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Ignorance is bliss: the information malleability effect

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IGNORANCE IS BLISS: THE INFORMATION MALLEABILITY EFFECT

by

Himanshu Kumar Mishra

An Abstract

Of a thesis submitted in partial fulfillment
of the requirements for the Doctor of
Philosophy degree in Business Administration
in the Graduate College of
The University of Iowa

July 2006

Thesis Supervisors: Assistant Professor Dhananjay Nayakankuppam
Associate Professor Baba Shiv

ABSTRACT

In this dissertation, I propose that, post-action, people tend to be more optimistic about outcomes when their actions were based on malleable (vague) information compared to when their actions were based on unmalleable (precise) information. However, pre-action, no such difference occurs. I term this inconsistency in optimism in the pre and post-action stage, the Information Malleability Effect (IME). These actions could include the choice of a product, drawing a ball from an urn, or consumption of a food item.

Prior research on ambiguity aversion has reliably documented that people are generally averse to making decisions based on malleable information. On the other hand, research on situated optimism has demonstrated that people exhibit a high level of optimism for events they consider more desirable and they distort the available information to make the desirable events seem more likely to occur. I review these two streams of literature and show that although both literatures make predictions in either the pre or the post-action stage, neither of them alone can explain the IME. I propose a theoretical framework to explain the underlying cause of the IME that combines these two streams of literature and utilizes the motivated reasoning account. Based on this framework, I posit hypotheses that are tested across a series of experiments. Experiment 1a and 1b demonstrate the IME in a between and within participant design. Experiment 2 demonstrates that interpretational flexibility of malleable information results in positive outcomes appearing more plausible and negative outcomes less plausible compared to

when information is unmalleable. Experiment 3 provides support for the proposed underlying process by priming accuracy and desired goals.

Abstract Approved:

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Iowa City, Iowa

CERTIFICATE OF APPROVAL

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PH.D. THESIS

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This is to certify that the Ph.D. thesis of

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has been approved by the Examining Committee
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To Amma and Papa

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I came to the University of Iowa to study the quantitative aspects of marketing but both Baba and DJ introduced me to the exciting world of consumer decision-making research and converted me completely. They both became my advisors and walked me through the entire PhD program. I am indebted to them for making my doctoral program a great experience.

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In this dissertation, I propose that, post-action, people tend to be more optimistic about outcomes when their actions were based on malleable (vague) information compared to when their actions were based on unmalleable (precise) information. However, pre-action, no such difference occurs. I term this inconsistency in optimism in the pre and post-action stage, the Information Malleability Effect (IME). These actions could include the choice of a product, drawing a ball from an urn, or consumption of a food item.

Prior research on ambiguity aversion has reliably documented that people are generally averse to making decisions based on malleable information. On the other hand, research on situated optimism has demonstrated that people exhibit a high level of optimism for events they consider more desirable and they distort the available information to make the desirable events seem more likely to occur. I review these two streams of literature and show that although both literatures make predictions in either the pre or the post-action stage, neither of them alone can explain the IME. I propose a theoretical framework to explain the underlying cause of the IME that combines these two streams of literature and utilizes the motivated reasoning account. Based on this framework, I posit hypotheses that are tested across a series of experiments. Experiment 1a and 1b demonstrate the IME in a between and within participant design. Experiment 2 demonstrates that interpretational flexibility of malleable information results in positive outcomes appearing more plausible and negative outcomes less plausible compared to

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CHAPTER 1: INTRODUCTION

In the pantheon of Greek mythology is the description of the River Lethe, one of the five rivers that flowed through the underworld. It was named after the Goddess Lethe, the goddess of oblivion. True to its name, the water of the river Lethe allowed absolution from one's past memories and gave a chance to start life anew with no past memories and no knowledge of the what the future holds; a state of bliss in the absence of prior knowledge. Now imagine such a river flowing in our vicinity. Would we be interested in drinking water from this river? Perhaps not! We usually want to acquire as much information as possible to predict future events. Thus, it is difficult to imagine drinking from the River Lethe simply because taking any decision without any prior knowledge would be an immensely uncomfortable experience for us. However, information can be available in various forms.

In this dissertation, I examine one aspect of possessing different forms of information and its resultant outcome. Specifically, I propose that people predict more favorable outcomes when their actions are based on vague information compared to when their actions are based on precise information. These actions could be the choice of a product, drawing a ball from an urn, or the consumption of a food item. Further, I propose that people display an internal inconsistency whereby prior to taking an action, they display less optimism with an option with vague information but after taking the action they display more optimism. However, no such difference in pre and post-action optimism emerges for actions based on precise information.

Before I discuss and provide evidence for the proposed phenomena, I would like to define some terms to lend clarity to the exposition.

Definitions of terms used in this dissertation

The first term deals with the form or structure of the available information. Existing research uses different terms to define precise and vague information. Precise information is variously called clear or unambiguous information and vague information is also called missing or ambiguous information. Irrespective of the term used, there is a fundamental difference between these two types of information; vague information is malleable and it can be interpreted in several different ways but precise information has just one interpretation. In this dissertation, I use the term "information malleability" to describe the flexibility with which the information can be interpreted. In subsequent discussions, I will use the term malleable information to mean vague information that can be interpreted in several different ways and unmalleable information to mean precise information, which has just one interpretation. For instance, Einhorn and Hogarth (1985) consider information to be on a continuum where risk is at one extreme and ignorance is at other with uncertainty in between. Using the information malleability paradigm I would conceptualize such a continuum to move from low to high information malleability. The available information that lends itself to just one interpretation forms one end of the continuum (e.g., readily available probability estimates for a risky situation) whereas highly malleable information (e.g., decision made under vague information or in ignorance) that can have several interpretations forms the other end of the continuum.

The second term that I define deals with optimism. I use optimism as a dependent measure, therefore it becomes pertinent to clarify its exact meaning. In this dissertation, optimism refers to situated optimism, which is defined as optimism induced due to the task structure (Armor and Taylor 1998). In situated optimism, the demand of the situation and the immediate needs of the individual determine the strength of optimistic expectancies. It is different from dispositional optimism, which is defined as a more personality level variable and sometimes considered confounded with negative affectivity (Smith, Pope, Rhodewalt, and Poulton 1989).

Optimism can be measured in several different ways (Armor and Taylor 1998). First, it can be measured by comparing expectancies with the real outcome, such as the comparison of a students expected grade with her actual grades. Second, the performance of others also works as a benchmark to measure optimism. A doctoral student, who expects to defend her thesis in 2 years when on average students take 4 years, can be called an optimist. A third way of measuring optimism is comparing self-expectations with predictions of other people. An assistant professor would be considered optimistic, if he expects to get tenure within 2 years of joining a university when senior professors generally predict 6 years. Fourth, the likelihood assessment that more positive and less negative events will happen with self compared to others can be used to measure subjective or comparative optimism. Finally optimism can be measured in an ordinal manner (i.e., one can be considered optimistic or pessimistic only when one's expectations are compared with other's expectations or one's own earlier expectations). A student expecting a 'B' can be considered optimistic compared to another student who expects a 'C' but pessimistic compared to a student who expects an 'A'. Similarly, a

student, expecting an ‘A’ 3 months before the exam, can be considered pessimistic if she now expects to get a ‘C’. Measures of optimism used in this research are of an ordinal nature where optimism is measured by comparing one’s expectation with other persons’ expectations for the same target.

The first aim of my dissertation is to demonstrate the phenomenon where people prefer an unmalleable information option pre-action but show more optimism for a malleable option post-action. I call this phenomenon the Information Malleability effect (IME). The second aim is to find out the underlying process responsible for IME. The dissertation is structured in the following manner. I first provide initial evidence for the IME with two experiments. Second, I review literature on the effect of different levels of information on subsequent decision and the role of optimism in decision-making. Third, developing the reviewed literature I propose a conceptual model for the cause of the IME. Finally, I test the conceptual model in experiment 2 and experiment 3.

CHAPTER 2: EVIDENCE FOR THE IME

Experiment 1a: Demonstration of the IME

The objective behind conducting this experiment was to demonstrate the IME, where pre-action (in this case pre-choice) people prefer an unmalleable information option over a malleable information option. The heuristic used to prefer more information perhaps stems from a notion that more information is likely to ensure a positive outcome in the future. However, post-action a discrepancy should occur where people should become more optimistic with malleable compared to an unmalleable information option.

Method

One hundred and two participants took part in this experiment for partial course credit. Similar to experiment 1a, this experiment also utilized a betting scenario. However, unlike the first experiment, participants were presented with both the boxes. They were told that the first box contained 3 red and 3 blue balls and the second box had red and blue balls in an unknown proportion. Winning this bet required them to pick up a blue ball. First, they were asked to choose a box from which they wanted to pick up the ball. Their preference for a box served as an indicator for preference for a malleable versus unmalleable information options. Subsequently, the participants were asked to draw a ball. After drawing the ball but before knowing the outcome of their draw participants were asked to indicate how optimistic they felt that they had picked up a blue ball. Their optimism ratings on a 1(Not at all optimistic) to 7 (Very optimistic) scale

served as a measure for their post-action optimism for malleable versus unmalleable information options.

However, one could argue that observing a higher optimism with malleable information option compared to an unmalleable information option in post action could be driven by a self-selection bias. Research has shown that optimism is positively related to risk taking behavior (Ashford et al 1998; Felton, Gibson, and Sanbonmatsu 2003) and this suggests the possibility that people high on dispositional optimism may be more likely to choose the malleable information option and hence likely to show more optimism in the post action condition. In other words, this alternate account would suggest that observing more optimism with malleable, as opposed to unmalleable information, in the post action condition would not be caused by the malleability of the information but rather due to the dispositional optimism of individuals, who predominantly choose the ambiguous (i.e., malleable) option because they are more optimistic about their chances there. To address this concern, participants' dispositional optimism was measured in an unrelated task using the revised Life Orientation Test (Scheier, Carver, and Bridges 1994). (Please refer to appendix 1 for the revised LOT items). If dispositional optimism was causing the IME, then we should expect to see the following patterns of data. First, we should expect high optimism participants to show a disproportionate preference for the malleable option. Second, high optimism participants should show a stronger IME than low optimism participants. A similar pattern of optimism scores across high and low optimism participants would rule out the alternate account.

Results and Discussion

When participants were asked to choose between the box with red and blue balls in know and unknown proportion, 69.6% of the participants chose the box with balls in known proportion (i.e. 3 red and 3 blue, unmalleable information) while 30.4% chose the box with balls in unknown proportion (i.e., malleable information), $\chi^2(1)= 15.68$, $p< .0001$. This pattern of result is consistent with past research that shows people prefer precise information to vague information (Ellsberg 1961). However, an opposite pattern emerged when participants were asked, after drawing a ball but before knowing the outcome, to rate how optimistic they were that they have drawn a blue ball. Those who had drawn the ball from the box with balls in unknown proportion were more optimistic ($M = 5.05$) than those who had drawn it from the known proportion box ($M = 4.4$), $F(1, 100) = 9.14$, $p < .0003$. Figure 1 graphs these results.

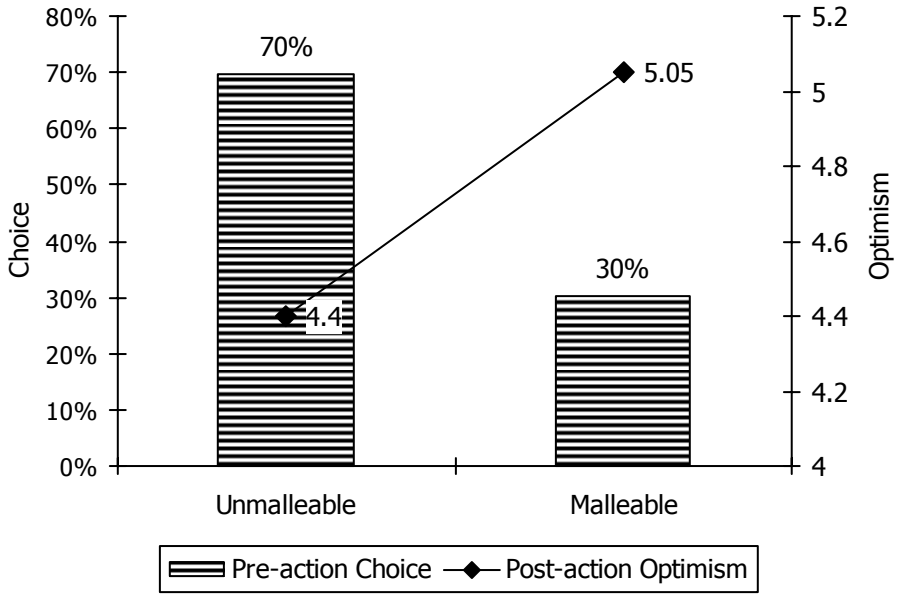

Figure 1: Choice and Optimism Ratings, Experiment 1a

To address the self-selection bias issue, the data was reanalyzed in four different ways. First, an analysis was run to find out if dispositional optimism scores were different across participants choosing malleable and unmalleable information option. No significant difference in dispositional optimism emerged across malleable ($M = 2.11$) and unmalleable information ($M = 2.34$) options, $F\ (1, 100) = 2.18$, $p = .14$.

Second, a logistic regression analysis was run to assess the influence of dispositional optimism on choice. The results show that dispositional optimism did not significantly influence the choice of the malleable information option (estimate = -.43, Wald's $\chi^2 = 2.12$, $p = .14$). This estimate indicates that the odds of choosing malleable option decreases by a factor of .645 (i.e. $e^{-.43}$) for every one point increase in the dispositional optimism score. Thus, individuals who are high on dispositional optimism are no more likely to choose the malleable option compared to individuals who are low on dispositional optimism.

Third, participants were divided into groups of high versus low dispositional optimists by performing a median split on their dispositional optimism scores. An analysis of variance using dispositional optimist (high vs. low) and choice (malleable vs. unmalleable) as independent variables and optimism to draw a blue ball as dependent variable yielded an insignificant dispositional optimist x choice interaction ($F < .05$). Thus, the tendency to become optimistic post-choice with malleable information is not moderated by dispositional optimism.

Fourth, an analysis was run to find out what percentages of participants who choose malleable or unmalleable option are dispositionally high versus low optimists. Results showed that of the participants who chose the malleable option, 38.7% were high

optimists and 61.3% were low optimists. The pattern was the opposite among participants choosing the unmalleable information option where 54.9% were high optimists and 45.1% were low optimists, although this reversal was not statistically significant, χ^2 (1) = 2.27, p =.13.

Recall that the self-selection hypothesis suggests that individuals who are dispositional optimists are more likely to feel optimistic about the ambiguous option, which they thus choose, and subsequently report a higher optimism for. Four different sets of results provide evidence inconsistent with the self-selection hypothesis.

Summary

Past research predicts the pattern of result obtained for the choice of the box; however, it does not predict the difference in optimism ratings that result post-choice, nor does it predict the internal inconsistency. One chooses a box only when he thinks that his chances of winning are higher with that particular box. Thus irrespective of the box participants chose, they should be equally optimistic about winning the draw. However, the difference in optimism ratings indicates an internal inconsistency shown by people where pre-action they prefer an option with precise information to an option with vague information. However, post-action they become more optimistic with the vague information. Although this experiment rules out self-selection hypothesis, demonstration of IME in a between subjects design would offer a more robust way to rule out this hypothesis.

Experiment 1b: The IME in a between-subjects design

The objective of this experiment was to demonstrate IME in a between subjects design. A betting scenario, with information presented in either a malleable or unmalleable form, was utilized to demonstrate the IME. An advantage of a betting scenario is that it avoids other potential confounds in testing the IME. Participants were asked to indicate their optimism about drawing a blue ball from a box, either pre or post-action. The design was a 2 (information: malleable versus unmalleable) x 2 (action: pre-action versus post-action) between-subjects design.

Method

Seventy-six participants took part in the experiment and were randomly assigned to one of the four experimental conditions. They took part in the experiment one at a time and were shown a box and were told that the box contains blue and red balls, and picking a blue ball mean winning this draw. In the unmalleable information condition, participants were told that the box contained 3 red and 3 blue balls whereas in the malleable information condition participants were told that the box contained red and blue balls in an unknown proportion. Their task was to predict how optimistic they felt that they would pick up a blue ball on a 1(Not at all optimistic) to 7 (Very optimistic) scale. Participants in the pre-action condition made this prediction before picking up the ball whereas participants in the post-action condition made this prediction after picking up the ball but before knowing the outcome of their draw.

Results and Discussion

Analysis yielded a significant information x action interaction, $F(1,72) = 5.22$, $p < .02$. A decomposition of the interaction across pre and post-action conditions revealed that pre-action, there was no difference in optimism ratings of participants with malleable ($M = 4.01$) or unmalleable information ($M = 4.17$), $F(1,72) = .27$, $p > .6$[1]. However, post-action (i.e. after drawing the ball and before knowing the outcome), participants with malleable information were more optimistic ($M = 4.75$) than those with unmalleable information ($M = 3.95$), $F(1, 72) = 7.5$, $p < .007$.

A decomposition of the interaction across information conditions (i.e. unmalleable and malleable) revealed that for participants with unmalleable information, no significant difference emerged between pre ($M = 4.17$) and post ($M = 3.95$) action, $F(1, 72) = .54$, $p > .46$. However, participants with malleable information were more optimistic post-action ($M = 4.75$) than pre-action ($M = 4.01$), $F(1,72) = 6.23$, $p < .04$. Figure 2 graphs these results.

This experiment demonstrated that pre-action participants are mostly equally optimistic between the two information options however, post-action participants became more optimistic about their chance of winning the draw in the malleable information condition compared to the unmalleable information condition. In addition to demonstrating the IME, this experiment rules out self selection hypothesis as an alternate account.

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[1] The difference in means within the pre-action conditions ($M = 4.17$ vs. $M = 4.01$) was not statistically significant, a finding that is consistent with prior research (Fox and Tversky 1995). According to this research, aversion toward malleable information is more likely to manifest with a joint presentation of the "malleable" and "unmalleable" options; when the options are presented separately as in this and subsequent studies, aversion toward malleability or vagueness greatly diminishes, and sometimes even disappears.

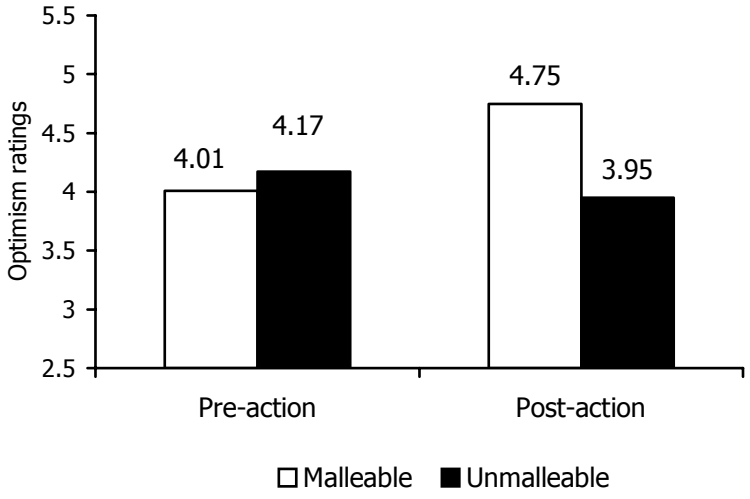

Figure 2: Optimism Ratings of Winning the Game, Experiment 1b

Taken together experiments 1a and 1b provide initial evidence for the occurrence of the IME and demonstrate its robustness across between and within-subject experimental designs. In the following section, I review existing literature, which provides the building block for my conceptualization of the cause of the IME. The first stream of literature deals with the form of given information, whether it is malleable (ambiguous) or unmalleable (unambiguous), its characteristics, and the resultant preferences. A general finding has been that people are ambiguity averse and prefer unambiguous options over ambiguous options (Ellsberg 1961, Camerer and Weber 1992, Einhorn and Hogarth 1985). These findings would predict that those who bought a product based on malleable information would be less optimistic about a product's future performance compared to those who bought it on unmalleable information.

A second stream of literature on unrealistic optimism illustrates that cognitive and motivational biases are responsible for unrealistic optimism (Armor and Taylor, 1998).

The cognitive account states that selective cognitive processing both due to errors in the inferential process and due to scenario-based thinking cause unrealistic optimism. This account would predict that malleable information would provide greater flexibility in scenario based thinking and thus would cause optimistic predictions in both pre and post-action stage. On the other hand, the motivational account posits that unrealistic optimism emerges by making more desirable events seem more likely to occur. Assuming that post-action participants are more motivated than pre-action participants, the motivational explanation would predict a main effect of pre versus post-action where participants in post-action stage would be more optimistic than those in pre-action stage. Collectively, these findings on unrealistic optimism predict either a main effect of post and pre-action conditions (motivational account) or a difference between malleable and unmalleable information for both the pre and post-action conditions (cognitive account). Thus, neither account can be used to explain the interactions found in the results of experiments 1a and 1b.

I review both these streams of literature in the next section and show that although both literatures make predictions only in either pre or post-action, by combining these two streams of literature it is possible to explain the underlying cause of the IME.

CHAPTER 3: THEORETICAL BACKGROUND

In this chapter, I discuss two streams of literature- influence of information malleability on decision-making and unrealistic optimism before arriving at the conceptualized process for the IME.

Decision making with malleable information

Many decisions made in everyday life are based on malleable or vague information, which cannot be easily quantified (Fox and Tversky, 1995). This research can be traced a long way back to Knight (1921) who defined measurable uncertainty as having precise probabilities and unmeasurable uncertainty as something that cannot be defined in probabilistic terms. Ellsberg's (1961) influential work, called the Ellsberg paradox, is considered a major breakthrough in the topic of decision-making under ignorance. In Ellsberg's two-color problem experiment the participants were presented with two urns each containing 100 red and black balls. They were told that urn 1 contains 50 red and 50 black balls whereas urn 2 contains red and black balls in an unknown proportion. First they were asked whether they would like to bet on a red ball or on a black ball. Next they were told that if they bet on red and a red ball is drawn then they would get $100; similarly for black. The findings indicated that while most participants were indifferent between betting on either a red or a black ball, however, they preferred betting on urn 1, which contained red and black balls in an equal and known proportion. Such a preference was particularly intriguing as it violated the expected utility theory

since the total probability summed to one for both the urns and hence participants should have been indifferent between the two urns. The preference for urn 1 suggests that the subjective probabilities of drawing a black or a red ball appear greater in the 50-50 urn than in the urn with red and black in unknown proportion and thus can not sum to one for both urns. Similar findings were obtained across numerous experiments using variations of Ellsberg's urn experiment (Camerer and Weber 1992) and the preference to bet on clear over vague events is called ambiguity aversion. In order to understand ambiguity aversion and its consequences I first elaborate on the meaning of the term ambiguous.

Information Vagueness or Ambiguity

Ellsberg (1961) defined ambiguous stimulus very succinctly; "as compared with the effects of familiar production decisions or well-known random processes (like coin-flipping or roulette), the results of Research and Development, or the performance of a new President, or the tactics of an unfamiliar opponent are all likely to appear ambiguous." (pp. 660-661)

Camerer and Weber (1992) traced the source of ambiguity to missing information and suggested the following factors that may cause ambiguity.

1) Ambiguity about probability: Knowledge about the probability structure of the stimulus gives rise to ambiguity. For instance, a dice with unknown number of faces will create ambiguity about the probability of getting a 1.

2) Source Credibility: Source credibility is a significant source of ambiguity. Product reviews given by a source whose credibility is not known creates a great deal of ambiguity about how reliable those reviews are. Conflicting reviews given by equally credible sources can also create ambiguity.

3) Weight of evidence: The weight of evidence can be defined as the available amount of information relative to the amount of conceivable information (also see Keynes, 1921). The difference is the amount of missing information, which may give rise to ambiguity.

Why do people avoid ambiguity?

Heath and Tversky (1991) aptly describes ambiguity aversion by stating that not knowing important information is upsetting and scary; it makes people shy away from taking either side of a bet. Whether it is fear of the unknown or the feeling that you lack information that others might have (Frisch and Baron, 1988, pp 153), research on ambiguity aversion shows a preference against the ambiguous option.

Various explanations for ambiguity avoidance can be broadly classified into three categories: cognitive, attributional/motivational, and behavioral ecology (optimal foraging theory). In the subsequent paragraphs I elaborate on each of the explanations.

The underlying assumption of the cognitive approach is that ambiguous probability information is transformed into a precise estimate (Ellsberg 1961; Einhorn and Hogarth 1985; Einhorn and Hogarth 1986; Curley and Yates 1989), which is used to calculate the option's expected utility. Therefore, the comparison is not between an unambiguous and ambiguous option, but between an option with a stated probability term and one with an estimated probability term. If the estimation rule is known for a particular subject, choices can be predicted. Different researchers have devised different estimation rules. Initially Ellsberg (1961) suggested an algorithm that is a linear combination of the expected value of the probabilities, the lowest possible probability and a parameter of the confidence for those estimations. Later, Einhorn and Hogarth

(1985) proposed an anchoring and adjustment mechanism to describe a probability estimation process from the ambiguous information. The first step in this estimation process is to fix an anchor by assigning a value to the unknown probability parameter. This value can be obtained from a variety of sources; for instance the best guess of experts in the area, previous information about the decision task or a number salient to the decision maker. The second step is the adjustment process, which involves mental simulation of possible probability values. The rationale for the simulation process is that in ambiguous situations probability can come from any one of a number of distributions. Thus, simulating various values of probability allows one to assess which distributions are more or less plausible and these simulated values are then incorporated into the adjustment term. Therefore, in the final model, the adjustment process nonlinearly transforms the anchor and the person arrives at the final estimation of the probability (adjustment). The claim made by these cognitive models is that ambiguity aversion occurs because the process people use to estimate the relevant probability parameter is inappropriate since it causes them to perceive the expected utility of the ambiguous option as lower than that of the unambiguous one.

The motivational explanation, on the other hand, suggests that the choice task is the place where ambiguity avoidance emerges. A comparison between the ambiguous and unambiguous option gives rise to motivational and attributional factors. For instance, Curley et. al (1986) showed that people choose an unambiguous option because it is easier to find reasons that support and justify such a choice. Fox and Tversky (1995) add on to this literature by stating in their 'comparative ignorance hypothesis' that people display ambiguity aversion only when the ambiguous and unambiguous options are

presented together and this aversion decreases substantially, and sometimes disappears, when the two options are presented separately. In other words, a joint presentation of the ambiguous and unambiguous options makes the vagueness (malleability) of the ambiguous option more salient and results in ambiguity aversion. A similar view holds that the unambiguous option makes us feel more competent and therefore a possible win can be attributed to competence whereas a possible win with an ambiguous option could be attributed to chance (Heath & Tversky, 1991).

Finally, the behavioral ecology based explanation follows the optimal foraging theory (Rode et. al. 1999), which suggests that avoidance of high variance outcomes is a predominant behavior among animals. Empirical studies of animal choice have demonstrated that under certain conditions, animals consider the mean and the variance of calories of available food options (Boneau & Cole, 1967). Specifically, if the mean calorie payoff is above the current need, animals choose the option with the lower variance whereas if their need is above the mean outcome they select higher variance options (Caraco, 1981). Such a strategy maximizes the probability of an organism's survival. Optimal foraging theory posits that choices between two options should reflect three parameters: (1) the need of the organism, (2) the mean expected outcome of each option, and (3) the variance associated with each option's outcome (Rode et.al 1999). Therefore, unknown probabilities (ambiguous options) are avoided because they co-occur with high outcome variability. However, if an organism's need were greater than the known option's expected mean outcome, it would display ambiguity-seeking behavior and choose the ambiguous (high variance) option.

Summary of the malleable versus unmalleable information literature

The information available to make any decision can vary on its level of concreteness. The available information can be very precise and unmalleable or it can be malleable and interpretable in different ways. For example, information about the proportion of red and blue balls in an urn constitutes precise and unmalleable information; however, merely knowing that the urn contains red and blue balls, without an exact estimate, constitutes malleable information. Ambiguous information can be construed in different manners. For instance, simply knowing that the urn contains red and blue ball can have interpretations ranging from "all balls are blue" to "all balls are red" with several combinations of red and blue balls in between. Multiple interpretations of ambiguous information make it malleable. On the other hand, unambiguous information can have only one interpretation. As demonstrated in the Ellsberg paradox and several demonstrations of ambiguity aversion, people are averse to malleable information. People prefer basing their decisions on unmalleable information. However, as highlighted by Fox and Tversky (1995), this aversion to malleable information reduces when comparison between information is made separately.

Influence of unrealistic optimism on decisions

Among the most prominent findings in the psychology of prediction is that individuals often nurture positive and sometimes unrealistic estimations of future events (Armor and Taylor 1998). Such optimism manifests itself in numerous forms. For instance, Buehler, Griffin and Ross (1994) document the planning fallacy, where people expect to finish a personal project in much less time than what it really takes to finish.

Similarly, when asked to predict the number of job offers, the magnitude of starting salary and the timing of the job offer, second year MBA students were found to overestimate their performance on all these three counts (Hoch 1985). Optimism also emerges in students' expectation of future grades - prior to taking an exam students expect to get higher grades than what they actually do get in the exam (Shepperd, Ouellette, and Fernandez 1996). Even experienced professionals are not immune to such unrealistically optimistic predictions. Calderson (1993) found that professional financial analysts consistently overestimated the earnings realized. It is interesting to note that many of these optimistic biases occurs even when people acknowledge that many of the predictions made by them in the past were unrealistic (Buehler et al. 1994). Optimism is said to stem from both cognitive and motivational sources and I review both these sources in the following section.

Cognitive sources of optimism

Predicting the future is inherently a biased process where biases in predictions emerge due to the mental construction of future events (scenarios) while making the predictions (Buehler, Griffin and Ross 1995; Griffin, Dunning and Ross 1990; Johnson and Sherman 1990; Klayman and Shoemaker 1993). Cognitive processes used to predict the future give rise to unrealistic optimism. Two broad categories of cognitive processes are responsible for optimistic biases in prediction. One is based upon how we infer the given information and make predictions and the second deals with how we construct scenarios.

Inferences drawn from the available information play a crucial role in predicting future outcomes. The inferences drawn are based on one's understanding of the world, on

prior experiences in similar situations, and on associations made with the information at hand. Research in decision-making (see e.g. Arkes and Hammond 1986; Hogarth 1987; Nisbett and Ross 1980) has documented several ways in which people's inference processes may be inadequate or inaccurate in handling complex situations. For instance, research on anchoring and adjustment has shown that people are often unduly influenced by an initial suggestion, even the ones they think they reject. This makes it highly plausible that one becomes optimistic about the future simply by considering a not-so-objective piece of information before making predictions about the future. Another inferential bias emerges when people become too satisfied with a single interpretation of the given information and are unable to generate alternative possible interpretations. Such a tendency is also known as focalism, which puts a ceiling on the quality of one's future predictions (Gilbert et al. 1998, Chambers and Windschitl 2004, see Schkade and Kahneman 1998 for a similar phenomenon called the focusing illusion). By interpreting the available information in a favorable manner, one can easily feel optimistic while there are several other ways where the same information can have an unfavorable interpretation.

The second cognitive source of unrealistic optimism is scenario based thinking, which focuses on goal achievement. For instance, asking a student to predict her success in an exam focuses her attention only on success to the exclusion of other factors that may hinder the achievement of success. In other words, people may generate scenarios about what they are capable of doing rather than what they are actually most likely to do (Armor and Taylor 1998). Buehler et al.'s (1994) findings on the planning fallacy provide the most direct evidence for this bias. In their first study, they measured the accuracy of

psychology students' completion-time estimate for their honors thesis. Results showed that students were overly optimistic about their completion time. Only 30 % of the students finished the thesis by the estimated time and when compared with their actual completion time, on average, students took 22 days more than they had anticipated. It is interesting to note that a majority (68% participants) of those who fall prey to the planning fallacy do recognize that in the past, they took more time than they had anticipated. Several subsequent experiments documented similar expressions of optimism in tasks ranging from home assignments, holiday shopping, income tax form submission etc. (Buehler, Griffin, and MacDonald 1997, Taylor, Pham, Rivkin, and Armor 1998).

It is argued that scenario-based thinking gives rise to unrealistic optimism by employing selective cognitive processing. First it focuses on case specific information and promotes a neglect of relevant base rate or statistical information that may be useful in making the prediction (Kahneman and Tversky 1982). Second the scenarios people create are themselves prone to bias. As the future is inherently ambiguous, there is enough latitude for people to perceive their future in an idealized manner (Dunning, Meyerowitz, and Holzberg 1989) therefore making them focus more on positive than on negative possibilities. As Kahneman and Tversky (1982) note, good scenarios - that is scenarios that are compelling and believed to be the most likely to come true - are the ones that bridge the gap between our present state and the desired state in easily imaginable steps. Hence, this lead to a selective search of memory to find ways to achieve success and a resultant neglect of possible impediments.

Motivational sources of optimism

Motivation greatly influences predictions about future outcomes by making more desirable events seem more likely to occur. The initial demonstration of such a influence of motivation goes back to Marks' (1951) work where he showed that research participants were more likely to predict they would pick a picture card from a mixed deck when this outcome was desirable than when it was undesirable. Research in different domains suggests that people would predict higher likelihood of events that they would like to see happen, a form of wishful thinking (Johnson and Sherman 1990, Taylor and Brown 1988). Such biases in prediction also emerge when people compare themselves with others. The desire to perceive themselves to be better than others results in people estimating a higher likelihood, compared to their peers, that they will experience a wide variety of pleasant events, such as liking their first job, getting a good salary, or having a gifted child (Weinstein, 1980). On the contrary, when asked their chances of experiencing various forms of negative events, including having an automobile accident (Robertson 1977), being a crime victim (Perloff & Fetzer 1986), having trouble finding a job (Weinstein 1980), or becoming ill (Perloff & Fetzer 1986) or depressed (Kuiper, MacDonald, and Derry 1983), most people believe that they are less likely than their peers to experience such negative events. Taylor and Brown (1988) aptly put this bias in the following statement - most people seem to be saying, "The future will be great, especially for me." These research findings seem to indicate motivational influences on prediction through a relatively mindless process: I wish for good health therefore I will not become ill or it is painful to contemplate a scenario where I don't get a job thus; I

predict that I will get a good job. Such instances highlight the purely motivational bias in prediction.

Summary of the causes of unrealistic optimism

As the above examination of the relevant literature attests, unrealistic optimism is very pervasive. The cognitive account suggests that unrealistic optimism is caused by errors in inferential process and due to scenario-based thinking, which gives rise to unrealistic optimism by employing selective cognitive processing. The motivational account posits that unrealistic optimism emerges by making more desirable events seem even more likely to occur.

Can ambiguity aversion or unrealistic optimism predict the findings of the IME?

First, the findings from the literature on ambiguity aversion would predict that in the pre-action condition a decision maker is likely to prefer the unmalleable information option over the malleable information option. This literature is however silent about people's preferences in the post-action condition. However if we extrapolate the findings from the pre-action condition to the post-action condition, then this literature would presumably predict that preferences should remain the same with the decision maker avoiding the ambiguous or malleable information option. Thus, in both pre and post-action, a decision maker who made a choice based on ambiguous information would be less optimistic about the performance of the product compared to one who used unambiguous information to arrive at the final choice. In other words the literature on

ambiguity aversion would fail to adequately explain the IME.

Second as discussed in the previous section, the two prominent sources of unrealistic optimism are cognitive and motivational. However, neither of them can predict the results of experiments 1a and 1b. First, consider the cognitive explanation. It posits that people base their predictions on mental simulation of all the activities they would engage in to achieve the desired outcome and ignore their experiences with the similar tasks. Hence it can be argued that participants with highly malleable information would have more flexibility in constructing the mental scenarios compared to the participants with less malleable information. As the desired outcome in both pre and post-action is drawing the winning ball, the cognitive explanation would predict that participants with malleable information would be more optimistic than the participants with unmalleable information. However, this prediction is inconsistent with the findings of the first two experiments.

The motivational explanation of optimism hypothesizes that more desirable outcomes are perceived as more likely to happen. Winning money presumably is a desirable outcome and, therefore, the motivational explanation would predict no difference in optimism levels in the two information conditions. Even if we assume that post-action participants are more motivated than pre-action participants, the motivational explanation merely predicts a main effect of pre versus post-action where participants who have already drawn the ball but do not know the outcome will be more optimistic compared to participants who have not yet drawn the ball. However, the motivational explanation makes no prediction about the interaction of information malleability with pre-post-action.

Thus, both these streams of literature individually are unable to explain the findings of experiment 1a and 1b completely. In the next section I propose an underlying process responsible for IME by combining the research on motivational influences on cognition with information malleability.

CHAPTER 4: CONCEPTUALIZATION

As evident from the discussion of the literature on ambiguity aversion and unrealistic optimism, no one explanation can completely account for the observed pattern of results of the first two experiments. In this section, first I discuss the findings on motivational influences on cognition; subsequently, I propose a theoretical framework to reconcile the predictions based on ambiguity aversion and unrealistic optimism by utilizing the research on motivated reasoning.

Motivational influence on cognition

The cognitive apparatus is harnessed in the service of motivational ends.

-Kunda (1987)

Kunda's statement underscores the importance of motivational influences on cognition. Motivation influences cognition in different ways. For instance, it influences the way we retrieve available information by biasing memory search. In a set of entertaining experiments, participants were first made to believe that tooth brushing and caffeine were bad for health (Ross, McFarland and Fletcher 1981, Sherman and Kunda 1989). Subsequently, when these participants were asked to report the frequency with which they performed both these behaviors (i.e., brushed their teeth or consumed caffeine) they reported far less frequency than did participants who were asked to believe that such behaviors were good for health. A selective search of evidence to support the desired conclusion also manifests itself in using fictitious benchmarks (Taylor, Wood and

Lichtman 1983) or by using comparison standards that would make one appear better than others and ignoring those that make one appear more vulnerable (Wood and Taylor 1991). For example, during the initial days of AIDS, people believed that they were invulnerable to this disease, as they didn't fall into the stereotypic image of an AIDS patient, while failing to consider many people similar to them who were falling prey to this disease.

Motivation can also distort how we weigh the importance of favorable and unfavorable evidence. It leads to the consideration of favorable evidence as a stronger source of success while preventing the realization that unfavorable evidence can be a source of hindrance. Dunning, Story and Tan (1989) found that self ratings provided by management students on a variety of dimensions correlated positively with their beliefs about the importance of these dimensions in determining success as a business executive.

Motivation not only biases information search and weighing of evidence; it may also influence the reconstruction of existing memory traces. McDonald and Hirt (1997) report the most fascinating account of motivational influence on memory. In a set of two studies, participants were given a target's name and his midterm grades to be recalled later. Subsequently, participants' expectations about the target's future performance was manipulated by providing some information that suggested that his academic performance will either improve, decline or remain the same. Participants desire to see these expectancies confirmed was manipulated by either making the target likable or dislikable. Results showed that when their liking and expectancy matched, (i.e. likable target-improve or dislikable target-decline) expectancy congruent distortion of midterm

grades occurred. However, when liking and expectancy did not match expectancy congruent distortion did not occur.

Similar evidence emerges from work on elastic justification (Hsee 1996). It demonstrates that factors which one realizes should actually not be used in a judgment task (unjustifiable factors such as looks, ethnicity etc.) in reality influence judgment by distorting the factors that ideally should be used (justifiable factors such as skills, education etc). However, distortion of justifiable factors is a function of their elasticity (i.e., possibility of interpreting those factors in multiple ways). The unjustifiable factor will have a greater influence on one's judgment if there is elasticity in the justifiable factors than if there is not. Such an influence emerges because despite one's motivation to take a judgment in a desired manner (presumably based on unjustifiable factors) when there is no elasticity it is difficult to generate reasonable arguments to justify the desired conclusion. However, when there is elasticity, one can potentially distort his or her evaluation of the justifiable factors to generate arguments in favor of the desired conclusion.

In sum, this literature demonstrates that motivation can bias the use of available information and subsequently influence the felt optimism. Kunda (1987) describes this as a process of *motivated inference* whereby people 1) build biased theories about the causes for positive and negative events, and (2) differentially evaluate information that has positive versus negative implications for the self.

Theoretical Framework

Extant literature on motivational influences on cognition shows how motivation can bias cognitive processing. Considering the pre and post-action stages of IME as two motivationally distinct stages, it can be conceptualized that the participants in the pre-action have a higher motivation to make an accurate choice and a low motivation to be optimistic about choice of either options. However, participants in the post-action stage have a high motivation to believe they have made the right choice and would be motivated to be optimistic about the chosen option's performance. I conceptualize and propose a model in which these two distinct motivational stages interact with information malleability. First, I discuss the pre-action stage.

Stage 1: Pre-Action

Pre-action is a stage of low motivation to distort the information. Therefore, consistent with the literature on ambiguity avoidance (Camerer and Weber 1992; Ellsberg 1961), I predict that a malleable information option will give rise to a less, or at least the same, optimistic prediction compared to the unmalleable information option. This prediction is reflected in the following hypothesis.

H1: Pre-action, decision makers using unmalleable information will be more or at least equally optimistic compared to those using malleable information.

The results of experiments 1 (a) and 1 (b) lend support to this hypothesis.

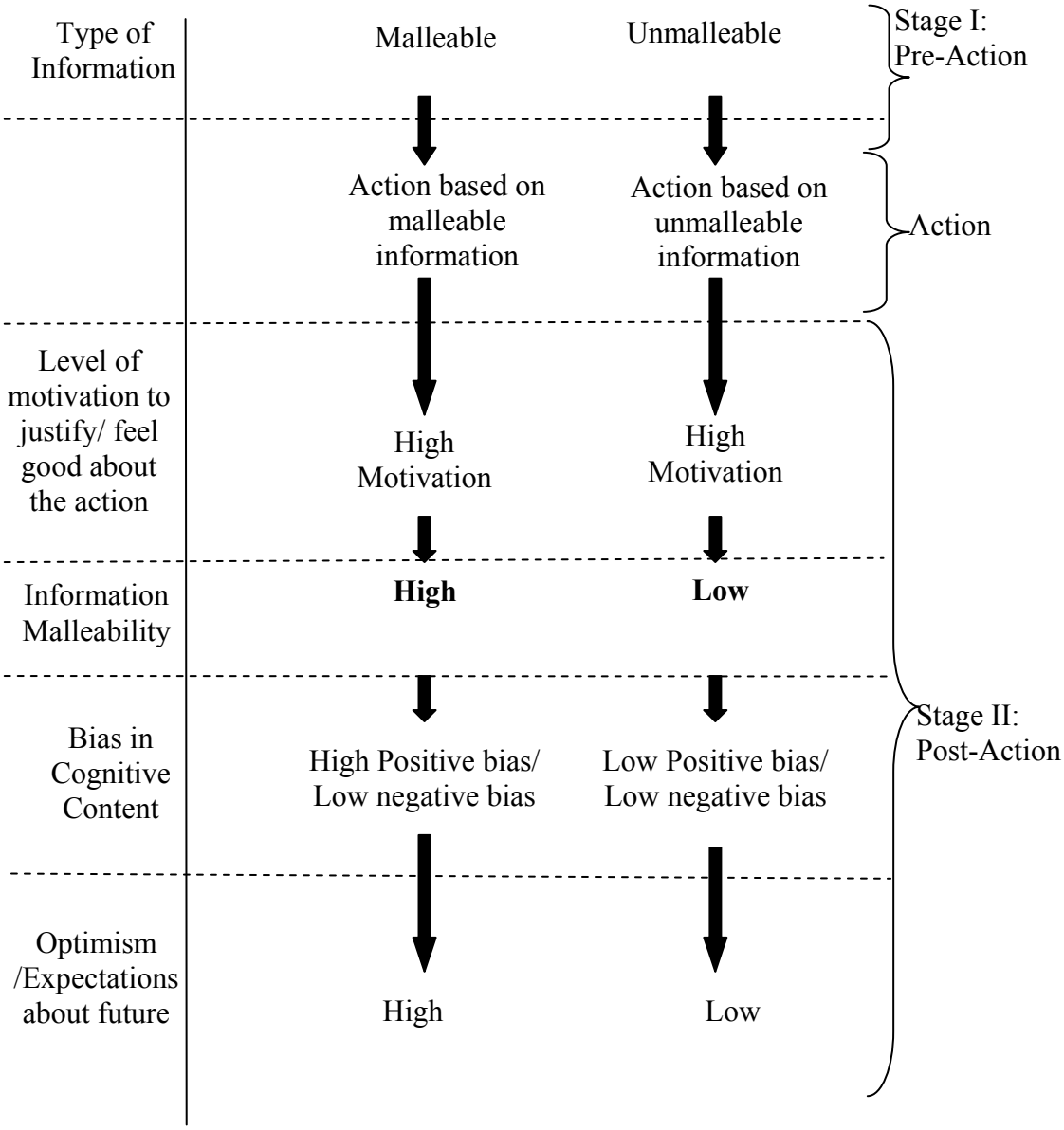

Figure 3: Proposed Theoretical Framework

Stage 2: Post-action

Post-action involves a phase where one wants to feel good about the action one has taken. The action could be choice of a product, drawing a ball from an urn, consuming a food item etc. Thus, the motivation is high to feel that one has made the right choice - that one has drawn the winning ball or believe that the chocolate one has consumed was not really harmful. Such a high motivation to feel good about the action just taken involves searching for information that validates the action and makes favorable predictions about its future outcomes (assuming that the decision maker does not have an option of undoing her action, e.g., returning the product or putting back the ball in the urn).

However, Kunda argues (1999, pp 224) "Motivation can color our judgment, but we are not at liberty to conclude whatever we want to conclude simply because we want to. Even when we are motivated to arrive at a particular conclusion, we are also motivated to be rational and to construct a justification for our desired conclusion that would persuade a dispassionate observer. We will draw our conclusion only if we can come up with enough evidence to support it." Which suggests that motivation does not operate without constraints, the onus of justification plays a significant role in how motivation colors our judgment. In other words we also feel the need to appear objective about our action both in our own eyes and in the eyes of an unbiased observer.

Incorporating these research findings, I propose that during post-action the motivation will be quite high to believe that one has made the best decision irrespective of whether one used malleable or unmalleable information. This high motivation is likely to cause the construction of future scenarios that will justify the action. It results in

differential evaluation of information (Moskowitz 2005) – a process whereby people are more critical of information that has negative implications for themselves and more accepting of information that favors them. However, at this stage I further propose that a difference will occur between actions based on malleable versus unmalleable information. Due to its basic nature of being vague, malleable information provides more flexibility in interpretation than does unmalleable information. Hence, it is easier to construe malleable information in a favorable manner and to feel that one has enough support to justify a desired conclusion. Therefore, those who acted on malleable information will have more leeway to construct scenarios to support their action than those who acted on unmalleable information. Conversely, people who act on unmalleable information do not have much leeway to construct favorable scenarios as their decisions are based on very precise information. Hence, they are less likely to feel optimistic because the precise nature of the information forces them to be objective. Stated formally,

> **H2**: Actions based on malleable information will result in favorable information appearing more plausible and unfavorable information appearing less plausible compared to when actions are based on unmalleable information.

I test this hypothesis in experiment 2.

Goals influence how people utilize the information and arrive at various conclusions (Kunda 1990). Thus I propose that by priming different goals I should be able to moderate the IME. Accuracy goals are at work when the motivation is to arrive at an accurate conclusion, whereas desired goals are at work when motivation is to arrive at a desired conclusion. The proposed framework suggests that there is a higher degree of

distortion with the malleable information than with the unmalleable information. Therefore, it would predict that priming accuracy goals would reduce the magnitude of optimistic predictions made with malleable information. Thus, the difference between predictions made with malleable and unmalleable information can be moderated.

H3: Accuracy goal would diminish the difference between optimistic predictions based on malleable versus unmalleable information.

On the other hand, priming desired goals would enhance the magnitude of optimistic predictions made with malleable information. This will provide an interesting way to test an assertion that I have been making frequently; malleable information provides more interpretational latitude than unmalleable information. If this assertion is true, then the difference between optimistic predictions made with the malleable information in accuracy and desired goals would be higher than the same difference calculated with the unmalleable information. If we denote

Prediction using malleable information with desired goals = **X**

Prediction using malleable information with accuracy goals= $\mathbf{X_1}$

Prediction using unmalleable information with desired goals =**Y**

Prediction using unmalleable information with accuracy goals= $\mathbf{Y_1}$

Then the following hypothesis reflects the suggested test of interpretational latitude assertion

H4: $\mathbf{X - X_1 > Y - Y_1}$

I test hypotheses 3 and 4 in experiment 3.

CHAPTER 5: EMPIRICAL TESTS OF THE CONCEPTUALIZATION

In this chapter, I present findings of experiments 2 and 3 that tests hypotheses 2, 3 and 4.

Experiment 2: Plausibility of positive and negative outcomes

The objective of this experiment was to test the second hypothesis. Specifically, the proposed model predicts that post-action the participants with malleable information would predict positive outcomes as more likely to happen and negative outcomes less likely to happen compared to the participants with unmalleable information. In other words, interpretational flexibility of malleable information will result in positive outcomes appearing more plausible and negative outcomes less plausible compared to when information is unmalleable.

To test this prediction, the stimulus used in this experiment was chocolate. Past research has indicated that chocolate is sometimes considered a hedonic vice and despite knowing that it may be harmful, people consume it. These qualities of a chocolate make it an ideal stimulus to test the differences in positive and negative outcome-expectations. Since consuming a chocolate is associated with a certain guilty pleasure, any suggestion about the harms of chocolate would appear painful. Hence, the act of consuming a chocolate gives one enough motivation to rationalize that it was not harmful. However, the available information about the chocolate plays a crucial role in alleviating the post consumption pain. If the available information is not malleable, (i.e., gives precise details

about the good and bad properties of the chocolate), it will be difficult to distort the positive and negative effects of consuming a chocolate. On the other hand, if the information is malleable, (i.e., gives vague details about the properties of chocolate), it will be easier to perceive higher likelihood of positive effects and lower likelihood of negative effects. However, irrespective of whether information was malleable or unmalleable, no such difference in expectations of positive and negative effects would occur prior to consumption as the motivation to ignore the harms of a chocolate would be low. In addition I was interested in investigating whether the IME would also get translated into attitudinal measures.

The design used was a 2 (consumption: pre versus post) x 2 (information structure: malleable versus unmalleable) x 2 (valence of attributes: positive versus negative) x 2 (order: expectation measures before attitudinal measures versus attitudinal measures before expectation measures) design, where the first, second and fourth factors were varied between-subjects and the third factor was measured within-subject.

Following the proposed conceptualization, the predictions were- post consumption participants using highly malleable information would agree more that the chocolate contains positive attributes compared to those using less malleable information. On the other hand, post consumption participants using malleable information would agree less with the statements that the chocolate contains negative attributes compared to the participants using less malleable information. Pre-consumption, no significant difference should emerge across participants using low or high malleable information for both positive and negative properties of the chocolate as there is less motivation to distort the available information.

Method

One hundred and twenty-five participants took part in this experiment one person at a time and were randomly assigned to one of the eight between-subject conditions. Participants were first told that a chocolate manufacturer is launching a new brand of chocolate and wants to assess consumer expectations. Subsequently, participants were given unmalleable or malleable information[2] about the chocolate. No brand name was disclosed for the chocolate. Subsequently, participants in the pre-consumption (pre-action) condition were asked to rate the dependent measures that tapped into their attitudes and attribute expectations. Participants in the post consumption condition first consumed the chocolate and then gave their responses to dependent measures.

Dependent measures

Two kinds of measures were used 1) Expectation measures and 2) Attitudinal measures. The order in which they appeared was counterbalanced. Thus, some participants saw attitudinal measures first and expectations second or vice versa.

Expectation measures. Based on the results of a pretest, six measures were selected and used to assess participants' expectations from the chocolate. Three of these measures were designed to assess the extent to which participants agreed that the chocolate contains good attributes and three measures were designed for the bad attributes. The participants' task was to indicate on a 1 to 7 scale whether they Agreed (7) or Disagreed (1) with the given statement.

Positive attribute expectation measures

[2] Cramer and Weber (1992) describes that not having complete information creates informational ambiguity. Therefore, unmalleable information described the chocolate's ingredients and its nutritional contents. Malleable information described only the ingredients of the chocolate and did not give any details of the nutritional contents.

a) It is made up of natural ingredients

b) It contains lower calories than the popular brand of chocolate

c) It can provide daily dosage of calcium

Negative attribute expectation measures

a) It can increase my cholesterol level

b) It can be very harmful to my teeth

c) It contains harmful levels of trans fatty acids

Attitudinal measures. These measures were

a) If the company provides free sample of this chocolate, how many samples would you pick up (1,2,3,4)

b) Would you recommend this chocolate to other people (1-Never, 7-Certainly)

Results

Positive-Negative attribute expectation. The order condition did not interact with other factors; therefore the following discussion utilizes the data collapsed across the order condition. A multivariate analysis of variance yielded a significant consumption x information x valence interaction, F (1,121) = 10.13, $p < 0.0019$. This interaction was decomposed into positive attribute expectation and negative attribute expectation and is discussed next.

An ANOVA on the positive attribute expectations yielded a significant consumption by information interaction (F(1,121) = 7.0, $p < .009$). As shown in figure 4, participants who received malleable information perceived the chocolate to be more favorable on its positive attributes in the post-consumption condition (M = 4.2) than in the pre-consumption condition (M = 3.59; F(1, 121) = 8.8, $p < .003$). No such

differences were observed in the unmalleable-information conditions (*M*s = 3.4 and 3.56 in the post and pre-consumption conditions, respectively; $F < 1$). Comparison of means across pre and post consumption conditions revealed a significant difference between malleable and unmalleable information conditions in post consumption , $F(1, 121) = 13.93$, $p < .001$, however, the such difference was not significant in pre consumption condition ($F < .1$).

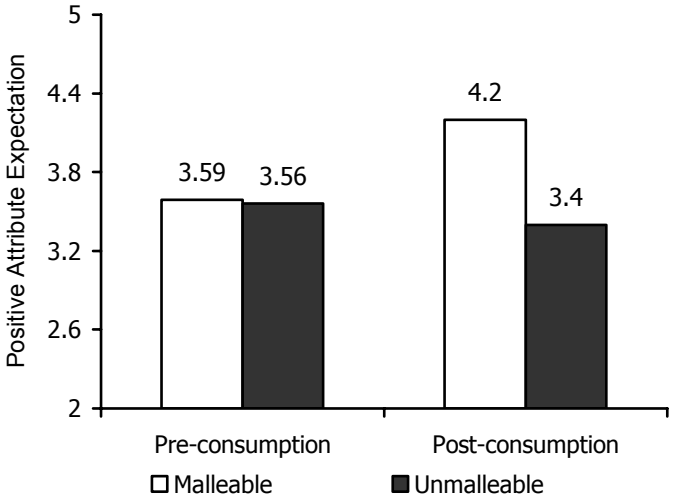

Figure 4: Positive Attribute Expectations, Experiment 2

Another ANOVA on the negative attribute expectations yielded a significant consumption by information interaction ($F(1,121) = 4.8$, $p < 0.03$). As shown in figure 5, participants who received malleable information perceived the chocolate to be less unfavorable on its negative attributes in the post-consumption condition ($M = 3.8$) than in the pre-consumption condition ($M = 4.3$; $F(1, 121) = 4.14$, $p < .04$). No such differences were observed in the unmalleable-information conditions (*M*s = 4.3 and 4.1 in the post

and pre-consumption conditions, respectively; $F(1, 121) = 1.1$; $p > .29$). Comparison of means across pre and post consumption conditions revealed a significant difference between malleable and unmalleable information conditions in post consumption , $F(1, 121) = 3.97$, $p < .04$, however, the such difference was not significant in pre consumption condition ($F(1, 121) = 1.14$, $p > .28$).

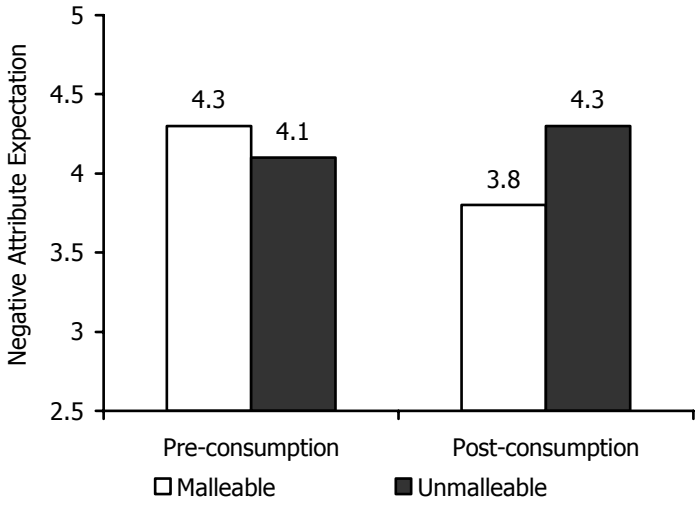

Figure 5: Negative Attribute Expectations, Experiment 2

Attitudinal Measures. An ANOVA on the number of free chocolate samples participants wanted to pick yielded a consumption by information interaction, $F(1, 119) = 4.8$, $p < .03$ and the order factor did not interact with the other two independent variables. In line with the IME, participants within the malleable information conditions picked more free samples in the post-consumption condition ($M = 2.9$) than in the pre-consumption condition ($M = 2.3$; $F(1, 119) = 5.3$, $p < .02$). No such differences were observed in the unmalleable-information conditions (Ms = 1.9 and 2.1 in the post and pre-

consumption conditions, respectively; $F < 1$). As depicted in figure 6, a comparison of mean number of chocolate across pre and post consumption conditions revealed a significant difference between malleable and unmalleable information conditions in post consumption , $F(1, 119) = 13$, $p < .001$, however, the such difference was not significant in pre consumption condition ($F < 1$).

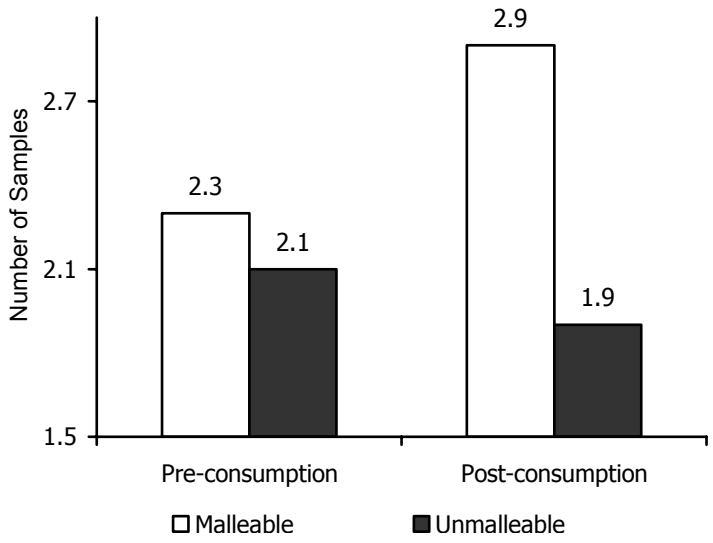

Figure 6: Number of samples, Experiment 2

Similar results were obtained on the measure of their likelihood of recommending the sampled/to-be sampled chocolate. It yielded a consumption by information interaction, $F(1, 121) = 3.7$, $p < .05$. As shown in figure 7, participants who received more malleable information were more likely to recommend the sampled/to-be-sampled chocolate to other people in post ($M = 5.4$) compared to the pre-consumption condition ($M = 4.2$; $F(1,121)= 9.6$, $p < .002$. No such differences were observed in the unmalleable-information conditions (Ms = 4.6 and 4.4 in the post and pre-consumption

conditions, respectively; $F < 1$). A comparison of mean likelihood of recommending across pre and post consumption conditions revealed a significant difference between malleable and unmalleable information conditions in post consumption , $F(1, 121) = 3.9$, $p < .05$, however, the such difference was not significant in pre consumption condition ($F < 1$).

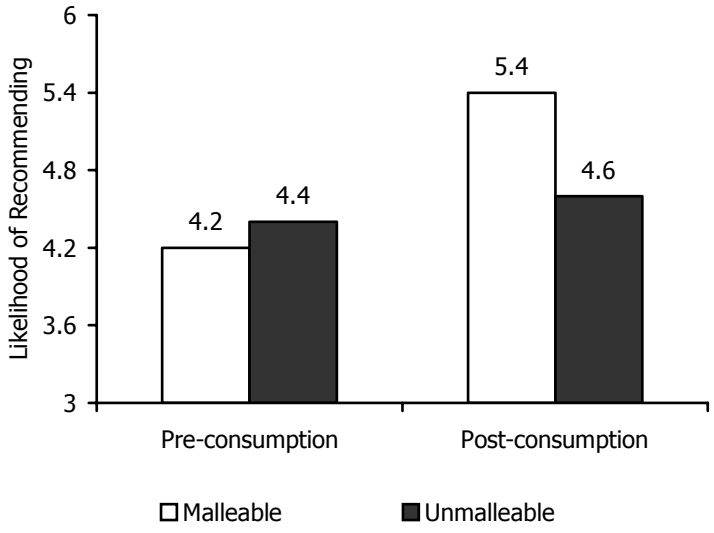

Figure 7: Likelihood of recommending

Discussion

Consistent with the second hypothesis, the results of this experiment show that post consumption participants relying on malleable information perceived chocolate to have less negative and more positive properties compared to those relying on unmalleable information. In addition, post consumption participants using malleable information indicated a desire to pick up more free samples of chocolate and were more likely to recommend the chocolate to other people compared to those relying on unmalleable

information. In sum, these findings demonstrate that malleability of information influences both the expectations from the product and attitudinal measures.

Experiment 3: Moderation of the IME

The objective of this experiment was to moderate the influence of information malleability on post-action optimistic predictions. Kunda (1990) suggested that goals influence how people utilize the information and arrive at various conclusions. Accuracy goals are at work when the motivation is to arrive at an accurate conclusion. Therefore, priming participants with accuracy goals should reduce the influence of IME thereby reducing the difference in optimism between participants making predictions based on malleable and unmalleable information.

I conceptualized that malleable information gives more interpretational latitude. Unlike unmalleable information, the malleable information is interpretable as evidence that supports or refutes the decision. Kunda (1990) also suggests that desired goals are at work when the motivation is to arrive at a desired conclusion. Thus, in order to test the difference in interpretational attitude with malleable and unmalleable information I predict that post-action the difference between optimistic predictions made after priming accuracy and desired goals would be more with malleable information compared to unmalleable information.

To test these predictions, this experiment used hand lotion as the stimulus. Participants were assigned to either the accuracy goal prime or the desired goal prime or a control condition. Subsequently, they made predictions about the performance of the lotion either before or after applying it.

The following are predictions about post choice optimism with malleable information. If malleable information provides higher interpretational latitude, then priming participants to be accurate would reduce the optimism about lotion performance compared to control condition. Conversely, priming desired goals should increase optimistic predictions in the malleable information condition compared to the control condition. Consistent with the notion that malleable information gives more interpretational latitude, post-action the difference between predictions following the accuracy goal priming and desired goal priming should be higher when information is malleable than unmalleable.

This experiment therefore utilized a 2 (usage: pre vs. post) x 3 (goal priming: accuracy vs. desired vs. control) x 2 (information structure: malleable vs. unmalleable) between-subjects design.

Method

Three hundred and eighty five participants were randomly assigned to one of 12 experimental conditions. The goal-priming manipulation was first carried out as part of a purportedly unrelated study. Participants in the accuracy goal-priming conditions were asked to describe an instance where they took "great care to collect information and make a very careful, unbiased and accurate decision." Participants in the control conditions were asked to "describe some events that occurred recently." Participants in the desired goal condition were asked to describe an incident where their "decision was based on their desires and not on the available information". All participants were then presented with claims made by a marketer of hand lotions. Participants in the unmalleable information condition were told that the results of a laboratory test substantiating the

marketer's claims were available and that the hand lotion had lived up to its claims with 50% of its users. Participants in the malleable-information conditions were told that laboratory tests had been conducted but the results substantiating the marketer's claims were not yet available. As in prior experiments, this manipulation of the information factor was in line with methods suggested by Camerer and Weber (1992).

The hand lotion was then presented in a bottle that did not carry a brand name. In the pre-action conditions, participants rated the dependent measures prior to using the hand-lotion. Those in the post-action conditions first applied the hand lotion before responding to the dependent measures.

Measures

Outcome-expectancies were assessed differently in experiment 3 compared to experiment 2. Six measures were used to assess participants' expectations from the hand lotion on 1 (unlikely) to 7 (highly likely) scales: "With frequent use, the lotion will (1) clog the pores of the skin (reverse coded), (2) improve the texture of the skin, (3) provide benefits for a long time, (4) provide the skin with the needed nourishment, (5) irritate the skin (reverse-coded), and (6) protect the skin from harmful ultra-violet rays". Since there was a possibility of gender-effects owing to the nature of the product being used (hand lotion), information about the gender of the participants was also collected.

Results

Participants' response on the six expectation measures were subjected to an exploratory factor analysis. The eigenvalue of the first factor was = 1.75 and for the second factor = .28, suggesting the presence of single meaningful factor. The scree plot

indicated one factor as well. The six expectation measures were thus averaged to form a variable representing the favorable expectations from the hand lotion and were used for further analyses.

An analysis of variance showed an insignificant gender x usage x goal x information interaction, $F(2, 361) = .31$, $p > .71$. Therefore, subsequent analysis utilizes favorable expectations collapsed across gender.

An analysis of variance yielded significant main effect of usage, $F(1, 373) = 7.34$, $p < .007$, goal, $F(2, 373) = 9.55$, $p < .0001$, and information, $F(1, 373) = 8.34$, $p < .004$. These lower order effects were qualified by the higher order usage x goal x information interaction, $F(2,373) = 3.21$, $p < .04$. A decomposition of the three-way interaction across pre and post application revealed a significant goal x information interaction, $F(2,190) = 5.56$, $p < .004$, for post-application condition. However, no significant goal x information interaction emerged for participants in the pre-application condition, $F < .1$, $p > .95$.

Further analysis of the post application condition revealed that in the control condition, those who had malleable information had more favorable expectations about the performance of the hand lotion than those who had unmalleable information, (M = 4.87 vs. 4.03, $F(1, 58) = 24.56$, $p < .0001$). Similar pattern of result emerged for those in the desired goal condition, (M = 4.94 vs. 4.48, $F(1, 66) = 6.37$, $p < .01$). However, for those who were primed with the accuracy goal, no difference in favorable expectation emerged, (M = 4 vs. 4.06, $F(1, 66) = .08$, $p > .77$.

Further, with respect to the control condition, priming accuracy goal didn't change favorable expectations of participants with unmalleable information (M = 4.03 vs. 4.06). However, as compared to control condition, priming accuracy goal reduced the

favorable expectations of participants with malleable information (M = 4.87 vs. 4, $F(1,63) = 15.44$, $p < .002$) suggesting that priming accuracy goal moderated the IME.

Comparison of desired goal and control condition also yielded some interesting results. Participants with malleable information largely displayed similar expectations from the cream in control and desired goal conditions (M = 4.87 vs. 4.94). However, participants with unmalleable information displayed more favorable expectations in desired goal compared to control condition (M = 4.48 vs. 4.03, $F(1,61) = 5.75$, $p < .01$).

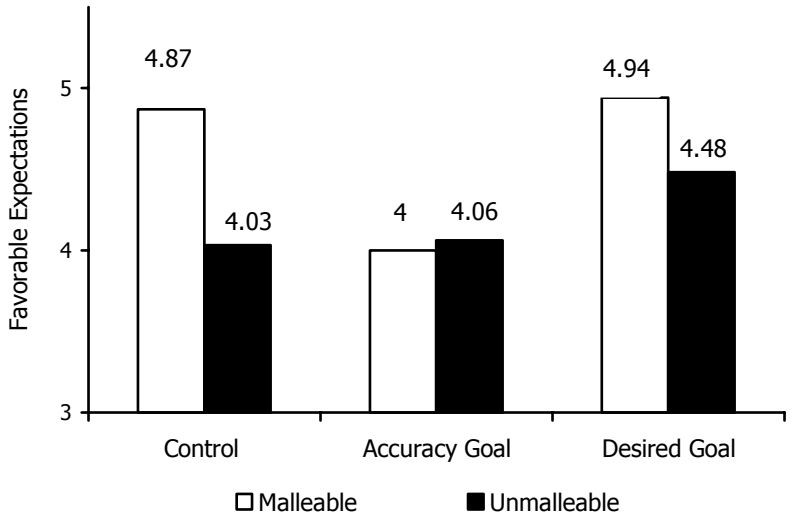

Figure 8: Post Usage Favorable Expectations, Experiment 3

Recall, another objective of experiment 3 was to test hypothesis 4, which states that if the assertion that malleable information provides more interpretational latitude than unmalleable information is true, then the difference between optimistic predictions made with the malleable information in accuracy and desired goals would be higher than the same difference calculated with the unmalleable information.

Formally, $\mathbf{X- X_1 > Y- Y_1}$

Where, expectations using malleable information with desired goals = **X**, and with accuracy goals = $\mathbf{X_1}$**.** Whereas expectations using unmalleable information with desired goals = **Y**, and with accuracy goals = $\mathbf{Y_1}$**.** Therefore, $\mathbf{X- X_1}$ denotes the interpretational latitude with the malleable information and $\mathbf{Y- Y_1}$ denotes the informational latitude available with the unmalleable information.

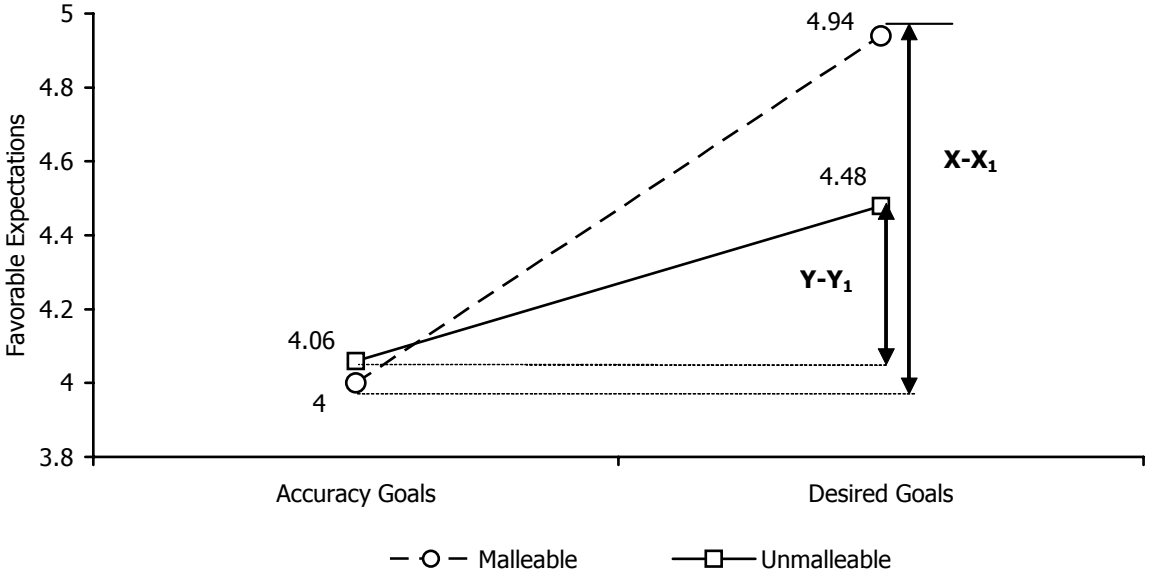

Figure 9: Test of hypothesis 4

To test this hypothesis, two t tests were conducted. The first t test tested whether $X- X_1$ is significantly larger than .42 (i.e. $Y-Y_1$). It revealed that $X- X_1$ is significantly larger than $Y- Y_1$ (i.e., 0.42), $t(68) = 2.48$, $p < .01$. Similarly another t test revealed that $Y-Y_1$ is significantly smaller than $X-X_1$ (i.e., 0.94), $t(64) = 2.83$, $p < .006$. As depicted in

figure 9, these results provide support to hypothesis 4 and demonstrate that malleable information provides more interpretational latitude than unmalleable information.

Discussion

The objectives of this experiment were to moderate the IME using accuracy and desired goals and to gather support for hypothesis 4. The pattern of results shows that accuracy goal and desired goal influence expectations about the performance of the hand lotion in opposing ways. The accuracy goal attenuates the expectations whereas the desired goal enhances the expectations. However, this influence of goals on expectation is moderated by the type of information (malleable vs. unmalleable) and usage (pre vs. post). Specifically, as opposed to the control condition, an accuracy goal attenuates post usage expectations about the performance of the hand lotion when the information is malleable and doesn't have a significant impact when the information is unmalleable. Similarly, as opposed to the control condition, a desired goal has more impact on post usage expectations when the information is unmalleable compared to when it is malleable. Such a moderation of the influence of goals on expectations highlights the interplay of these two goals in determining the post usage (i.e., post-action) expectations. The accuracy goal supplants the desired goal when information is unmalleable whereas desired goal supplants when information is malleable. This experiment also provided support for hypothesis 4 and shows that malleable information provides more interpretational latitude than unmalleable information.

CHAPTER 6: GENERAL DISCUSSION, IMPLICATIONS AND THEORETICAL CONTRIBUTIONS

General Discussion

Prior work on ambiguity aversion suggests that people prefer taking actions based on precise rather than vague information (Ellsberg 1961; Camerer and Weber 1992). In this dissertation, I document the reverse of prior findings in "post-action" scenarios– people expect favorable outcomes from actions taken on malleable rather than unmalleable information. I term this inconsistency the Information Malleability Effect (IME), where people prefer options involving unmalleable (precise) information "pre-action" but show more optimism for a malleable (vague) information option post-action.

I demonstrate the robustness of the IME in the first two experiments by utilizing a simplified traditional gambling task. Across both experiments participants displayed more optimism in the post action scenario when their prediction was based on malleable versus an unmalleable option. To explain the cause of the IME, I then propose an underlying process that invokes research on motivational influences on cognition (Kunda 1987; McDonald and Hirt 1997). Construing the pre and post-action stages as being motivationally distinct, I posit that in the pre-action stage, individuals have a higher motivation to make accurate choices and, as a result, have a lower motivation to be optimistic about options with either malleable or unmalleable information. However, in the post-action stage, individuals are, in general, more motivated to justify their choices. Due to its basic nature of being vague, malleable information provides more flexibility in

its interpretation, thus, offers more leeway in justifying one's actions. Unmalleable information does not provide such flexibility due to its relatively precise nature. The final three experiments provide support for the underlying process. The proposed conceptualization suggests that participants with malleable information have more interpretational latitude in justifying their actions. Therefore, experiment 2 provides evidence that chocolate consumption based on malleable information resulted in the favorable information appearing more plausible and unfavorable information appearing less plausible compared to when actions were based on unmalleable information. Experiment 3 tests for the proposition that the pursuing desired or accuracy goal should moderate the IME. By utilizing a priming manipulation, I demonstrate that priming accuracy goals moderated the IME by diminishing the difference between optimistic predictions about the hand lotion's performance based on malleable versus unmalleable information in the post-action conditions while priming desired goal increases optimistic predictions across malleable and unmalleable information.

Practical implications and further areas of research

Consumer Decision-Making

In the last two decades marketing researchers have explored the influence of informational and experiential ambiguity on consumer decision-making. Work on ambiguous information has implications for advertising theory. For instance, Hoch and Ha (1986) found that the ambiguity of the evidence moderated the influence of advertising on consumers' interpretation of product quality. Advertising can lead to changes in beliefs only if the evidence is ambiguous. Similarly, while proposing a model

of consumer learning Hoch and Deighton (1989) argue that the ambiguity of the information environment can significantly influence the learning process. When the experience is not vague consumers learn fast and managers have very little influence on their learning process. However, when the experience is ambiguous, managers can influence the interpretation of that experience (with the help of advertising) in favor of their brands. The findings of this thesis adds to this literature by suggests that performing an action (i.e., taking a decision, consumption etc.) can potentially distort the way one interprets the ambiguous information. The findings of this thesis focus on the influence of different forms of information (malleable or unamalleable) mainly in the domain of positive outcomes, since winning a game of chance, consuming a chocolate or using a hand lotion are actions that do not have any salient negative outcome. It would be worthwhile for future studies to explore how the type of information influences expectations about potentially negative outcomes in pre and post action stages.

A large body of consumer decision-making research focuses on the antecedents of choice. However, relatively less attention is paid to the processes that occur post choice. This research will assist in understanding consumer decisions that are made post-choice. Post-purchase decisions, such as purchase of extended warranty, product return etc., are worth well over $100 billion in the US alone (Stock, Speh, and Shear 2002). First, this research could assist in designing different communication messages before and after purchase to manage product returns. Specifically, from the set of available precise and malleable information about a product, it would be advisable to give precise information pre-purchase and malleable information post-purchase (e.g., in usage manuals), thereby reducing the likelihood of product returns. Second, product recommendation is another

very important aspect of post-purchase decision-making. The IME would predict that people are more likely to be optimistic about product performance when their purchase decision was based on malleable information (for instance a new product) which would then translate to higher product recommendation as I demonstrated in experiment 3. Third, a general procedure for selling warranties and insurance is at the check-out counter when a consumer has already selected a product. If it can be assumed that new products have very precise performance estimates and can be considered malleable product options then the IME would suggest that bundling the warranty with the new product would be better. Since, once the consumer has decided on buying the product, she is likely to become optimistic about its performance and less likely to purchase a warranty.

Insurance Decisions

With the current booming real estate market, home insurance is a multi billion dollar industry. Homebuyers have to base the choice of a house and the insurance that they wish to pay on the information they are able to gather while making a choice. Some buyers have a lot of information while others might base their decision on very little information. Hence, the findings of this research will give an insight into how new homebuyers decide about insurance coverage.

Medical Decision-Making

Patients frequently encounter a choice between an established versus a new but promising surgical procedure where a precise success-to-failure estimate is not always available. Past research has shown that people tend to prefer established procedures to new ones. However, the findings of the IME would predict that after undergoing the

surgical procedure, patients who underwent a new procedure would be more optimistic about their recovery than those who underwent the established procedure. Given the very important role of optimism and hope in the recovery process, the IME would help predict the recovery of the patients.

Stock Market Investment

The IME could be used to explain an interesting observation in the stock market. Past research has shown that, after adjusting for market risk, stock prices of new and smaller firms rise more than prices of large firms (Keim, 1983). Following the IME, it could be argued that predictions about the future performance of new companies are more malleable than that of large and established companies, making stockholders more optimistic about new companies. Thus, making them less likely to sell the stocks in the hope of future gains.

Theoretical Contributions

This research makes several theoretical contributions. First, it extends the findings on uncertainty and vagueness to post-action scenarios, a relatively less explored area in consumer decision-making literature. Second, it adds to the past literature on modeling ambiguity in decision-making under uncertainty (Kahn and Sarin 1988). This literature presents models that predict consumers' choices under the conditions of ambiguity and uncertainty. By incorporating the findings of IME, these models can be extended to predict consumers' choices in post-purchase decision-making. Third, this research integrates the findings of two different streams of literature–unrealistic optimism and

ambiguity aversion, which have been used in isolation to predict decision-making outcomes. Fourth, by exploring decision making in post decision scenarios, this research provides an interesting extension to the work on predecisional distortion (Russo, Meloy, and Medvec 1998). Finally, the literature on well-being and happiness has acquired a significant importance in the last decade (Kahneman, Diener, and Schwarz 1999). The IME suggests that vagueness could be a source of happiness. In other words, despite one's aversion to vagueness, vagueness can make one happy about the outcome of one's actions by allowing one to see what one wants to see, a case when ignorance is truly bliss.

APPENDIX

Life Optimism Test (LOT) is comprised of ten items, 4 of them are filler items. The items are

1. In uncertain times, I usually expect the best.
2. It's easy for me to relax. (Filler item)
3. If something can go wrong for me, it will.*
4. I'm always optimistic about my future.
5. I enjoy my friends a lot. (Filler item)
6. It's important for me to keep busy. (Filler item)
7. I hardly ever expect things to go my way.*
8. I don't get upset too easily. (Filler item)
9. I rarely count on good things happening to me.*
10. Overall, I expect more good things to happen to me than bad.

*These items were reverse scored before scoring and analyses.

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