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Kuvaas, Bård; Selart, Marcus

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Effects of attribute framing on cognitive processing and evaluation

Bård Kuvaas[a,*], Marcus Selart[b]

[a] Department of Leadership and Organization Management, Norwegian School of Management, Box 580, N-1302 Sandvika, Norway
[b] Department of Strategy and Management, Norwegian School of Economics and Business Administration, N-5045 Bergen, Norway

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Abstract

Whereas there is extensive documentation that attribute framing influences the content of people's thought, we generally know less about how it affects the processes assumed to precede those thoughts. While existing explanations for attribute framing effects rely completely on valence-based associative processing, the results obtained in the present study are also consistent with the notion that negative framing stimulates more effortful and thorough information processing than positive framing. Specifically, results from a simulated business decision-making experiment showed that decision makers receiving negatively framed information had significantly better recall than those receiving positively framed information. Furthermore, decision makers in the negative framing condition were less confident than decision makers in the positively framed condition. Finally, compared to a no-framing condition, decision makers receiving positive framing deviated significantly more in evaluation than decision makers receiving negative framing did.

Keywords: Attribute framing; Cognitive processing; Susceptibility to framing

There is extensive documentation that the formulation of a decision stimulus or an event influences how decision makers think and decide. According to Tversky and Kahneman (1981), a decision frame may be defined as referring to the decision maker's conception of acts, outcomes, and contingencies associated with a particular choice. Hereby, the frame that a decision maker adopts depends heavily on how a decision problem is described, although norms, habits, and personal characteristics also play a part (Kahneman & Miller, 1986; Kühberger, 1998; Levin, Schneider, & Gaeth, 1998). Since Kahneman and Tversky's (1979) seminal work, a large number of studies have demonstrated that framing normatively equivalent information in positive versus negative ways, so called valence-based framing, may systematically affect the decisions or actions decision makers take. Even though framing effects have been documented across several decision making situations (see Kühberger (1998) and Levin et al. (1998) for reviews of the framing literature), the search for a deeper understanding of the cognitive processes that underlie valence framing has been limited (Levin et al., 1998). Indeed, Kühberger (1998) refers to the cognitive processes that are responsible for framing effects as a "stepchild" of framing research.

In an attempt to better explain how positively and negatively valenced information affect judgments and decisions, Levin et al. (1998) developed a typology to distinguish between three distinct types of valence framing effects with different underlying mechanisms and consequences. Risky choice framing effects occur when willingness to take a risk depends on whether the potential outcomes are framed positively or negatively. Goal framing effects occur when a persuasive message has different appeal depending on whether it stresses the positive consequences of performing an act to achieve a

* Corresponding author. Fax: +47 6755 7678.
E-mail addresses: bard.kuvaas@bi.no (B. Kuvaas), marcus.selart@nhh.no (M. Selart).

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particular goal or the negative consequences of not performing the act. Finally, attribute framing effects occur when evaluations of an object or event are more favorable if a key attribute within any given context is framed in positive rather than negative terms.

Due to its simplicity (i.e., positive framing supports more favorable evaluations and negative framing supports less favorable evaluations), attribute framing is particularly suitable for providing insights into the nature of the information processing differences resulting from positive and negative framing (Levin et al., 1998). Levin and Gaeth (1988), Levin, Johnson, Russo, and Deldin (1985), and Levin et al. (1998) argue that attribute framing effects occur because information is encoded relative to its descriptive valence. Positive labeling of an attribute will thus lead to an encoding of the information that tends to evoke favorable associations in memory, whereas negative labeling of the same attribute will cause an encoding that evokes unfavorable associations. According to such an associative model explanation, material that is associatively linked to the framing manipulation is more likely to be used in various constructive cognitive tasks, leading to framing congruency in attention, learning, memory, associations, and eventually to positivity and negativity biases in evaluations and judgments.

The associative model may be valid in explaining why attribute framing affects the nature of evaluations or the content of cognition (i.e., *what* people think). It may be less useful, however, in explaining more subtle effects attribute framing may have on the process of cognition (i.e., *how* people think). First, the associative model does not take into account the possibility that negative framing may stimulate more effortful and thorough cognitive processing than positive framing. Although only indirectly evidenced in the context of attribute framing (Dunegan, 1993), it is frequently observed that people encode and respond to positively and negatively valenced affective and informational stimuli in systematically different ways (e.g., Bless, 2002; Chatterjee, Heath, Milberg, & France, 2000; Dunegan, 1994; Forgas, 2002a; Peeters & Czapinski, 1990; Taylor, 1991). Second, if the valence of attribute framing has systematic processing consequences, decision makers in positive and negative framing conditions may also differ in how affected they are by the framing information. Then, however, the explanation of results showing that positively valenced framing creates a positivity bias and negatively valenced framing a negativity bias solely by way of valence-based associative processes, may represent an oversimplified picture of how attribute framing affects cognitive processing.

This being the case, the current study was undertaken to explore potential asymmetrical influences of positively versus negatively valenced framing on modes of cognitive processing and susceptibility to attribute framing effects in evaluations. Improving our understanding of the processes that underlie attribute framing will not only provide more satisfactory accounts of attribute framing effects, but may also have implications for managerial decision-making and the emerging research on how to attenuate or eliminate framing biases among "real world" decision makers (e.g., Hodgkinson, Bown, Maule, Glaister, & Pearman, 1999; Wright & Goodwin, 2002). In order to detect a potential asymmetry in susceptibility to framing we compare whether positive and negative framing decision-makers deviate more or less in framing effects compared to decision makers receiving no framing information. To explore whether framing may act as a catalyst for different modes of cognitive processing we include three different conceptualizations of cognitive processing; self-reported analytical thinking reflecting the level of analytic versus intuitive processing (Mantel & Kardes, 1999), and decision makers' amount of recall of decision event information and their level of confidence in estimating the accuracy of their own recall (Kuvaas & Kaufmann, 2004). Dunegan (1993) pointed to memory as an important distinguishing characteristic of different cognitive processing modes. After decision makers have made a decision, they tend to recall much more information about the decision event when controlled or more effortful processing is used (Kernan & Lord, 1989; Langer, 1989a; Maheswaran & Chaiken, 1991). Regarding level of confidence, dozens of laboratory studies have documented the prevalence of too much confidence in judgment, i.e., decision makers' certainty that their predictions are correct most often exceeds the accuracy of those predictions (Simon & Houghton, 2003). The tendency to be highly confident is found to be greater when decision makers act as "cognitive misers" (Mahajan, 1992). High levels of confidence is thus more likely to occur when decision makers engage in less effortful processing, as indicated by limited information search (Cooper, Folta, & Woo, 1995; Harvey, 1994), truncated mental search where potentially critical information is ignored (Mahajan, 1992) or used incorrectly (Au, Chan, Wang, & Vertinsky, 2003).

Theory and hypotheses

Most contemporary models of individual information processing view discrepancy between a desired or expected state and an experienced state as an activator of more rigorous and systematic information processing (e.g., Beach & Mitchell, 1990; Lord & Maher, 1990; Louis & Sutton, 1991). In accordance with evolutionary and adaptive arguments (e.g., Peeters & Czapinski, 1990; Taylor, 1991), it is argued that because negative or unfavorable incoming information may signal inconsistency between expected or experienced conditions, or

adverse or threatening events, there is a tendency for decision makers to engage in more deliberate and careful analysis (e.g., Dunegan, 1994; Wofford & Goodwin, 1990). Conversely, when information is positive, cognitive processing tends to be less thorough and systematic (e.g., Dunegan, 1994; Klein, 1989). Consistent with the conventional wisdom that "if it ain't broke don't fix it", decision makers may feel justified in using a more cognitively economic response (Dunegan, 1994).

Most affect-cognition models make a similar proposition (e.g., Bless, 2002; Forgas, 2002a, 2002b). According to the feelings as information model, for instance, negative affect informs the individual that current conditions are problematic and await solution (Clore, Schwarz, & Conway, 1994; Schwarz, 1990). To solve problems, information processing is characterized by adherence to established rules and procedures as well as attention to detail and systematic information processing. Positive affect, in contrast, informs the individual that current conditions are benign and signals that systematic information processing is unnecessary because no problem awaits solution. Accordingly, in studies where participants are induced to feel positive or negative affect and then are given a task in which their type of processing can be inferred, those in negative emotional states or moods are usually found to engage in more bottom-up and systematic processing, whereas those in positive emotional states or moods are found to engage in more top-down and more heuristic processing (e.g., Forgas, 2002a; Tiedens & Linton, 2001). Although there are different explanations for this effect (Bless, 2002), most affect-cognition models stipulate that the information processing consequences arise from the valence of the affective state (Tiedens & Linton, 2001). It should be noted, however, that the finding of positive–negative information processing asymmetry is qualified by exceptions (e.g., Ashby, Isen, & Turken, 1999; Isen, 1993; Staw & Barsade, 1993), contextual contingencies (e.g., Kuvaas & Kaufmann, 2004; Martin, 2001; Martin & Stoner, 1996), and evidence that other affective dimensions than valence can influence processing (e.g., Tiedens & Linton, 2001).

While activating more systematic or effortful cognitive processing when experiencing an unfavorable or unhappy rather than a favorable or happy situation may seem quite logical and functional, the question addressed here is whether a similar response will emerge when equivalent information is merely framed in a positive or negative way. Whereas Levin et al. (1998) did not acknowledge positive–negative information processing asymmetry as a potential theoretical account for attribute framing effects, they relied on this mechanisms to explain goal framing effects, and Kühberger (1997) discussed this possibility in a risky choice framing context. Furthermore, based on several experiments where participants in the negative risky choice frame were conflicted about which option to choose, rather than risk seeking, Schneider (1992) suggested an aspiration level contingency where negative framing leads to higher aspiration levels and higher awareness than positive framing, consistent with a negative framing-systematic processing view. In the context of attribute framing, Dunegan (1993) reported two studies that indirectly support the view that attribute framing systematically influences modes of cognitive processing. Specifically, he found significant relationships between how subjects interpreted a situation and how they responded only in the negative-frame condition and that current and trajectory images were perceived to be less compatible when feedback information was framed negatively. Thus, we hypothesize:

Hypothesis 1. Decision makers receiving negatively framed information will report a higher degree of analytical thinking, recall more information, and be less confident than decision makers receiving positively framed information.

So far, we have argued that there may be systematic processing consequences associated with the valence of attribute framing. In this section, we discuss contrasting views on how potential processing differences may affect susceptibility to attribute framing effects in evaluation. The conventional explanation for cognitive biases is that people in general tend to rely on heuristic information processing or judgmental short cuts to form inferences (Tversky & Kahneman, 1974). Accordingly, if negative framing decision makers engage in more systematic and relatively less heuristic processing than positive framing decision makers, they should also deviate less from rational norms of decision making and be less susceptible to attribute framing effects. Indirect support for this prediction is provided by research evidence showing that induced elaborated thinking eliminates or reduces risky choice framing effects, such as when decision makers are asked to provide justification for their choice or spend more time on a decision making task (e.g., Sieck & Yates, 1997; Takemura, 1982, 1994). Another piece of indirect evidence stems from studies revealing that subjects with higher need-for-cognition scores[1] are less susceptible to risky choice framing effects (Chatterjee et al., 2000; Smith & Levin, 1996). Similarly, Stanovich and West (1998) found that students with higher academic aptitude, as measured by SAT scores, were not as affected by risky choice framing as students with lower academic aptitude. Furthermore, although Levin, Gaeth, Schreiber, and Lauriola (2002) found no effect of need-for-cognition on attribute framing, they found that of those subjects showing large difference scores[2]

[1] A measure of the tendency to engage in effortful, analytical thinking (Cacioppo & Petty, 1982).

[2] Equal to or greater than 1.0 in magnitude on a 7-point scale.

between the positive and negative condition, 39 were in the positive direction while only 3 were in the negative direction.

In affect-cognition research, the kind of vigilant, systematic attention to stimulus details caused by negative affect has been used to explain enhanced stereotype and priming effects under positive mood and greater sensitivity of negative mood subjects to strong and weak arguments in persuasion (Fiedler, 2000). Moreover, Forgas (1998) has found processing consequences of negative mood to reduce and even eliminate such common judgmental biases as the fundamental attribution error. He has also reported evidence that positive affect tends to increase, and negative effect to reduce, the likelihood of other kinds of cognitive mistakes in social thinking (Forgas, 2000). Even though there is much evidence that positive affect may also produce distinct processing advantages (e.g., increased flexibility and more creative thinking[3]), the findings reported above suggest that positive attribute framing should create greater framing effects than negative attribute framing:

Hypothesis 2. Compared to decision makers receiving no framing information, decision makers receiving positively framed information will be more influenced by framing information in evaluation than will decision makers receiving negatively framed information.

The position that cognitive effort should reduce the effects of framing has received modest empirical support (LeBoeuf & Shafir, 2003) and is challenged by the suggestion that effortful processing may sometimes increase framing effects. First, studies indicating that need-for-cognition and SAT scores reduce framing effects have used risky-choice framing tasks. In such tasks (e.g., the ''Asian Disease Problem''), where the ability to understand and use rule-based decision aids in a consistent manner would be appropriate, decision makers engaging in systematic processing may have an advantage. This may not necessarily be the case for attribute framing, however. Second, Crawford and Skowronski (1998) found that participants with higher need-for-cognition scores exhibited greater sensitivity to biasing effects than participants with lower need-for-cognition scores when the decision task involved recalling stereotype-consistent information, and research on persuasion suggests that high need-for-cognition subjects may sometimes be more affected by framing than their low need-for-cognition counterparts (Wegener, Petty, & Klein, 1994). Consistent with the associative model explanation of attribute framing, as suggested by Crawford and Skowronski (1998); Levin et al. (1998) argue that higher need-for-cognition individuals are more likely to invest the cognitive effort required to search for, find, and remember subtle themes that run through the information to which they are exposed. Similarly, Rothman and Salovey (1997) argue that cognitive processing mediate the influence of framing and remind us that in order for framing to have an effect, a minimum level of attention or systematic processing is required. Thus, one may also argue that more effortful or systematic processing will result in higher selective attention to framing-congruent information and to the forming of more framing-congruent associations than less effortful or systematic processing. For instance, in explaining stronger impact of negative than of positive goal (message) framing, Levin et al. (1998) refer to the negativity bias that people pay greater attention to and are influenced more by negative than by comparable positive information. Affect-cognition research points to a similar effect, arguing that affect infusion is greater when people engage in more extensive and elaborate thinking (e.g., Forgas, 2001). Furthermore, research reviewed by Cacioppo, Petty, Feinstein, and Jarvis (1996) supports the view that individuals high in need-for-cognition are more susceptible to the influence of affective states on cognition than are individuals low in need-for-cognition. Thus, if negative framing facilitates more effortful or systematic processing than positive framing, we may expect that negative attribute framing will create greater framing effects than positive attribute framing:

Hypothesis 2′. Compared to decision makers receiving no framing information, decision makers receiving negatively framed information will be more influenced by framing information in evaluation than will decision makers receiving positively framed information.

Methodology

Subjects and procedure

Seventy-three undergraduate students participated in the study. They were all enrolled in an organization theory course at a business school in Norway. As part of a voluntary classroom exercise, participants were asked to take part in a decision-making study where they should act as project managers of a student organization in a simulated business situation. The task was to decide on how much the student organization should invest in a particular project. Participants were given a booklet of materials that included a business scenario, a manipulation check measure, an instruction to make an investment decision, and a measure of self-reported analytical thinking. At the end of the task, the responses were collected and a second instrument designed to measure recall and level of confidence was presented to the

[3] See for instance the special issue of Psychological Inquiry on the role of affect in social thinking and behavior (2002, Vol. 13, No. 1).

subjects. At the end of both tasks, respondents were debriefed about the study.

Variables

Framing

The brief business scenario (slightly less than one page) in which an investment decision had to be made about funding allocations for a project team was used to manipulate framing (see the Appendix). All participants received the same scenario, with one slight modification: the positive framing group ($n = 25$) read, "of the projects undertaken by this team, seven of the last 10 have been successful." The corresponding scenario provided to the negative framing group ($n = 23$)[4] read, "of the projects undertaken by this team, three of the last 10 have been unsuccessful," while the no-framing group ($n = 25$) was not informed about prior performance. With the exception of this sentence, all information was the same. The framing effect was measured by a three-item 9-point semantic-differential scale (Mittal & Ross, 1998) reflecting the degree of negative–positive evaluation of the scenario (a threat/opportunity for the organization, a potential for losing/making money, and a positive–negative situation). The Cronbach's alpha for the scale was .82 and a composite score was created for each subject by averaging the items.

Self-reported analytical thinking

Self-reported analytical thinking was assessed using six previously used items (Mantel & Kardes, 1999) that were modified to fit the current research problem. The items were presented to the participants immediately after they had made the investment decision. Examples of items are: "The answer just came to me" (reverse coded); "My decision was based on facts rather than on general impressions and feelings"; "My decision was based on careful thinking and reasoning." Agreement was expressed on a 1 = "strongly disagree" to 7 = "strongly agree" scale. Cronbach's alpha for the scale was .78 and a composite score was created for each subject by averaging the items.

Recall

The business scenario used to manipulate framing contained several pieces of factual information such as names and numbers that were used to define 10 recallable questions (a sample questions is "how many students are members of the student organization"). Each question was scored from 0 to 10 dependent on the correctness of the answer. With the aim of presenting participants with items varying in degree of difficulty, we developed two questions that requested more than one answer ("what are the names of the student organization's three main sponsors" and "in addition to yourself being the project leader, what are the titles of the two other members of the management team"). These were scored 5 if one out of two answers were correct, and 3.33 if one out of three were correct. An observed recall score was created for each subject by averaging over the 10 questions. Since recall was assumed to be a formative as opposed to reflective measure (i.e., the items/observed variables are assumed to cause the latent variable/construct, rather than that the items/observed variables are caused by the latent variable/construct (e.g., Bollen & Lennox, 1991)). Under these conditions, internal consistency between items was of minimal importance because items that might even be negatively related can serve as meaningful indicators of a construct (Nunnally & Bernstein, 1994). Accordingly, we did not compute Cronbach's alpha for the index.

Level of confidence

Level of confidence was measured by first asking respondents to estimate the level of certainty for correct answers on the recall-questions. Immediately after each of the 10 recall question they were asked to indicate, on a 0–100%-scale, how sure they were that each of their answers were correct. We then divided these responses by ten, and used the difference between certainty ratings and accuracy or actual recall to calculate 10 confidence scores ranging from −10 to 10, where a positive score implied overconfidence, a negative score implied underconfidence, and a score of 0 implied a perfectly calibrated response. For instance, if the certainty score for a correct answer (scored 10) were 100%, the confidence score of this item would be perfectly calibrated (10–10 = 0). If the certainty score for a correct answer were 90%, the confidence score would constitute an underconfident item response (9–10 = −1). Conversely, if the certainty score for a wrong answer (scored 0) were 90%, this would constitute a highly overconfident item response (9–0 = 9). For the recall items that were asking for two titles and three names (of main sponsors), respondents were asked to provide confidence estimates that both titles and all three names were correct. Respondents were instructed not to provide certainty estimates of unanswered recall items (resulting in a perfectly calibrated confidence score of 0, that is, neither overconfident nor underconfident). A composite index was created for each subject by averaging the 10 confidence scores. Being based on the recall questions, confidence was also seen as a formative index and no Cronbach's alpha was computed.

Manipulation check

The three-item 9-point semantic-differential scale measuring the degree of negative–positive evaluation

[4] Two responses suffered from missing data.

of the scenario was used to check the framing manipulation. Scores were from 1 to 9, where a higher score implies a more positive evaluation. A one-way analysis of variance (ANOVA) with framing manipulation (negative, no-framing, or positive) as factor showed that the group means for framing effects were different ($F_{2,70} = 68.68$ $p < .001$), and Tukey's honestly significant difference test revealed that all three means were significantly different from each other ($M_{\text{negative}} = 4.42$, $SD = 1.22$; $M_{\text{no-framing}} = 5.48$, $SD = 1.06$; $M_{\text{positive}} = 7.76$, $SD = .70$).

Analysis and results

Multivariate analysis of covariance (MANCOVA) was used prior to testing of Hypothesis 1 because recall and confidence were significantly correlated ($r = -.60$, $p < 0.001$). MANCOVA can test whether there is a significant multivariate effect of the independent variable on the dependent variables after controlling the correlation between the latter. Using Wilks's lambda (λ), this analysis revealed that framing ($\lambda = .70$, $F_{3,43} = 6.22$, $p < .01$) was significantly related to the set of dependent variables. These results suggest that separate hypotheses testing for each dependent variable could be performed without a high risk for an inflated Type I error.

The impact of framing on each of the dependent variables was tested using between-subjects analyses. These analyses revealed that the two groups did not differ significantly from each other in self-reported analytical thinking ($F_{1,45} = .35$, n.s.; $M_{\text{negative}} = 4.10$, $SD = .94$; $M_{\text{positive}} = 3.93$, $SD = 1.01$), but that the negative framing group had significantly better recall ($F_{1,45} = 14.56$, $p < .001$; $M_{\text{negative}} = 7.93$, $SD = 1.15$; $M_{\text{positive}} = 6.43$, $SD = 1.53$) and lower confidence ($F_{1,45} = 9.93$, $p < .001$; $M_{\text{negative}} = -.37$, $SD = .96$; $M_{\text{positive}} = .66$, $SD = 1.26$) than the positive framing group.[5] Accordingly, the hypothesis (Hypothesis 1) that decision makers receiving negatively framed information will report a higher degree of analytical thinking, recall more information, and be less confident than decision makers receiving positively framed information was supported for recall and confidence (the positive framing subjects were slightly overconfident and the negative framing subjects slightly underconfident), but not for self-reported analytical thinking.

To test the competing hypotheses on susceptibility to framing we first calculated the differences between the mean value framing effect of the no-framing group and the framing effects scores given by the negative and positive framing subjects. ANOVA revealed that the positive framing subjects deviated significantly more from the mean of the no-framing group than the negative framing subjects ($F_{1,45} = 18.30$, $p < .001$; $M_{\text{negative}} = 1.06$, $SD = 1.22$; $M_{\text{positive}} = 2.28$, $SD = .70$). A disadvantage with this method is that it does not take into account the standard deviation of the no-framing condition. We hence computed the standardized differences (Cohen's d) for the no-framing group and each experimental group (Cohen, 1988). In these computations, pooled standard deviations were applied in each case (Rosnow & Rosenthal, 1996). The standardized difference between the no-framing group and the positive framing group ($d^{\text{c-pf}} = 2.53$, with 100% non-overlap in confidence intervals) and the standardized difference between the no-framing group and the negative framing group ($d^{\text{c-nf}} = .93$, with 52% non-overlap in confidence intervals) did, however, not indicate that the standard deviation of the no-framing group in any way would disconfirm the results obtained from the ANOVA. Thus, the hypothesis stating that when compared to decision makers receiving no framing information, decision makers receiving positively framed information will be more influenced by framing information in evaluation than will decision makers receiving negatively framed information (Hypothesis 2), was supported, while the competing hypothesis (Hypothesis 2′) was not.

Discussion

Consistent with prior theorizing (Levin et al., 1998), valence-based associative processing is probably a valid explanation of how attribute framing affects the content of people's thought, and thus why positive attribute framing led to more positive evaluations of the business scenario than negative attribute framing in our study. The obtained differences in recall, confidence, and susceptibility to framing effects, however, suggest that asymmetrical information processing may also play a role in explaining attribute framing effects. Accordingly, this study contributes to the framing literature by extending previous accounts for attribute framing effects. It should be noted, however, that there is some disagreement on how to characterize negative–positive information processing asymmetry. In the framing literature, Schneider (1992), for instance, refers to aspiration levels that are more difficult to achieve and higher awareness in the face of negative framing, while Levin et al. (1998) refer to the negativity bias and that the impact of negative information is systematically stronger than the impact of objectively equivalent positive information in goal framing. Furthermore, while prior affect-cognition research suggested that people experiencing positive affect tend to employ more superficial

[5] Scales: analytical thinking scores were from a 1 to 7 Likert scale, where a higher score implies a higher level of analytical thinking; recall scores were from 0 to 10, where a higher score implies better recall; confidence scores were from −10 to 10, where a positive score implies overconfidence, a negative score implies underconfidence, and a score of 0 implies a perfectly calibrated response.

information processing strategies, more recent research argues that the processing consequences are better understood in terms of use of general knowledge structures and attention to the details of a situation (e.g., Bless, 2002; Fiedler & Bless, 2000; Forgas, 2002a, 2002b).

Prior attribute framing research has usually investigated evaluation effects of labeling a key attribute in positive versus negative terms without questioning differences in susceptibility to framing effects. By including a no-framing condition, we were able to examine the magnitude of framing effects and found that participants receiving positive framing were more affected by attribute framing than those receiving negative framing. Also this finding is consistent with asymmetrical information processing effects of negative versus positive framing and the position that more effortful and less heuristic processing may reduce susceptibility to cognitive biases (e.g., Sieck & Yates, 1997; Takemura, 1994; Tversky & Kahneman, 1974). This is not to say, however, that effortful processing should always reduce framing effects. The business scenario used in our study contained more information and was considerably more complex and ambiguous than is usually the case in attribute framing research. In such a research context, decision makers using relatively more effortful processing may have been better able to counterbalance the framing information with other and more relevant information, than those using comparably less effortful processing. Thus, for some tasks, probably most complex or analytical challenging tasks, a facilitating effect of more detailed processing should be more likely than an inhibiting or biasing effect (e.g., Au et al., 2003; Cacioppo et al., 1996; Huber & Seiser, 2001; Langer, 1989b; LeBoeuf & Shafir, 2003; Levin, Huneke, & Jasper, 2000; Louis & Sutton, 1991; Reger & Palmer, 1996). However, when the task used to investigate attribute framing effects contains little information other than the framing manipulation, which is often the case (for instance whether beef is 80% lean versus 20% fat), more effortful processing should lead to more framing congruent cognitive associations and probably result in greater framing effects than less effortful processing. Furthermore, particularly within the affect-cognition literature, there is growing consensus that processing consequences of both negative and positive stimuli have distinct advantages (e.g., Forgas, 2002b; Isen, 2002). Positive mood has for instance been found to promote more flexible and creative thinking styles (Forgas, 2002a; Isen, 2002). It is probably safe to conclude then, that the impact of processing differences on evaluation, judgment, choice and behavior depends on context, in particular the nature of the task. This, in turn, makes it very difficult to explain how people think (i.e., cognitive and affective process) based on studies of what people think (e.g., evaluation and decisions). Accordingly, to better understand the processes that underlie framing effects, we need more research that investigates process and output separately.

This study has limitations that should be considered when interpreting the results. First, this study used an experimental design and, thus, suffers from the limitations of generalization to more complex natural situations. Moreover, the use of a student sample further limits the generalizability of the results. Second, to be able to test potential effects of framing on recall and confidence, we had to present the framing manipulation in the beginning of the business scenario (before the factual information used to measure recall and confidence). This may have resulted in weaker manipulation effects than if the manipulation information had been presented in the last sentence, as is usually the case. Third, even though participants were randomly assigned to the three groups, we can not completely rule out the possibility that other factors than framing may have influenced the results, for instance individual differences in expectations and norms (Kahneman & Miller, 1986) regarding the prior performance information used to manipulate framing. Thus, it is not impossible that the stronger framing effect that was obtained in the positive frame could be interpreted as the deviation from some previously established norm. The fact that we were stressing the potential successes of the funding in favor of failures in this framing condition, may thus by the audience have seemed like a ''pitch'' constructed to enhance the likelihood that more funding would be forthcoming. Hence, the positive frame may have been regarded by some as an attempt to persuade rather than an invitation to evaluate the information. This criticism is well in line with the views of constructivist theorists who argue that frames can be distorted by communicators acting strategically to secure their own instrumental interests.

Finally, our measures of recall, confidence and self-reported analytical thinking represent indirect operationalizations of cognitive processing. This limitation is evident in the non-significant differences for self-reported analytical thinking, which may in part be explained by a social desirability bias, leading participants to report having thought more carefully about their decisions than they actually did. It is also possible that it is difficult for people to give accurate descriptions of their level of information processing (e.g., Svenson, 1989). We know, for instance, that people often think of themselves as active and purposeful decision makers, while research in managerial cognition suggest that they may be predisposed toward using relatively effortless information processing most of the time (e.g., Louis & Sutton, 1991; Mitchell & Beach, 1990; Reger & Palmer, 1996; Walsh, 1995). In support of these arguments, self-reported analytical thinking was not significantly correlated with recall or confidence. However, social desirability should not be a problem for our incidental recall test and the confidence measure. Moreover, using the same instru-

ment in a similar research context, Kuvaas and Kaufmann (2004) found that need for cognition was positively related to recall and negatively related to confidence. Accordingly, these two measures should be adequate indicators of cognitive processing, and clearly better than speculating about cognitive processes on the bases of output measures only (e.g., evaluation or decisions). Still, alternative operationalizations of level of processing such as response latencies (e.g., Svenson & Benson, 1993) or verbal protocols (e.g., Maule, 1994) are needed before any firm conclusion can be drawn.

Despite these limitations, the results of this study may have one important practical implication. Many in the popular press celebrate the benefits of a positive outlook (Dunegan, 1993) and strategic cognition researchers argue that the potential power of viewing environmental events, trends and developments in a positive way is so strong that organizations should actively construct opportunities, and suppress threats (e.g., Dutton, 1993). However, even though positive framing and opportunity interpretation has the capacity to enhance motivation and flexible processing, and very high levels of threat perceptions may result in fixed or rigid processing (Staw, Sandelands, & Dutton, 1981), negative framing may have the advantage of fostering more systematic processing. Furthermore, managers are fare from immune to positive illusions (Bazerman & Hoffman, 1999; Hayward & Hambrick, 1997; Kahneman & Lovallo, 1993; Kuvaas, 2002) and they often act as cognitive misers when making decisions, even important ones (Beach & Mitchell, 1990). Thus, managers may benefit from knowing that both positive and negative framing have distinct advantages and disadvantages. This line of reasoning also implies that an interesting avenue for future research is to explore potential benefits from purposely framing key information in both positive and negative terms in "real world" decision-making or strategic conversations.

Framing research is only beginning to understand the cognitive processes that underlie valence-based framing (Kühberger, 1997, 1998; Levin et al., 1998). The present study was undertaken to increase our knowledge of attribute framing effects and obtained support for positive–negative information processing asymmetry using both process (recall and confidence) and output (evaluation) indicators. Accordingly, even though Levin et al.'s (1998) typology of valence framing has made a very important contribution to the framing literature by organizing and explaining risky choice, goal, and attribute framing, the explanation of attribute framing may be further developed.

Appendix. Story used to induce positive(negative) framing

Imagine you are the project manager of a student organization at a university. The student organization consists of 14 different project teams that are engaged in planning and implementation of different student projects. Of the projects undertaken by the largest project team, "The Student Week," seven of the last 10 have been successful (three of the last ten have been unsuccessful). The student organization is commercially run and needs more profitable than unprofitable projects. The operations are organized by a management team consisting of a marketing manager, a project coordinator and yourself being the leader of the group. The budget for 2000 is approximately 1 million NOK. The most important source of income is membership fee from around 1500 students. In addition, the student organization has three main sponsors; Lillebrand Inc., Storeborg Inc. and the Burseth Group.

In late March, the Student Week project team asks you for 50,000 NOK more than originally budgeted in order to finish a project called ODIN – a project that should have been completed five weeks ago. ODIN has been running for six months and has already been funded with 200,000 NOK. Despite the delay, the project group has great faith in the project. ODIN is a combined social and educational arrangement. Those responsible for the project are students with different levels of experience in arranging student projects. The turnover of members is relatively high because students that get their degrees leave the project and continuity is provided by written project reports. The members of the project are not paid, but are motivated by the "work experience" and networking associated with working in student projects.

For the coming year, you have 500,000 NOK at your disposal for funding new projects and you have to use this budget if you want to spend the additional 50,000 NOK on ODIN. If ODIN fails, you will also have to provide coverage of deficit.

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