite preferences for gambles differing in the sign of the outcomes (i.e. whether the outcomes are gains or losses).” (Fagley and Miller, 1993, p. 451) By this account, people would prefer to win 100 for sure to a chance to win 500 dollars. On the other hand, people would prefer a chance to lose 500 dollars to a sure loss of 100 dollars. By this account, the perceived problem domain of the decision maker would be framed by the actual problem domain. The framing effect as demonstrated by the ”Asian disease problem” above remains a loss in both Problems 1 and 2 with people dying in either scenario. The choice shift for the framing effect is caused by the changes in the problem frame; positive vs. negative, while the actual problem domain is not changed. For the reflection effect, the actual problem domain causes the change in the perceived problem domain.

Framing effects have been tested repeatedly in a number of contexts. Kuhberger (1998) reported the results of a meta-analysis of 136 empirical studies of framing with a pool of nearly 30,000 participants. The studies included in this study were located in 66 different journals from experimental, social, and applied psychology, medicine, management, business and accounting and other applied areas. He concluded that framing is a reliable phenomena and that type of sample (students vs. target populations) and unit of analysis (individual vs. group) were not important. Interestingly, by and large,

these experimental evaluations carried no actual risk to the participants. A particularly salient point considering the experiments sought to test risky choice.

Manipulation of the perceived problem domain can be effected via two routes in the ecommerce environment: changes in the actual problem domain (gain vs. loss) and changes in the wording of the choices or problem frame (positive vs. negative) in a risky choice scenario. The determination of the perceived problem domain as manipulated by these two factors depends on the theory employed. Thus far, this discussion has centered on the predictions of Prospect Theory; but, it is not the only theory of risky choice available. Three theories: Prospect Theory (Kahneman, 1979), Probabilistic Mental Modeling (Gigerenzer, 1991) and Fuzzy-Trace Theory (Kuhberger, 1995), have been investigated in prior research to explain how the perceived problem domain of a decision maker in a risky choice scenario is determined. This paper will concentrate on Probabilistic Mental Modeling and its role in determining choices of the decision maker in the ecommerce environment.

Introduced by Gigerenzer et al. (1991), this theory was introduced to deal with overconfidence in judgments made on spontaneous decisions with an immediate reaction, and not those for which their was a long period of contemplation on the part of the decision maker, which is comparable to Prospect Theory. In probabilistic mental modeling (PMM), when decision makers are faced with alternatives, they first attempt to construct a local mental model (LMM). The LMM can be constructed by the decision maker if a) precise figures can be retrieved from memory for both alternatives, b) intervals that do not overlap can be retrieved, and c) elementary logical operations, such as exclusion, can compensate for any missing knowledge.

Gigerenzer et al. (1991) use the following example to illustrate the LMM. The subjects are asked, "Which city has more inhabitants? (a) Heidelberg or (b) Bonn" The subjects were asked to choose (a) or (b) and give a numerical judgment of their confidence. They assume that the mind first attempts to generate a direct solution through the construction of a LMM. For example, the subject may recall from memory that Heidelberg has a population between 100,000 and 200,000 and Bonn has a population over 290,000. Therefore, the subject chooses Bonn as the correct answer and would rate the confidence in their answer as 100 percent. These ratings of 100 percent confidence can be considered overconfidence if the recalled information is incorrect and the answer is wrong.

If no LMM can be formed, it is assumed by Gigerenzer et al. that a probabilistic mental model (PMM) is activated. A PMM places the task of the subject into a larger context. A PMM connects the specific structure of the task with a probability structure of a corresponding natural environment. For example, when direct knowledge of the population of the cities is not available to the decision maker, then the alternatives of (a) and (b) are considered within a reference class of objects such as "all German cities" and other factors, besides population, are considered in determining the choice of the subject between the two alternatives.

After the target variables of (a) Heidelberg and (b) Bonn are placed in the reference class of all German cities, the subject searches for cues to the answer. Some cues are based on known information, such as the capital of Germany, location in the country, proximity to other large cities such as Frankfort and Munich, the city's soccer team inclusion in the national soccer tournament and so forth. The answers to these cues

as they relate to the particular problem at hand increase or decrease the probability that (a) or (b) is the correct answer. Gigerenzer et al. (1991) labeled these probability cues. These probability cues will be "activated" for use in making the decision if the two alternatives, in relation to the reference class, differ. For example, if both cities have a soccer team in the national soccer league, then, they do not differ on this probability cue and this cue would not be activated for the purposes of making this particular decision. The probability cue of the location of Bonn in the northern industrial area, more likely to be heavily populated versus the location of Heidelberg south of Frankfort in the Bavarian and decidedly more rural area of Germany would most likely be an activated probability cue. The location of the city is not directly tied to the population of the city, yet increases the probability that the city will have a greater population, thus, this information is considered a "probability cue". The subject is assumed to generate these cues in order of validity, or applicability, in relation to the decision task at hand. Each cue is generated, tested for differences on key factors, and then either activated or dismissed.

In this iterative mental process, which for an important decision could be quite tedious, one might suspect that several cues are evaluated and either dismissed or activated in relation to the task at hand. This has not been upheld in research. Even when subjects were explicitly instructed to produce all possible reasons for and against each alternative in a decision task, they generated only about three on average and at the most, four cues. (Koriat, 1980)

Kuhberger (1995) first suggested that PMM could be used to explain the framing effect in decision making despite its grounding in overconfidence in judgments and decisions. In the case of the Asian disease problem, it is unlikely that an individual subject would be able to construct a LMM for making a decision due to the lack of information. For the classic "Asian disease" problem, Kuhberger (1995), offered that the reference class for the target variable could be "programs for fighting disasters" (Kuhberger, 1995) Cues used to evaluate the alternatives could be time, newly developed knowledge, new skills and medicines that may become available, and other possible future resources. In addition, MacDonald (1986) stated that subjects interpret figures given as "lower bounds" for conditions and that in interpreting written language, the use of exact certainty in figures is unnatural and the words "or more" are automatically mentally inserted by the user of the information. Therefore, the change by Chang (2002) to the use of the phrase "and more may be saved/die later", models this process described by MacDonald (1986). The certain choice in Program A implies that 200 people will be saved but doesn't say what will happen to the other 400, therefore there is room for the subjects to build their own PMM. The subjects could surmise that with Program A, over time, new medicines will be discovered that could save more lives. Therefore, in the PMM of the subject for Problem 1, Chang (2002) rewrote the options:

Program A: 200 people will be saved and some more may be saved later.

Program B: These is a 1/3 probability that 600 people will be saved and a 2/3 probability that no people will be saved.

The problem frame of Program A is positive, (only discussing the possible survival of people), whereas the problem frame of Program B is mixed. This may explain why more people choose Program A over Program B. However, changing the wording to the loss domain and replace saved with will die, yields the following options:

Program A: 400 people will die and some more may die later.

Program B: These is a 1/3 probability that nobody will die and a 2/3 probability that 600 people will die.

In this negatively framed option set, the subject could surmise that although 400 will die under Program A, more may die later based on information not known with certainty at this point. So, although Program A is negatively framed, there is a mixed message with Program B since the possibility that no one will die under this option. This may explain the choice of Program B over Program A as was found by Kahneman and Tversky (1979). Therefore, Chang (2002) has introduced a possible alternative to the explanations for the choice shift found by Kahneman and Tversky (1979) that was linked to the problem domain under Prospect Theory. In the PMM theory, it was the problem frame and not the problem domain that lead to the choice shift as tested by Chang (2002).

## RESEARCH MODEL AND HYPOTHESIS DEVELOPMENT

### Research Model

Both initial trust and perceived risk are theorized to be affected by the manipulation of assurance structures and appropriate manipulation checks will be used to determine their veracity.

### Definition of Research Constructs

The actual problem domain refers to whether the domain of the problem is a gain or a loss domain. A gain domain is manipulated by whether or not the subject will gain something from the interaction. For a lottery winner that has the choice to turn in a prize they have just won in order for a chance to win an even bigger prize package, the actual problem domain is a gain domain. In the classic "Asian Disease problem", since the problem was dealing with the loss of life, the actual problem domain was loss. In this experiment, the operationalization of the actual problem domain will be determined by whether the subject has the ability to win additional lottery tickets or will be subject to varying levels of loss of lottery tickets. The problem frame, a control in this study, refers to the use of heuristics that cast the problem into a positive light (i.e. use of the wording "tickets saved" or "tickets not lost") or into a negative light (i.e. use of the wording "tickets not saved" or "tickets lost"). The use of the negation is the indication of the turn from the positive framing to the negative framing in either domain. In this study, we test the effect of the actual domain on the perceived problem frame and subsequent behavior.

### Moderating Variable

The moderating variable in the research model is assurance structures. Assurance structures as defined earlier in this paper are statements, promises, guarantees, logos, symbols and any other structural components of a website intended by the vendor to reduce perceptions of risk in transacting on their website. In this experiment, the assurance structures consist of the following elements on the websites viewed by the subjects: security policies, privacy and cookies usage policies, shipping information, money-back guarantees, and toll-free customer service numbers, among others. Any

statement or guarantee of the retailer meant to reduce the perception of risk of the potential online consumer and, subsequently, increase initial trust and purchase intentions, would be considered an assurance structure.

Assurance structures are considered moderating variables because they are only expected to effect behavior under the perceived gain domain. Therefore, it is expected to moderate the relationship between the manipulation of the perceived problem domain and purchase behavior in the gain domain. In the loss domain, little to no effect is anticipated.

**Dependent variable**

The dependent variable in this study is the risk preference of the potential online consumer. In contrast to several prior studies of online behavior, this study will require subjects to make an actual decision about making an online purchase where personal gain or loss is at stake. Although there's a strong link between intentions and behavior as demonstrated in the testing of the TRA, it is a natural extension of ecommerce assurance research to test the effect of the experimental manipulations on an actual behavior (or a choice). This will also enrich the study's external validity and avoid potential problems with tautological constructs.

**Probabilistic Mental Modeling**

Application of PMM theory to the online purchasing decision is a natural extension of prior research and complements the testing of prospect theory as an alternative explanation of framing effects. In the evaluation of a first time transaction between an online consumer and an unknown vendor, there are several uncertainties that may present themselves. However, the buyer could, based on prior purchasing experience, draw from a reference class of prior experience in purchasing goods and services, both online and through more traditional means, in order to create a reference class for an online transaction. Moreover, if the borrower does indeed evaluate the purchasing decision using PMM, then the choice shifts between manipulated option sets could easily be identified through the evaluation of the choices of subjects. The following hypotheses would outline the predictions of PMM in the online purchasing decision.

H1a: According to PMM theory, when the website is presented in a gain domain/positive frame, online consumers will choose the certain option (not to buy) over the risky option (to buy). When the website is presented in a loss domain/negative frame, online consumers will choose the risky option over the certain option.

H1b: According to PMM theory, when the website is presented in a gain domain/negative frame, online consumers will choose the risky option (to buy) over the certain option (not to buy). When the website is presented in a loss domain/positive frame, online consumers will choose the certain option over the risky option.

These hypotheses outline the importance of perceived problem domain. In PMM theory, the perceived problem domain is influenced by the problem frame. The framing is the choice driver in PMM, as discussed above, and the actual problem domain is not relevant. However, when the decision maker perceives that the problem domain is gain,

they are risk-averse, and when they perceive the problem domain as a loss domain, they are risk-seeking, regardless of which theory you are testing. The difference lies in which problem manipulation, domain or frame, determines the perceived problem domain. In Prospect theory, it is the actual problem domain that drives the perceived problem domain and in PMM theory, it is the problem frame. Prospect theory is tested in another study and not presented here.

**Moderating effect of assurance structures**

The role of assurance structures has been tested in the ecommerce context. (Kovar et al., 2000; Mauldin and Arunachalam, 2002; Odom et al., 2002; Pennington et al., 2003-4; McKnight et al., 2002) The findings of this research have generally shown that assurance structures help to increase trust and/or purchase intentions of potential online consumers. This was, however, tested without consideration of the risk associated with the transaction.

Since assurance structures are supposed to address concerns about risk associated with the transaction online, consideration of the factors, namely the problem frame and perceived problem domain, which affect the consideration of risk, is of paramount importance. In this study, the interaction of the assurance structure and the factors used to determine the perceived problem domain is not hypothesized to change the perception of the online consumer as to whether the problem domain is gain or loss, rather, it is hypothesized that the actions of the subjects in the perceived problem domain of gain when assurance structures are present will reverse. Consider the following option set under PT with a perceived problem domain of gain and positive frame:
Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows: If Program A is adopted, 200 people will be saved.
If Program B is adopted, there is 1/3 probability that 600 people will be saved and 2/3 probability that no people will be saved.

By introducing assurance structures, we are adding specific information that addresses one half of Program B that reads ”2/3 probability that no people will be saved”. Those assurance structures would provide information specifically addressing the risks associated with the risky option and increasing the likelihood that the particular undesirable consequence under consideration is null. Therefore, increasing the probability of the occurrence of the consequence in the first half of Program B to ”3/3 probability that 600 people will be saved” or 600 people will be saved. In the presence of assurance structures, undesired consequences are eliminated and then the choices as perceived by the subject are:
If Program A is adopted, 200 people will be saved.
If Program B is adopted, 600 people will be saved.

Obviously, the choice of Program B is the best choice. If the hypotheses H1a and H1b were supported, the result would be a choice reversal of the prediction of PMM. According to Kahneman and Tversky (1979, 282), the simplification of prospects in the editing phase can lead the individual to discard events of extremely low probability and to treat events of extremely high probability as if they were certain. So, with the

introduction of the assurance structures, the prospects can be simplified such that the probability weights of the second part of Program B (”2/3 probability that no people will be saved) are judged as extremely unlikely and are discarded. The probability of the other part (1/3 probability that 600 will be saved) becomes more likely, so much so, that the decision maker treats this highly likely event as certain. Thus, leaving the decision maker only one rational choice. Regardless of the perceived problem domain, the risky option is the most chosen option.

This would mean that assurance structures would cause a choice reversal in the perceived gain domain but not in the perceived loss domain as the risky option simply becomes more desirable under the loss scenario. The following hypotheses attempt to test these propositions of the moderating effect of assurance structures drawn from the literature.

H2a: When the perceived problem domain of the decision maker is a gain, the presence of assurance structures will cause a choice reversal such that the perceived risk of the risky option (to buy) is eliminated and the decision maker will choose the risky option (to buy) over the certain option (not to buy).

H2b: When the perceived problem domain of the decision maker is a loss, the presence of assurance structures will not significantly affect the decision maker’s choice between option sets.

## EXPERIMENTAL DESIGN

### Subjects

Subjects were 400 undergraduate students recruited from accounting and management classes at a major university in the Midwest. After removing unusable responses, 337 useable responses were analyzed. Any completed questionnaires with incorrect answers to the lottery ticket manipulation questions were considered unusable and removed from the analysis.

Fifty-five percent of the subjects indicated that they spent 10 hours or more on various activities on the Internet. Ninety-three percent had made at least one purchase on the Internet and sixty-eight percent responded that they made at least one purchase on the Internet per semester. The subjects were composed of 202 males and 135 females. The average age of the subjects was 22.2 years old. The average yearly reported income (including parents’ income if they lived at home) was $16,310. (See Table 1) Based on these findings, it was determined that the subjects had the opportunity, experience, knowledge and income to serve as excellent sample of potential Internet consumers.

The students were solicited for voluntary participation in the study. The incentives for participation were twofold: First, the students received nominal extra credit in most instances for participation by their respective instructors and secondly, five prizes of $200.00 each were to be awarded among the participants. The extra incentive of the lottery prize was included in the study to increase the probability that the solicited potential participants would desire to participate and to help operationalize a personal interest in the outcome of the decision task as is described below.

**Selection of Sample Size and Power**

Sample size and power were determined a priori using a sample size calculator provided online by DSS Research: http://www.dssresearch.com/toolkit/sscalc/size_p2.asp. This company is a full service healthcare marketing research and consulting firm. This calculator requires the input of the expected percentages for each sample, the alpha level and the desired power. By entering ninety percent for sample one, 70 percent for sample two (a twenty percent difference which is practically significant), an alpha of .05 and a beta of .20, the calculator indicated the need for a sample of 25 per cell. The final sample size and percentage spread among groups in the study lead to realized power of 70 percent due to the reduced sample size for those entries that had to be eliminated. However, this level of power was considered sufficient to continue the chi-square analysis.

**Task**

Subjects assumed the role of an Internet consumer. Their task was to evaluate an online purchase decision made by the experimenter and determine whether it was a bad decision or a good decision. The story line was that the experimenter had purchased a box set of "The Beatles" from an online retailer. The purchase was recently made and therefore the results of that purchase had not been determined. The subjects were to determine if the purchase was a good decision or a bad decision as outlined in the instructions. To accomplish this task, they viewed the website and then determined whether they believed that the purchase would meet defined criteria included in the experimental materials. The number of lottery tickets earned by the subjects was tied to their accurate evaluation of the outcome of the online purchase decision made by the experimenter.

**Procedures**

The pool of possible participants was chosen from students enrolled in two management classes and five accounting classes. Some of the classes were lower division and some were upper division. The instructors of the classes gave permission for the experimenter to visit the class to read an invitation to participate in the experiment. A series of possible participation times were given to the participants, which varied from class visit to class visit. This was done to ensure that the students visiting the experimental laboratory were spread across the available times.

The experimental materials were collated by the experimental conditions with one set placed in front of each computer in the laboratory. As each participant completed the data collection materials, a new set was placed at that computer from the top of the stack. That ensures that regardless of the session in which a participant attended, the subjects were assigned to conditions randomly. Measures were taken to ensure that the computers assigned to participants that were in the participant's line of vision were assigned the same website. In that way, the participant that looks around during their evaluation, at the computers next to them or those in the opposite row but in their line of vision, the same website would be viewed as they are viewing on their own computer. This was

necessary to ensure that the participants were not aware that two websites were being used as this would destroy the ruse that this was a "real" website.

The subjects were asked to sign in as they arrived at the laboratory and choose any computer that was available. Allowing the subject to choose the workstation also increased the randomness of the condition assignment. At each workstation, there was an Internet enabled computer and a set of experimental documents. The experimental documents consisted of instructions for the task and a data collection envelope.

The subjects were instructed to read the instructions carefully as the experimental task was explained therein. At the conclusion of the instructions, the subjects were asked to log on to the computer using their regular login ID. The laboratory used for the experiment was the same computer laboratory that the students often use to complete assignments, check their email and surf the web. Therefore, most students were well aware of how to log into the computers. Those students who needed help were asked to raise their hands and wait for an experimenter to come by. The instructions included a website for the students to evaluate. Two websites were used and were completely crossed with the framing conditions.

Both websites were fictional and created for the purpose of the study. The participants were instructed in the instructions that the websites were real and that the purchase that they were evaluating was made from the website that they were viewing. The websites were identical except for the presence of assurance structures and the web address. The students were given a website in the instructions to log onto in Internet Explorer. The act of having the student type in the web address helped to increase illusion that they were visiting an actual online retailer. The choice of product in this study was important for a number of reasons. The product chosen, music CDs, was considered a product familiar to the subjects. There are many retailers on the web selling CDs so the fact that this retailer was unknown to the subjects was not considered to be a cue that the retailer was fictional. The website was designed to give the impression that this was a small retailer specializing in vintage rock 'n roll. This specialization would also help to keep the subjects from questioning the authenticity of the website based on the fact that they are not familiar with the retailer.

Another important product consideration deals with the ability of the subject to quantify the opportunity costs associated with not making a purchase from the website. The reason given to the subjects for choosing this website for the purchase was the greatly reduced cost of the set from this retailer which was quantified. If the subjects choose that the purchase was a bad decision, they can quantify exactly, in terms of dollars, the opportunity cost of that decision. The opportunity cost would be constant across subjects. A music CD would be considered a search good and this is a product from which the quality does not change from retailer to retailer and is often purchased without having any previous experience with the chosen item. In contrast, an experience good is one in which the consumer often wants to try the product first. Examples would be clothing, food, and perfume. With an experience good, the lack of ability to touch, feel, taste, smell or see prior to purchase could have effects on the decision of the participant. The use of a search good helps to control for this factor. The selection of "The Beatles" as the music was chosen also because participants were more likely to be familiar with their work and increase the categorization of this set as a search rather than experience good. The subjects were able to spend any amount of time they deemed

necessary to make a decision about the online retailer and its ability to meet the established criteria.

After they were finished viewing the website, they were instructed to open the Data Collection envelope and completely fill out the questionnaire. The data collection consisted of obtaining the decision of the participant, manipulation checks, demographic information, risk propensity and personal contact information. The actual decision of the participant was whether or not the purchase from the viewed website was a good decision or a bad decision. A good decision means that the purchase would meet the criteria spelled out in the instructions. A bad decision means that the purchase would not meet the criteria. Their decision would measure the subject's intention to make a purchase from the website. If the subjects choose that the decision was a good decision, then they would have more intention to purchase from the website than a subject that chooses that the decision was a bad decision. Since this choice in itself does not have personal consequences to the subject, another manipulation was included to tie the decision of the participant to a personal stake in the outcome of the purchase. Since online consumers have a personal stake in the outcome of their online purchase decisions, this manipulation was intended to increase both the external validity and construct validity of the decision of the participant.

Each subject had the opportunity to either gain or lose tickets in the lottery depending on the outcome of the experiment. Two conditions, gain and loss, were created using lottery tickets. The subjects in the gain condition were given 100 tickets in the lottery just for participation in the experiment. If they choose that the decision was a good one, and thus decided to take a risk on the retailer, they were subject to one of two possible results:

1) If the retailer performed as agreed and the purchase met the criteria set out in the instructions, then the subject would gain 1000 tickets, or

2) If the retailer failed to perform and the purchase did not meet the criteria set out in the instructions, then the subject would not gain any additional tickets.

This manipulation modeled the possible consequences in an actual purchase on the Internet. When an individual makes a purchase on the web, the outcome of the decision to make the purchase will result in good or bad consequences to the consumer.

Alternatively, if the subject chose, they could decide that it was a bad decision, thereby predicting that the criteria set forth would not be met, and in this case, they would automatically gain 500 tickets in the lottery.

Note that the expected gain to the participant is 500 tickets regardless of the option chosen. If the risky option is chosen, the expected gain is 1000*.50 + 0*.50 or 500 tickets whereas in the second option the 500 gain is assured. This manipulation has important implications to testing PMM. It is critical in PMM that the two options differ in risk not expected gain. The loss condition was set up in a similar manner. In the loss condition, the participants were given 1000 tickets for participation and, if they choose the risky option, they could lose 0 tickets if the purchase met the criteria or 500 if the purchase did not meet the criteria. For the certain option, they would choose this option and automatically lose 500 tickets. These two scenarios, loss and gain, were crossed with each website, for a total of 8 separate conditions. The manipulation checks in this study consisted of a series of three questions that were designed to ensure that the subjects understood what they had to either gain or lose by their choice.

Of the 400 collected responses, 337 answered the questions concerning the number of lottery tickets at risk correctly. Only the responses that answered the questions correctly were included in the data analysis. The next section collected demographic information about the subjects.

The subjects also completed a series of six questions designed to gage their risk propensity in general. These questions were assigned to conditions randomly from a possible twelve questions in the Kogan and Wallach Choice Dilemmas Questionnaire (CDQ) (Kogan and Wallach, 1964) Because the entire survey included 12 scenarios, it would be lengthy for the participants to complete the entire 12 scenarios along with the rest of the participation requirements, each experimental condition included 6 of the 12 chosen randomly. Finally, the subjects were asked to provide their names, email addresses and their telephone numbers so that they could be contacted in case they were winners in the lottery.

The 400 participants' personal information was entered into a Microsoft Access database with an index number being automatically entered for each record. After the information was entered, a random number generator at www.random.org selected 5 numbers ranging from 1 to 400. These numbers were matched to the index numbers assigned to the participants and the names of the winners were selected. The winners were notified and collected $200 dollars each. The names of the winners were not released due to privacy concerns.

JSB

**Experimental design**

Two factors were varied in the experiment: presence of assurance structures (present/not present) and the problem domain (gain/loss). The dependent variable was the choice of the participant. If the participant chose that the purchase was a good decision (the risky option), they exhibited a preference for risk. This preference for risk arises from the fact that the expected value of both options would be the same; therefore, choosing the risky option manifests their risk preference. If the participant chose the certain option, then they exhibited no preference for risk. The dependent variable would be measured as the proportion of the total participants that chose each of the options: risky vs. certain.

## RESULTS

**Testing of the hypotheses**

H1a and H1b are designed to test Probabilistic Mental Modeling. H1a was testing by examining the choices made by the subjects in cells 1 and 3 as outlined in Table 2. Cell 1 was significant (Chi-square =13.889, p=.0002), and in the right direction. Cell 3 was significant and in the right direction. (Chi-square =4.122, p=.0423), H1 is supported by the results.

H1b is not supported by the data from the experiment. Although cells 2 and 4 were significant, the choices of the subjects of the certain option over the risky option are not consistent with the predictions of Probabilistic Mental Modeling. Therefore, there was no support for H2b.

Overall, the results of the testing of H1a and H1b seem to provide partial support for Probabilistic Mental Modeling as a theory that explains behavior in the online environment.

**Testing of the Interactive Effects of Assurance Conditions**

H2a and H2b outline the proposed interactive effects of assurance structures and the framing effects in the ecommerce context. H2a predicted a choice reversal in the perceived gain domain. In the gain domain, the subjects would be expected to choose b over a, but with assurance, the choices would reverse such that subjects would prefer a over b with the assurances on the website.

To test H2a, a two-step approach was used. First, the cell frequencies were tabulated to determine if a choice shift or choice reversal occurred. Secondly, a Chi-square test of independence was run to determine if the change was significantly related to the assurance condition. In the assurance condition, 53 subjects in the gain domain choose the risky option and 38 choose the certain option. In the no assurance condition, 24 subjects choose the risky option and 65 choose the certain option. Table 3 summarizes the counts in each experimental condition. This is direct evidence of a choice shift as predicted by H2a. In the second step, the chi-square test of independence demonstrated that assurance was a significant factor in the choice of the subject. (Pearson Chi-Square=17.98, $p<.001$) H2a is supported. (See Table 3) In the no assurance condition, H2b was partially supported.

At this point, the author hesitates to analyze the results for the loss domain. In the assurance condition, those subjects in the cell intended to act in a loss domain chose A over B at 37/44. In the no assurance condition, the subjects chose A over B at 22/54. (See Table 3) This shows a slight choice shift, yet not a reversal as in the groups intended for the gain domain. One possible explanation is that some of these subjects did perceive a loss domain as intended by the study, yet not a majority. This optimistic explanation should prove fertile ground for further testing in this field of inquiry.

The chi-square test of independence found that assurance was significant in the choice of the subjects. (Pearson Chi-Square = 4.679, $p = .031$) (See Table 3) This finding did not support H2b, which predicted that assurance would have no effect on the subject in the risk seeking condition of a perceived loss domain. H2b was not supported. Although H2b is not supported, the choice shift found in the loss domains, rather than reversal found in the gain domains, does indicate that it is possible that assurance structures do have differential effects based on the perceived domains of the decision maker in the ecommerce context.

## IMPLICATIONS, LIMITATIONS, AND FUTURE RESEARCH

One of the main questions being addressed in this study was the effect of framing on choices of consumers in the ecommerce environment and whether assurance structures moderate those effects. The evidence strongly suggests that framing effects are present in the ecommerce environment and that assurance does interact with those effects to alter choices by individuals. The implications of this research are far reaching.

First, this research helps researchers understand more about the nature of decision making in the ecommerce environment. This study provides the first evidence of framing effects in the ecommerce environment. For at least the gain domain, framing effects were found that significantly altered the choices of the decision maker under uncertainty. This study also extends prior research by tying the outcome of the decision to a personal consequence of the decision maker.

It was suggested earlier that McKnight et al. (2002) might have created a ”loss” domain in his study of trust in the online environment by tying the answers to certain manipulation checks to the extra credit points of the subjects. The lack of a choice reversal under conditions of assurance in the “loss” domain in this study when compared to the total choice reversal under conditions of assurance in the “gain” domain provides some evidence to support this conjecture.

For the accounting profession, important evidence of the overwhelming power of assurance for decision-making under uncertainty is presented in this study. Although this study did not test assurance that is specifically provided by CPA’s such as the WebTrust seal, it is important to understand as much as we can about both the extent and the strength of assurance in the contexts in which CPA’s and the profession as a whole intend to market their services. Perhaps, based on the findings of this study, assurance serves a more useful purpose in potential “gain” domain ecommerce contexts than in the ”loss” domain contexts. This information could be used to market and target these types of assurance services in the assurance market.

Another limitation of this study was the use of student subjects. The student subjects were good proxies for online consumers but the use of online consumers would have given increased external validity to the study. The student subjects did have an interest in the outcome of the purchase decision and their personal outcome in the transaction was dependent on them making a good decision. Yet, the use on online consumers in real dollars transact ions would have had greater utility. Future research should focus on creating and testing a loss domain. The main issue to address here is how to create a loss to the subjects within the confines of the ethical guidelines of the academic environment. In this study, the plan was to give the subjects 1000 tickets and then they would lose from that point. However, the subjects did not perceive this as much of a loss as they did a gain. Further research should endeavor to find new and creative ways to address this issue successfully.

Table 1 Key Demographic Data

How many hours per week do you spend on various activities using the Internet?

| Choice | Frequency | Percentage |
|---|---|---|
| Less than 10 hours per week | 151 | 44.8 |
| 10-20 hours per week | 143 | 42.4 |
| More than 20 hours per week | 42 | 12.8 |
| Total | 337 | 100.0 |

How often do you make purchases on the Internet?

| Choice | Frequency | Percentage |
|---|---|---|
| Never | 25 | 7.4 |
| Only once | 26 | 7.7 |
| Once per year | 56 | 16.6 |
| Once per semester | 121 | 35.9 |
| Once per month | 92 | 27.3 |
| Once per week | 15 | 4.5 |
| Several times per week | 2 | .6 |
| Total | 337 | 100.0 |

| | Mean | Std. Deviation |
|---|---|---|
| Age | 22.22 | 5.30756 |
| Income | $16,310.03 | $30,872.45 |

Table 2 Cell Comparisons
Probabilistic Mental Modeling
(No Assurance condition)

| | Domain | |
|---|---|---|
| | Gain | Loss |
| Positive Frame | Cell 1<br>(10/35)<br>$p < .01$ | Cell 3<br>(14/27)<br>$p < .05$ |
| Negative Frame | Cell 2<br>(11/34)<br>$p > .05$ | Cell 4<br>(11/33)<br>$p > .05$ |

H1a: Both 1 and 3 tested
H1b: Both 2 and 4 tested

In parentheses: (# who chose Risky option/# who chose certain option) for each cell.

Table 3 Chi-square test of independence

Gain condition

| | | | Assurance | No assurance | Total |
|---|---|---|---|---|---|
| Choice | Risky option A | Count | 53 | 24 | 77 |
| | | Expected Count | 38.9 | 38.1 | 77 |
| | Certain Option B | Count | 38 | 65 | 103 |
| | | Expected Count | 52.1 | 50.9 | 103 |
| Total | | Count | 91 | 89 | 180 |
| | | Expected Count | 91 | 89 | 180 |

| | Value | Asymp. Sig (2-sided) | Df |
|---|---|---|---|
| Pearson Chi-square | 17.980 | .000 | 1 |
| Continuity Correction | 16.725 | .000 | 1 |
| Likelihood Ratio | 18.335 | .000 | 1 |

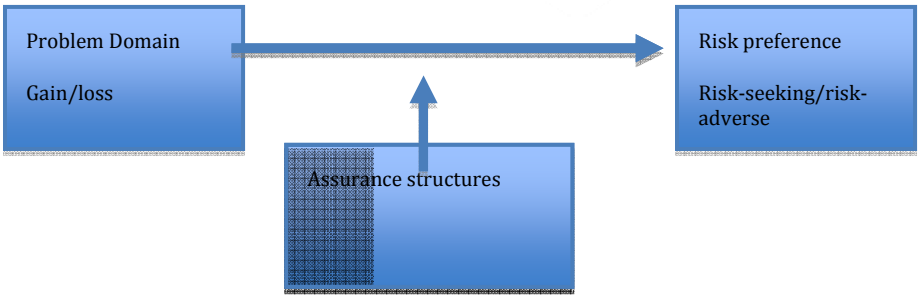
Loss condition

| | | | Assurance | No assurance | Total |
|---|---|---|---|---|---|
| Choice | Risky option A | Count | 37 | 22 | 59 |
| | | Expected Count | 30.4 | 28.6 | 59 |
| | Certain Option B | Count | 44 | 54 | 98 |
| | | Expected Count | 50.6 | 47.4 | 98 |
| Total | | Count | 81 | 76 | 157 |
| | | Expected Count | 81 | 76 | 157 |

| | Value | Asymp. Sig (2-sided) | Df |
|---|---|---|---|
| Pearson Chi-square | 4.679 | .031 | 1 |
| Continuity Correction | 3.993 | .046 | 1 |
| Likelihood Ratio | 4.719 | .030 | 1 |

JBSB

Figure 1. Research model




Construct Definitions

Actual Problem Domain is the actual domain of the problem is determined by whether the problem centers on a potential gain in utility for the decision maker or a potential loss in utility for the decision maker. The domain is determined by the shift from the reference point, 0, to some other point with a utility either positive or negative. (Kahneman and Tversky, 1979)

Problem frame is determined by use of negation in the choice alternative and the use of heuristics. For example, 20 out of 100 lives saved means the same as 80 out of 100 lives not lost. In both cases, the actual problem domain is a loss but they are framed positively by the use of "saved" and "not lost". The use of the words "lost" or "not saved" would frame negatively. (Kuhberger, 1995)

Assurance Structures are statements, promises, guarantees, logos, symbols and any other structural components of a website intended by the vendor to reduce perceptions of exposure to loss in transactions on their website. (Bahmanziari and Odom, 2009)

Risk preference refers to the choice of the decision maker. The risk preference of risk-seeking or risk-adverse is determined by the choice of the decision maker. A certain choice would identify the risk preference of the decision makers as risk adverse. The risky choice option, if preferred by the decision maker, would identify the risk preference of the decision maker as risk-seeking. This factor is the result of the manipulation of the actual problem domain and the problem frame. (Chang et al., 2002)

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