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LEADER COGNITION DURING ORGANIZATIONAL CRISIS:
AN EXPERIMENTAL INVESTIGATION OF OUTCOME FRAMING AND
STRATEGIC ORIENTATION EFFECTS

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LEADER COGNITION DURING ORGANIZATIONAL CRISIS:
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STRATEGIC ORIENTATION EFFECTS

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To Addie, Leia, and Pookie who remind me that no matter how seemingly serious life and academic pursuits may appear what matters most is remaining a kid at heart.

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Abstract

Leadership is traditionally understood as a social influence process, but leaders also have to think. This study, using a simulated leadership task, exposed participants to a complex, ambiguous organizational crisis and required them to generate a problem solution and vision. A negative or positive outcome frame and a prevention or promotion strategic orientation were manipulated, along with attribution of responsibility. A balanced orientation to the problem, either a negative outcome frame accompanied by a promotion strategy or a positive outcome frame accompanied by a prevention strategy, produced solutions and visions of highest quality. Attribution of responsibility influenced the originality of solutions. The findings with regard to the effectiveness of a balanced orientation call into question the emphasis of many current leadership theories on positivity. It appears that some negativity is required, suggesting that effective leaders must be able to effectively shift between positivity and negativity.

Introduction

Leaders play a central role in shaping the performance of groups and organizations. Traditional notions of leadership emphasize social-interactional and influence processes, and significant strides have been made in understanding the nature of leader-follower relationships and how leaders exercise influence (Bass, in press; Graen & Uhl-Bien, 1995; Yukl, 2006). Although relationships and influence are clearly central to leader performance, leaders also must think (Lord & Hall, 2005; Mumford, Friedrich, Caughron, & Byrne, 2007). The importance of leader cognition becomes rather evident with consideration of just some critical leader activities. For instance, leaders often must develop plans for organizing people and work tasks to be accomplished (Fleishman, Mumford, Zaccaro, Levin, Korotkin, & Hein, 1991; Mumford, Zaccaro, Harding, Jacobs, & Fleishman, 2000). Leaders also must anticipate downstream effects of the implementation of plans and policies (Spillane, 2000). It is also necessary for leaders to generate novel solutions to problems for which extant approaches may not be sufficient (Mumford, Connelly, & Gaddis, 2003).

Although the need for leaders to engage in cognitive activities has been recognized (Hogarth & Makridakis, 1981; Sternberg, 1990) and studies of cognitive factors, such as intelligence and creative problem-solving, have demonstrated a positive relationship between cognitive factors and leader performance (Connelly, Gilbert, Zaccaro, Threlfall, Marks, & Mumford, 2000; Judge, Colbert, & Ilies, 2004; Zaccaro, Mumford, Connelly, Marks, & Gilbert, 2000), little research has examined the effects of specific aspects of how leaders think. Therefore, the purpose of this study was to examine the effects of two factors pertaining to how a leader thinks during

organizational crisis on two products of leader cognition – specifically problem solutions and vision statements. The key factors of interest were how a leader thinks about potential outcomes of the crisis and the process of addressing the crisis. Before turning to the proposed effects of these aspects of leader cognition, it is important to first consider a model of how leaders think during crisis.

Leader Cognition

Leader cognition proves particularly central to leader effectiveness and organizational performance during times of crisis, which are characterized by uncertainty, disruption, and serious consequences for organizational stakeholders (Mumford et al., 2007). When confronted with organizational crisis, a leader must devise a feasible approach for addressing the key problems implied by the crisis and also must take into account follower considerations, including consequences for followers and approaches for involving followers in working towards solving the problem and attaining desired change (Awamleh & Gardner, 1999; Sosik, Kahai, & Avolio, 1999). Moreover, it is during times of significant disruption that organizational stakeholders look to leaders to provide meaning and direction (Foldy, Goldman, & Ospina, 2008).

A theoretical framework of leader cognition during crisis proposed by Mumford, Friedrich, Caughron, and Antes (2009) suggests that once a leader recognizes a crisis via scanning and monitoring of the environment, the leader forms a mental model, or cognitive structure, via sensemaking activities that allows one to understand the crisis and shapes the development a solution for addressing the key problems broached by the crisis. This mental model, via the structure that it imposes on the situation and by

articulating the key causes and goals operating in the situation, provides a basis for integrating actions among multiple parties and assessing the desirability of various actions. In addition, this mental structure for understanding the crisis permits the articulation of a vision – an idealized image of the future of the organization (Conger, 1999) – which provides followers with direction (Sosik, Kahai, & Avolio, 1999; Strange & Mumford, 2002).

In forming a cognitive model for understanding and responding to the crisis under the timeframe and conditions confronting a leader, the manner in which a leader thinks about aspects of the crisis and how to approach addressing it are likely to impact the formation of a mental model and thus the production of a problem solution and vision. In particular, leaders must think about potential downstream outcomes arising from the crisis situation (Mumford, Schultz, & Osburn, 2002) and the process and procedures for addressing the crisis (Mumford, Schultz, & Van Doorn, 2001). Different approaches may be taken for thinking about potential outcomes and processes, but one fundamental distinction pertains to whether a leader's thinking focuses on positive or negative elements (Mumford, 2006).

Much extant leadership theory implies, or directly emphasizes, the importance of leaders maintaining positivity in leadership activities (Avolio & Gardner, 2005; Bono & Ilies, 2006; De Cremer, 2006; Ilies, Morgeson, & Nahrgang, 2005; Ladkin & Taylor, 2010). However, these theories do not take into the cognition underlying leader performance. Research examining complex cognition in organizations demonstrates the importance of critical, evaluative thinking to address workplace problems, which requires, at least at times, a negative orientation (e.g., Antes & Mumford, 2009;

Caughron & Mumford, 2008). Other work examining decision-making and problem-solving provides rather convincing evidence that applying a negative versus positive frame, or thinking style, significantly impacts an individual's thinking (Krishnamurthy, Carter, & Blair, 2001; Kuvaas & Selart, 2004; Tversky & Kahneman, 1986).

With regard to leader cognition, especially given the critical importance of obtaining follower buy-in and support, it may be that while a negative orientation facilitates some aspects of responding to crisis, such as critical analysis of the situation and evaluation of ideas, a positive orientation, facilitates others, such as considering consequences for people and articulating a vision to build a common sense of direction. Accordingly, the present study examined the effects of a positive versus negative approach to outcomes and processes in terms of their influence on leader problem-solving and vision articulation.

Outcome Framing

When confronted with an organizational crisis, any number of potential outcomes may be on the horizon for organizational leaders, stakeholders, and the organization as an entity (Milburn, Schuler, & Watman, 1983). Consideration of potential outcomes provides leaders with some awareness of the trajectory of the crisis and how the crisis might turn out given different courses of action (Roese & Olson, 1995). When confronted with examining the potential outcomes of a crisis, whether a leader frames outcomes negatively or positively may affect the formation of a mental model and, in turn, the generation of a solution and vision.

Negative framing tends to induce analytic thinking and controlled information processing (Dunegan, 1993; Kuvass & Selart, 2004). Thus, applying a negative frame to

consideration of outcomes may facilitate construction of a coherent understanding of the aspects of the problem, such as causes, key actors, and contingencies, which may be acted upon to address the problem (Altier, 1991; Bardwell, 2007). In addition, as one recognizes the presence of a crisis, the descriptive mental model initially activated to make sense of the situation will likely consist of a sense of impending failure (Mumford et al., 2007). As a result, consideration of negative outcomes would be consistent with this initial model for understanding the situation, which may further facilitate active, thorough analysis.

Although these points suggest the value of framing outcomes negatively, applying a positive frame during decision-making and problem-solving shifts one's thinking towards potential opportunities as opposed to threats (Highhouse & Paese, 1996). An orientation towards opportunity stimulates divergent thinking and risk-taking, providing individuals with ideas not likely to be encouraged by negative outcome framing (Estrada, Isen, & Young, 1994; Mumford et al., 2001). In addition, although negative outcome framing may prove most consistent with one's initial understanding of the crisis and thus facilitate thinking, positive framing, by inducing a shift in focus, may stimulate continued information processing when a negative orientation might constrain processing (Shiv, Britton, & Payne, 2004).

Although outcome framing may influence how one understands a crisis and thus one's approach to addressing it, another fundamental component that a leader must think about in devising a solution is the strategy to be applied in working to resolve the crisis (Mumford et al., 2000). The strategic approach considered may be generally

positive or negative in nature. Therefore, in examining the effects of outcome framing, it is critical to also take into account the nature of a leader's strategy.

Strategic Orientation

Two general approaches that individuals commonly apply in making decisions and solving problems involve two very different strategies (Crowe & Higgins, 1997). A promotion strategy emphasizes advancement and accomplishment (Zhu & Meyers-Levy, 2007). A prevention strategy, on the other hand, concentrates on safety and security. Therefore, a promotion strategy orients thinking towards obtaining success, while a prevention strategy encourages thinking about potential derailment. Clearly, these are quite different approaches to thinking about the process of addressing organizational crisis, and thus would produce different mental models for understanding the crisis and how to respond. A promotion focus, for instance, may support thinking about how to get people to work together (Langens, 2007). A prevention focus, however, would facilitate thinking about critical contingencies that might yield more feasible solutions.

As noted previously, leaders must think about where he or she sees things going *and* how to get there. Thus, the influence of outcome framing and strategic orientation must be considered in conjunction. Of course, the most positive approach in this regard would be to think about potential positive outcomes arising from the crisis and how to attain success. This positive approach contrasts starkly with thinking about the potential negative outcomes and means to avoid derailment. On the other hand, another approach would be to consider outcomes from one mindset and orient one's strategy towards the other.

When considering negative outcomes, coupling this outcome frame with a promotion-focused strategy would emphasize negative outcomes that might arise but processes for promoting a successful resolution of the crisis. Likewise, consideration of positive outcomes, when coupled with a prevention-focused strategy, would concentrate one's thinking on opportunities for success and means for avoiding failure. These thinking approaches suggest balanced thinking, which is likely to facilitate leader cognition. Therefore, a two-way interaction hypothesis was anticipated:

Hypothesis 1: Outcome framing and strategic orientation will interact to influence leader cognition, such that a balanced thinking approach will be most effective.

It is of note, however, that although a balanced approach is expected to prove most effective, leaders must produce different products as a result of their thinking. When confronted with an organizational crisis, the generation of a solution to address key problems broached by the crisis and a vision articulating an ideal future state for the organization prove of particular importance (Mumford et al., 2007). Although there are similarities among these cognitive products, for instance they both convey causes of the crisis (Mumford et al., 2007; Strange & Mumford, 2002), there are also key differences in these products. Therefore, the thinking approach facilitating the generation of effective problem solutions may not be consistent with the approach facilitating effective vision articulation.

Visions are inherently outcome-oriented (Strange & Mumford, 2005). Although visions must suggest procedures for obtaining desired future states, more critical is the articulation of a general framework allowing followers to understand where the

organization is going (Bass, 1990). Therefore, vision articulation may be particularly susceptible to the frame applied to outcomes. In particular, a positive frame may facilitate articulation of downstream objectives. Pairing positive outcome framing with a prevention focus would serve to draw attention to key contingencies, fostering the feasibility of ideas articulated for obtaining the future state. Although the underlying ideas conveyed by a vision may be abstract, visions are more likely to be accepted by followers when the ideas appear viable (Awamleh & Gardner, 1999). A prevention strategy may facilitate vision articulation in this regard. Thus, the following hypothesis was proposed:

Hypothesis 2: Positive outcome framing coupled with a prevention strategy will produce the most effective vision statements.

Although problem-solving indeed requires consideration of potential outcomes, effective problem solutions are inherently procedural (Mumford & Gustafson, 2007). A useful problem solution must clarify the key issues to be addressed and means for addressing them. A negative outcome frame, as suggested above, would serve to focus thinking towards critical elements of the problem, and a promotion strategy would facilitate the generation of actions that might be taken in addressing the problem. Thus, problem solutions generated under a negative outcome-promotion strategy approach were expected to be more effective. These observations implied a third hypothesis:

Hypothesis 3: Negative outcome framing coupled with a promotion strategy will produce the most effective problem solutions.

Attribution of Responsibility

Although these outcome framing and strategic orientation effects were expected to prove central to leader cognition, leader cognition is likely to be influenced by a number of other variables. After all, leaders must think under dynamic, complex conditions, and during organizational crisis, these conditions are especially complex and ambiguous (Mumford et al., 2007). With regard to organizational crisis, attributing responsibility for the crisis internally to oneself, or externally to another individual, may prove of critical importance. Indeed, under conditions of significant organizational turmoil, attributions of responsibility are imposed (Paglis, 2008).

Attributing fault internally is clearly much different than attribution to external forces where fault is focused outward (Kanter, 2003; Thompson, 1985), and these different focuses were expected to influence a leader's thinking about crisis. Specifically, a leader's perceptions about personal responsibility for a crisis may interact with their outcome frame and strategic orientation to influence cognition. External attributions will likely focus attention to situational elements of the problem that must be addressed. On the one hand, internal attributions of responsibility could encourage broader, more active thinking to identify solutions for a problem for which one feels responsible (Howell & Avolio, 1992). Alternatively, internal attributions could hinder thinking due to a focus on personal fault rather than problem analysis and idea generation. Given these potential influences of attribution of responsibility, the following research question was asked:

Research Question 1: Does attribution of responsibility interact with outcome framing and strategic orientation to influence leader cognition? If so, what is the nature of the interaction?

Subjective Psychological Well-Being

Of importance in examinations of leader cognition are outcomes beyond the quality of products of cognition per se. It has been argued that positivity should be maintained to foster psychological well-being (Fredrickson, 2001; Luthans, Luthans, Hodgetts, & Luthans, 2001; Scheier & Carver, 1993). Given that effective complex cognition may, at least to some extent, require a negative orientation, a question arises regarding the psychological effects of applying different approaches to thinking. Therefore, of interest was how different thinking approaches impacted subjective well-being – cognitive fatigue in the present study. A leader's report of cognitive fatigue indicates how alert they feel and suggests how responsive they might be to other demands of their work (Webster, Richter, & Kruglanski, 1996). Given the ongoing, demanding nature of leadership (Kirkpatrick & Locke, 1991), this consequence of different thinking approaches proves significant.

Clearly, positively framed outcomes, accompanied by a promotion-focused strategy, imply the most psychologically positive experience. But, when the proposed effects of outcome framing and strategic orientation are considered, this presumption may be called into question. The balanced approach suggested by the positive outcome-prevention strategy and negative outcome-promotion strategy approaches – approaches expected to facilitate cognition – may yield the best outcomes in terms of subjective ratings of well-being such as cognitive fatigue. Other thinking approaches may not provide what is needed to make sense of the situation, produce a viable mental model, and generate a solution. Therefore, a second research question was asked:

Research Question 2: Do different thinking approaches produce different reports of cognitive fatigue following performance? If so, what is the nature of these differences?

Method

Sample

The hypotheses were tested in a sample of 200 undergraduate students attending a large southwestern research university. The sample was comprised of 70% females. The average participant was 20 ($SD = 3.67$) years of age and most were freshman (51%), followed by sophomore (23%), junior (14%), or senior/other (12%). Seventy-percent of the students selected Caucasian when asked to report their ethnicity, and the remaining selected Asian (11%), African American (8%), Hispanic (5%), or other (6%). Nearly all participants ($n = 178$) reported having held one or more leadership positions in high school, college, or at work. The participants tended to be from social science fields of study (32%), but represented a number of other fields as well, including the health sciences (25%), business (14%), biological science (7%), with the remainder of students undecided or in education, engineering, and the arts.

General Procedure

Participants were recruited via two outlets, and recruitment announcements indicated that the study was an investigation of leader problem-solving. In the first recruitment method, participants were recruited via a study enrollment website. Students visited the website where they were able to read short descriptions of available studies and sign-up to participate. The second recruitment method consisted of in-class announcements where students were invited to sign-up by emailing the researcher. The

participants were compensated for their participation in the form of research hour credits in their psychology courses. Participation in this study was voluntary, and upon arrival at the study location, participants were given informed consent forms and asked to indicate if they wished to proceed to participate in the study.

The study was conducted in three-hour group sessions with no more than 20 participants in each session, but typically about 5 participants were in each session. During the initial 30 minutes of the study, after completion of the informed consents, participants completed several psychometric measures used to control for individual differences among the participants. Next, participants engaged in the experimental task which presented them with a leadership scenario for an organization undergoing crisis. Participants were asked to work through the leadership scenario and generate a problem solution and vision statement. Participants were randomly assigned to work on this task under different conditions where responsibility attribution, outcome frame, and strategic orientation were manipulated. Following completion of the experimental task, participants immediately completed a measure of fatigue. Finally, during the last 30 minutes of the study, participants completed several remaining individual differences measures, in addition to manipulation check and background information questionnaires.

Problem-solving performance was evaluated by scoring the participants' written solutions for quality, originality, and elegance. Vision performance was evaluated by scoring the participants' written solutions for utility. Scores on these performance tasks were obtained by ratings provided by trained experts.

Control Measures

The first control measures completed by participants assessed key cognitive abilities known to influence problem-solving performance, including verbal intelligence and divergent thinking (Vincent, Decker, & Mumford, 2002). The measure of verbal intelligence was the Employee Aptitude Survey verbal reasoning measure. In this measure, participants are given five minutes to read six sets of facts and determine if a conclusion derived from the presented facts is true, false, or uncertain. Evidence for the validity of this measure has been provided by Ruch and Ruch (1980), and in this study, the measure yielded a split-half reliability coefficient of .77.

In addition to this measure of verbal intelligence, participants also completed Guilford's Consequences measure assessing divergent thinking (Merrifield, Guilford, Christensen, & Frick, 1962), which has been shown to be related to leader performance (Vincent et al., 2002). This measure asks people to identify potential consequences of change events, such as "What would happen if everyone lost the ability to read and write?" Responses to this open-ended measure, when scored for fluency (i.e., the number of consequences identified) and flexibility (i.e., the number of unique categories classifying identified consequences), produced internal consistency coefficients of .92.

Given the complex, unstructured nature of the experimental task, participants also completed Cacioppo and Petty's (1982) Need for Cognition Scale assessing an individual's tendency to engage in and enjoy complex cognitive tasks. The 18-item behavioral self-report measure asks participants to indicate their agreement, on a 5-point scale, with statements such as "I prefer complex to simple tasks." Evidence for the

measure's construct validity is available in Cacioppo and Petty (1982) and Marcy and Mumford (2007). The internal consistency coefficient obtained in this sample was .88.

The Big Five Inventory was administered to measure five general personality dimensions, including openness to experience, conscientiousness, neuroticism, agreeableness, and extroversion (John, Donahue, & Kentle, 1991). These general personality dimensions shape the manner in which a person experiences and responds to the world, and they have been shown to influence leadership and workplace behavior (Barrick, Mount, & Judge, 2001; Goodstein & Lanyon, 1999). The self-report measure consists of 44 short phrases, such as "I am someone who is outgoing, sociable" and "I am someone who is a reliable worker". Respondents indicate, on a 5-point scale, the extent to which they agree or disagree that the statements describe general characteristics of them. This measure has received substantial evidence demonstrating its reliability and construct validity (Benet-Martinez & John, 1998; John & Srivastava, 1999). In this sample, the internal consistency coefficients for the five sub-scales ranged from .77 to .86.

Given the potential affect inducing nature of the scenario's crisis situation and the manipulations requiring participants to take on negative or positive frames of reference, participants completed a measure of trait affect. Participants completed the Positive and Negative Affect Scale (Watson, Clark, and Tellegen, 1988) where they indicated, by responding on a 5-point scale, the extent to which 20 affective descriptions (e.g., interested, excited, hostile, afraid) describe how they typically feel. The positive and negative emotionality sub-scales, created by aggregating the 10 positive affective descriptions and the 10 negative affective descriptions, have

evidenced construct validity (Watson et al., 1988), and they produced internal consistency coefficients of .89 and .85, respectively.

The final measure assessed individual differences in regulatory focus, given that performance on the task was expected to vary as a function of promotion and prevention strategies. The Regulatory Focus Questionnaire asked participants to respond, on a 5-point scale, to 11 self-report items (Higgins, Friedman, Harlow, Idson, Ayduk, & Taylor, 2001). The items assess participant's subjective history of success using promotion, approach or eagerness means of goal attainment, (e.g., "How often have you accomplished things that got you "psyched" to work even harder?") or prevention, avoidance or vigilance means of goal attainment (e.g., "Not being careful has gotten me into trouble at times"). Evidence for the construct validity of this measure has been provided by Higgins et al. (2001) and Freitas, Liberman, Salovey, & Higgins (2002), and the internal consistency coefficients obtained were .60 (promotion scale) and .78 (prevention scale).

At the conclusion of the study, participants completed a questionnaire about the leader problem-solving task adapted from Antes and Mumford (2009). This questionnaire asked participants to respond, on a 5-point scale, to questions such as "Did you find the scenario about EDUTECH engaging?", and "Were you motivated to do a good job as the leader of EDUTECH?" This questionnaire evaluated the extent to which participants were motivated in their completion of the experimental task. The internal consistency coefficient obtained for the seven items comprising this scale was .89.

The final set of control measures were designed to measure participants' domain-relevant expertise as expertise influences leadership and problem-solving performance (Ericsson & Charness, 1994; Vincent et al., 2002). Leadership, business, and educational expertise were assessed via a background data measure adapted from Scott, Lonergan, & Mumford (2005). The 8-item education scale examined exposure to, and interest in, educational issues (e.g., How much time do you spend thinking about how to make schools better?). The additional scales, consisting of six and seven items respectively, were developed to examine leadership (e.g., How often have you studied notable leaders to learn from them?) and business (e.g., How often did your parents or primary caregivers discuss business issues at home when you were growing up?) experience and interest. These scales demonstrated internal consistency coefficients of .79, .89, and .86, respectively. Given the technological focus of the business presented in the leadership scenario, participants were also asked to indicate, on a 5-point scale, to what extent they have interest in technology.

Experimental Task

The business scenario that participants engaged in simulated an organizational leadership problem that required participants to engage in problem-solving (Motowidlo, Dunnette, & Carter, 1990). Participants were instructed to take on the role of a top organizational leader responding to the recent crises taking place within the company. An educational technology company was selected for the leadership task because undergraduate students are familiar with these domains (Baer, 1998), and findings obtained in prior research (e.g., Antes & Mumford, 2009; Scott et al., 2005) indicate that students find these types of problems engaging.

The problem presented to participants (shown in Figure 1) first provided two pages of background information about the company and the participant's leadership role, followed by a short description of the current state of the organization. The background information described the participant's role in co-founding a small educational technology firm eight years earlier. The participant was informed that he or she was appointed to be the President of the company given his or her leadership skill. The participant was given a top leadership role to simulate high-level leadership and to provide the participant with the authority to make a wide-range of changes. Moreover, a top-level role in a self-founded organization was utilized to promote feelings of investment in the company and engagement. In this introductory information, a mentor was also introduced. A former college professor was presented as a trusted source of business advice over the last eight years. The background information went on to briefly describe other organizational co-founders, the company philosophy, products, and departments. Following this background information the current status of the company was noted.

Participants were informed that EDUTECH had been struggling recently, and that EDUCTECH purchased and merged with a small technological firm over the last year. Participants were then told that as a top leader of the company, he or she must develop a solution to the problem and a new vision for the future of the company. The participant was then informed that he/she had taken two actions so far to begin to address the situation. These actions included hiring a consulting firm to analyze the company's current status and emailing his or her mentor for advice. The consulting firm's report allowed for additional information about the organizational crisis to be

presented. The responsibility attribution manipulation was also delivered in the consultant report. The email requesting advice from the mentor allowed for the manipulation of outcome framing and strategic orientation. These manipulations will be described in detail in the manipulation section.

The consultant report provided four pages of information where the nature of the organizational crisis was described. First, a brief memo was provided by the consulting firm indicating the firm's approach for gathering information about the organization, including meetings with organizational managers, employees, and customers, review of company reports and documents, and observation. Next, the memo indicated that an outline of the key issues was attached (shown in Figure 2), followed by a short summary report of what the firm had determined caused the current situation.

The outline of key issues was structured so as to increase the complexity and ambiguous nature of the organizational crisis. Issues identified were arranged according to key organizational areas, including finances, employees, customers, management, products, research and development, and advertising/marketing, but there was no clarity about what might be the key problems and the appropriate plan of action. The final summary report indicated that although the company faced some challenges, it had a number of valuable assets that made it a promising company. Responsibility attribution was then manipulated at the end of this summary report. Following the summary report, the leader's email to Frank and his reply were presented; it was here that the participants received the final two manipulations before writing solutions and vision statements.

It is of note that the order in which participants wrote their solutions and visions was counterbalanced. Participants were provided with as much time as they needed, and they were instructed to work at their own pace, the average participant took about seventy-five minutes to complete the leadership task. Participants were provided with two pages to write their solution and two pages for their vision statement. Responses were typically one page in length. Instructions for the problem solution prompted participants to write their overall plan for solving the company's problems. They were instructed to describe their ideas for solving the major issues faced by the organization and how they would go about implementing their ideas. The vision statement prompt instructed participants to write their vision for the company, which should describe the future of the company. The instructions indicated that forming and communicating a vision is an important part of helping followers understand what the company values and what the company will achieve in the future.

Manipulations

The outcome frame and strategic orientation manipulations were manipulated through the emails received by the leader's business mentor, Frank. Following the consulting firm's summary report, an email exchange between the participant and mentor was provided. In this email, the leader told Frank that he/she was in trouble at EDUTECH. He/she mentioned that an analysis has been conducted, and that he/she had to develop a solution and vision statement to get the company back on track. The leader then solicited advice from Frank. Frank's email reply indicated that one of the most important things to do in solving a major problem is think about the outcomes of the problem and the process of solving the problem in a particular manner. He then

indicated that he had attached two worksheets containing exercises to complete before writing the solution and vision statement. These worksheets provided the basis for manipulation of outcome framing and strategic orientation. It should be noted that these attachments, or manipulations, were presented in counterbalanced fashion.

Outcome Framing. The outcome framing attachment indicated that the leader should think about the potential outcomes of solving the problem. In the *negative outcome framing* condition, participants were told to think about the negative outcomes that could result from not solving the problem. In the *positive outcome framing* condition, participants were instructed to think about the potential positive outcomes of solving the problem. Outcomes were defined for participants so that they would be sure to be clear about what they were to think about. Outcomes were described as the consequences that would come as a result of solving, or not solving, the problem, or the way that things will turn out in the end. Participants were asked to think about as many possible outcomes as they could and write about them in a think-aloud fashion on a one-page provided space. In order to encourage participants to actively process this manipulation, they were instructed to write about *at least 5* outcomes.

Strategic Orientation. The strategic orientation attachment provided by the business mentor indicated that the leader should think about the process that the organization would go through to solve the problem. In the *prevention focus* condition, participants were instructed to think about things that could prevent solving the problem – things that would be disruptive and would need to be avoided. In the *promotion focus* condition, participants were instructed to think about things that could promote solving the problem – things that would be helpful and would need to be accomplished.

Participants were asked to think about as many things as possible and write about them in a one-page provided space. Participants were asked to write about *at least* five things that could prevent, or promote, solving the problem.

Manipulation checks for the outcome frame and strategic orientation manipulations were conducted by rating the participants' written responses to the manipulation prompts. Raters, who were blind to the conditions during rating, were trained to identify positive and negative outcomes and promotion and prevention focused responses. Raters provided three ratings for the participant's outcome responses. These ratings included the extent to which, on a 5-point scale, the nature of the response was outcome-oriented. Next, raters provided a rating regarding the extent to which the response was negative and another rating regarding the extent to which the response was positive. For the strategic orientation manipulation responses, raters indicated the extent to which the response was focused on processes and procedures for working to solve problem. Next, they indicated the extent to which the response was focused on things that could promote solving the problem, or things that could prevent solving the problem. The raters exhibited high agreement on these ratings, with an average interclass correlation coefficient of .91.

These ratings were examined to determine if participants had completed the manipulations as instructed. An average score of 3.75 or above was required on the general outcome framing and strategic orientation ratings to pass the manipulation check. The positive-negative and prevention-promotion ratings were examined by condition to determine if the scores obtained reflected accurate completion of the manipulations. Participants varying more than one and one-half scale points from the

appropriate score for their condition were considered to have failed the manipulation check. This analysis revealed ten participants who had not passed the manipulation checks, and these participants were dropped from the final analysis.

Attribution of Responsibility. Attribution of responsibility was manipulated in the consulting firm's summary report just before the participants continued on to the mentor emails and the outcome framing and strategic orientation manipulations. The summary report indicated that many of the current problems faced by the company emerged about the time that the company acquired the small technology firm and merged it with EDUTECH. In the *internal attribution* condition, participants were told that he/she had mismanaged the merger. The participant was informed that he/she was unorganized and not thorough during the merger. In the *external attribution* condition, participants were told that that the manager of Xtreme Techonology, the small technology firm, had mismanaged the merger. Participants were informed that this individual was unorganized and not thorough during the merger. In order to reinforce this manipulation, a line in the email to Frank mentioned frustration about the situation being caused by the participant himself/herself, or the manager of Xtreme Technology.

As a manipulation check, participants were asked on a post-study questionnaire to respond to six questions assessing their attribution of responsibility for the crisis. Example items include, "To what extent did you feel responsible for causing the problem faced by EDUTECH?", and "To what extent did you feel that the problem was caused by factors outside of your control (reverse scored)?" The scale produced an internal consistency coefficient of .63, and participants reported higher internal

attribution ($M = 3.54$, $SD = .64$) in the internal attribution condition compared to the external attribution condition ($M = 2.94$, $SD = .64$), $t(1, 188) = 6.65$, $p < .01$.

Dependent Variables

Given the complex, ambiguous nature of the performance task and the range of potential approaches that might be taken to address the crisis, participants were asked to respond in an open-ended fashion. These open-ended responses, including a problem solution and a vision statement, were content analyzed to provide scores on the performance variables of interest. Four individuals, all senior-level doctoral students in the field of Industrial and Organizational Psychology with expertise in the domains of leadership and organizational cognition, read the responses provided for the problem solutions and vision statements and content coded the participants' responses. Raters were blind to the conditions when rating the material, and they were unaware of the study hypotheses under investigation.

Problem Solution. The first set of dependent variables consisted of three dimensions of problem solution effectiveness – quality, originality, and elegance – identified in past research of problem-solving on complex, ill-defined problems (Besemer & O'Quin, 1999). Quality was defined as a comprehensive, coherent, and feasible solution. Originality was defined as a novel, unexpected solution, and elegance was defined as a solution that was well-designed and fit together in a straightforward, skillful fashion.

The content judges read each response and rated the quality, originality, and elegance of the problem solution on a 5-point benchmark rating scale, where benchmarks were selected to reflect high, medium, and low levels of performance

(Redmond, Mumford, & Teach, 1993). Figure 3 provides an illustration of the benchmark ratings scales utilized for solution quality. Prior to completing these ratings, the judges participated in a 15 hour training workshop where they were familiarized with the constructs to be rated. Raters received definitions of the constructs and the benchmark rating scales, and practiced using these scales to assign ratings to responses. After two practice sessions and meeting to discuss any discrepancies in their ratings, the judges proceeded to rate all participant responses. The inter-rater agreement coefficients, assessed using intra-class correlations, for these ratings were .81, .75, and .67 for quality, originality, and elegance respectively. As expected (Mobley, Doares, & Mumford, 1992), these ratings evidenced the expected pattern of positive correlations with quality being positively correlated with originality ($r = .74$) and elegance ($r = .73$), and originality being positively correlated with elegance ($r = .57$). These ratings were also positively related to verbal intelligence, with correlations of .15, .16, and .10 for quality, originality, and elegance respectively. Originality was positively related to openness to experience ($r = .14$), providing some additional construct validity evidence for this rating of performance (McCrae, 1987).

Vision Statement. The vision statements were read and coded in a second round of ratings. The vision statements were coded for utility. The utility rating captured the extent to which the judges believed that the vision articulated would prove effective for communicating to followers a sense of direction and shared commitment. Prior to making this rating, the judges participated in a second workshop (8 hours in length) to learn about the construct of interest and practice using the benchmark rating scale. The scale applied for this rating is illustrated in Figure 4.

To corroborate the utility ratings obtained by the judges, naïve undergraduate students were also asked to rate the vision statements (Strange & Mumford, 2005). These ratings assessed the undergraduates' subjective reactions to the vision. Four undergraduate students read the background information and the problems facing the company, and were then instructed to answer a questionnaire for each vision imagining that they were an employee of the organization. The questionnaire consisted of several questions, to which undergraduates responded on a 5-point scale, addressing their affective reactions (e.g., "To what extent did you find the vision engaging?") and whether the vision gave them a sense of direction (e.g., "Did the vision statement help you understand what you could do to help solve the problem?"). The inter-rater agreement for these judgments was .76. The undergraduate responses to these questions demonstrated high inter-item correlations, thus an aggregated scale score was obtained to indicate overall appeal of the visions. More centrally, the undergraduate appeal scores demonstrated a strong positive correlation ($r = .77$) with the expert judges' ratings of utility, providing some evidence for the construct validity of these ratings.

Cognitive Fatigue. Given the complex nature of the leadership task, of interest was whether different approaches to thinking would have differential effects on cognitive fatigue. The measure used to assess cognitive fatigue was Shirom's measure of burnout in the workplace consisting of scales measuring physical, cognitive, and emotional fatigue (Shirom, 2003). The measure asked participants to report how they were feeling at the moment they responded to the questions. An example cognitive fatigue question was, "I have difficulty concentrating". The measure consists of physical, cognitive, and emotional fatigue scales and was administered in its entirety,

but the cognitive fatigue subscale was of key interest for the final analysis. The internal consistency coefficient was .92 for the cognitive fatigue scale.

Analyses

To examine the effects of outcome framing, strategic orientation, and responsibility attribution, an analysis of covariance was conducted for the problem solution (i.e., quality, originality, and elegance) and the vision statement (i.e., utility) dependent variables. The secondary dependent variable, cognitive fatigue, was also analyzed using analysis of covariance. In all three sets of analyses, respective covariates were retained in the final analyses if they were significant at the $p \leq .10$ level.

Covariates were selected prior to the final analysis using a combination of forward insertion and backward deletion procedures where covariates were retained if they were significant using both methods. This procedure ensures that unnecessary covariates are not retained, in turn, maximizing degrees of freedom and the utility of the analysis of covariance procedure (Tabachnick & Fidell, 2001).

Results

The problem-solving findings are presented followed by the vision articulation and cognitive fatigue results. Means, standard deviations, and intercorrelations of study variables are presented in Table 1.

Problem-Solving

The quality, originality, and elegance of solutions generated in response to the crisis scenario were examined to determine the effectiveness of problem-solving. Table 2 presents the results obtained in the univariate analyses of covariance examining quality, originality, and elegance.

Three covariates were retained in the analysis examining solution quality, including need for cognition ($F(1, 179) = 4.28, p < .05$), task motivation ($F(1, 179) = 4.52, p < .05$), and interest in technology ($F(1, 179) = 3.95, p < .05$). This analysis revealed a statistically significant two-way interaction between outcome framing and strategic orientation ($F(1, 179) = 4.35, p < .05$). Examination of the cell means indicated that solution quality was highest under the balanced thinking conditions. Compared to thinking about positive outcomes and a promotion strategy ($M = 2.80, SD = .10$) or negative outcomes and a prevention strategy ($M = 2.69, SD = .10$), when an individual thought about negative outcomes and a promotion strategy ($M = 2.98, SD = .10$) or positive outcomes and a prevention strategy ($M = 2.92, SD = .10$), solutions were highest in quality.

The analysis examining solution originality also included need for cognition ($F(1, 181) = 9.29, p < .01$) as a covariate. A statistically significant three-way interaction between responsibility attribution, outcome framing, and strategic orientation was obtained in this analysis ($F(1, 181) = 3.82, p < .05$). Examination of the cell means indicated that when responsibility was attributed internally to oneself, thinking about negative outcomes and a promotion strategy resulted in more original solutions ($M = 2.86, SD = .13$). When responsibility was attributed externally to another individual, solutions were most original when an individual thought about negative outcomes and a prevention strategy ($M = 2.83, SD = .14$), followed by thinking about negative outcomes and a promotion strategy ($M = 2.74, SD = .14$). Although thinking about negative outcomes and a prevention strategy when responsibility was attributed externally resulted in more original solutions, when responsibility was attributed

internally, thinking about negative outcomes and prevention strategy resulted in solutions of the lowest originality ($M = 2.32$, $SD = .14$).

The originality for all other conditions was moderate relative to those mentioned in the preceding paragraph, with thinking about positive outcomes and a promotion ($M = 2.66$, $SD = .14$) or prevention strategy ($M = 2.66$, $SD = .14$) when responsibility was attributed internally being equally original. Similar originality scores were obtained when responsibility was attributed externally and positive outcomes and a promotion strategy were thought about ($M = 2.64$, $SD = .13$). However, originality was diminished when responsibility was attributed externally and positive outcomes and a prevention strategy were considered ($M = 2.51$, $SD = .14$), producing the lowest originality when responsibility was attributed externally.

In the analysis of solution elegance, need for cognition was again retained as a covariate ($F(1, 180) = 7.19$, $p < .01$), in addition to conscientiousness ($F(1, 180) = 2.77$, $p < .10$). In this analysis, the two-way interaction between responsibility attribution and strategic orientation was statistically significant ($F(1, 180) = 4.10$, $p < .05$), in addition to the two-way interaction between outcome framing and strategic orientation ($F(1, 180) = 4.85$, $p < .05$). The cell means indicated that when responsibility was attributed to oneself, more elegant solutions were obtained when thinking about a promotion strategy ($M = 2.56$, $SD = .07$), but when responsibility was attributed to someone else, more elegant solutions ($M = 2.56$, $SD = .08$) were obtained with a prevention strategy. Solution elegance was lowest when responsibility was attributed to oneself and a prevention strategy was applied ($M = 2.35$, $SD = .08$), and elegance was moderate when

responsibility was attributed externally and a promotion strategy was applied ($M = 2.46$, $SD = .08$).

With regard to the interaction between outcome framing and strategic orientation, a similar pattern to solution quality was obtained. More elegant solutions were produced when thinking about outcomes and strategies was balanced. Specifically, solutions were most elegant when thinking about negative outcomes and a promotion strategy ($M = 2.59$, $SD = .08$) or positive outcomes and a prevention strategy ($M = 2.54$, $SD = .08$). Solutions were less elegant when thinking about positive outcomes and a promotion strategy ($M = 2.42$, $SD = .08$) or negative outcomes and prevention strategy ($M = 2.37$, $SD = .08$).

In summary, these findings with regard to problem-solving provide support for Hypothesis 1 which proposed that outcome framing and strategic orientation would interact to influence leader cognition. Moreover, balanced thinking about outcomes and strategies resulted in solutions of the highest quality and elegance. Hypothesis 3 suggested that negative framing of outcomes and a promotion strategy would produce the most effective problem solutions. Although, the cell means for quality, originality (except under externally attributed responsibility), and elegance tended to be highest under these conditions, they were not markedly higher than the other balanced condition where individuals thought about positive outcomes and a prevention strategy.

In response to Research Question 1, the findings with regard to problem-solving indicated that attribution of responsibility interacted with outcome framing and strategic orientation with respect to one aspect of problem-solving, namely originality. The effect of outcome framing and strategic orientation differed depending on whether

responsibility was attributed internally or externally. Thinking about negative outcomes and a promotion strategy was most effective for internally attributed responsibility, but for external responsibility, thinking about negative outcomes and a prevention strategy produced the most original solutions.

Vision Articulation

The overall effectiveness of vision articulation was examined using the expert judges' ratings of utility. Table 3 presents the results obtained in the analysis of covariance examining utility. Three covariates were retained in this analysis, including scores on the individual differences measure of preference for a promotion regulatory strategy ($F(1, 179) = 6.63, p < .01$), task motivation ($F(1, 179) = 7.07, p < .01$) and task order – whether the vision statement was written before or after the problem solution – ($F(1, 179) = 2.77, p < .10$). The analysis revealed a two-way interaction between outcome framing and strategic orientation ($F(1, 179) = 3.72, p < .05$). Similar to the results obtained for problem-solving, visions of the highest utility were produced under balanced thinking conditions. Specifically, visions were most effective when thinking about positive outcomes and a prevention strategy ($M = 2.97, SD = .10$) or negative outcomes and a promotion strategy ($M = 2.86, SD = .10$). Interestingly, vision utility was lowest in the positive outcome-promotion strategy condition ($M = 2.69, SD = .11$) and moderate in the negative outcome-prevention strategy condition ($M = 2.75, SD = .10$).

These findings with regard to vision articulation provided additional support for Hypothesis 1, as a balanced outcome-strategy orientation was most effective for vision articulation. The pattern that emerged with respect to vision utility provided some

support for Hypothesis 2, which proposed that positive outcome framing and a prevention strategy would be the most effective thinking approach for vision statements. Indeed, visions of highest utility were obtained in the positive outcome framing-prevention strategy condition. Although Hypothesis 3 was not strongly supported by the pattern of means emerging for problem-solving, comparison of the effects of outcome framing and strategic orientation on vision articulation versus problem-solving provided some evidence that the thinking approach facilitating one aspect of leader cognition may not be entirely consistent with the thinking approach facilitating the other. More specifically, although a negative outcome-promotion strategy and positive outcome-prevention strategy were most effective for both vision articulation and problem-solving, clearly positive outcome-prevention strategy was more beneficial for vision articulation. Moreover, while thinking about negative outcomes and a prevention strategy produced visions of moderate utility and thinking about positive outcomes and a promotion strategy produced the lowest utility visions, the reverse pattern was true for problem solution quality. That is, more quality solutions were obtained in the positive outcome-promotion strategy condition than in the negative outcome-prevention strategy condition. Finally, in response to Research Question 1, although attribution of responsibility produced at three-way interaction with regard to solution originality, responsibility attribution did not interact with outcome framing and strategic orientation to influence vision utility.

Cognitive Fatigue

Cognitive fatigue following performance on the leadership task was a secondary dependent variable of interest. The analysis of covariance examining cognitive fatigue

is shown in Table 4. Task motivation ($F(1, 176) = 13.78, p < .01$), openness to experience ($F(1, 176) = 9.67, p < .01$), and number of completed psychology courses ($F(1, 176) = 5.34, p < .05$) were retained as covariates. One potential explanation for the positive relationship between number of completed psychology courses and fatigue is that participants with more psychology experience were more familiar with the importance of participant performance in experiments, inducing stress or performance anxiety.

Research Question 2 asked whether different approaches to thinking would produce different reports of cognitive fatigue following performance. Indeed, a statistically significant interaction was obtained between outcome framing and strategic orientation ($F(1, 176) = 5.06, p < .05$). The cell means revealed that participants reported the least cognitive fatigue when positive outcome framing was coupled with a prevention strategy ($M = 2.43, SD = .18$) followed by negative outcome framing coupled with a promotion strategy ($M = 2.60, SD = .18$). Participants reported the greatest cognitive fatigue in the negative outcome framing-prevention strategy ($M = 3.12, SD = .18$) and positive outcome framing-promotion strategy conditions ($M = 2.72, SD = .18$). Thus, it appears that a balanced thinking approach, the same approach facilitating performance, resulted in the lowest reported levels of cognitive fatigue.

Discussion

Leadership has been described by some scholars as managing chaos (Hunt, Boal, & Dodge, 1999; Marion & Uhl-Bien, 2001). Leaders must continually monitor and make sense of their surroundings, and they must generate solutions to complex social problems ranging from organizing follower expertise to accomplish task

objectives to generating novel solutions to disruptive, ambiguous crises (Mumford et al., 2007). When confronted with organizational crises, countless factors and potential consequences are at play (Pearson & Clair, 1998). Moreover, others must be managed and brought together to work towards resolution of the crisis (Rousseau, Sitkin, Burt, & Camerer, 1998). Clearly, these leadership activities require complex thinking.

Existing leadership theory emphasizes social-interactional processes, and many theories emphasize positive, cheerful leadership styles focusing on positive affect and influence strategies (Avolio & Gardner, 2005; Bono & Ilies, 2006). These theories, however, do not take into account the cognition underlying effective leadership. Emerging work suggests that the production of quality problem solutions, plans, and viable visions requires complex, critical thinking (Antes & Mumford, 2009; Caughron & Mumford, 2008; Shipman, Byrne, & Mumford, in press), which implies a divergence from the positive approach embodied by many theories of leadership (Norem & Chang, 2002).

In the present study, the effects of positive versus negative approaches to thinking about potential outcomes and the process of working through organizational crisis were examined. As expected, the findings demonstrated that effective leader cognition took place under balanced thinking conditions. When positive outcomes were considered, then a prevention strategy – characterized by thinking about things that could derail the process of solving the problem – facilitated the production of an effective problem solution and vision statement. When negative outcomes were considered, then a promotion strategy – characterized by thinking about things that could facilitate the problem-solving process – contributed to effective problem solutions

and vision statements. Thus, it appears that the production of quality solutions and viable visions statements relies upon a compensatory strategy where the thinking approach to be applied during one aspect of leader cognition depends upon the approach applied during others (Lonergan, Scott, & Mumford, 2004). Clearly, a general positive approach to thinking did not facilitate leader cognition and the production of effective solutions and visions.

Of course, the mechanisms underlying these effects are of key interest for understanding leader cognition. The balanced thinking approach facilitating problem-solving and vision articulation may aid the development of a more sophisticated mental model for acting on the crisis by inducing shifts in thinking about elements of the crisis (Maani & Maharaj, 2004; Mumford et al., 2007). A positive approach signals safety and stability, while a negative approach signals disruption and threat (Higgins, 2002). These approaches call for many different considerations with regard to addressing the crisis, fostering comprehensive analysis regarding key opportunities, threats, strengths and weaknesses.

Not only might these shifts simply invoke thinking about more elements of the crisis, but they might facilitate more effective thinking about certain aspects of the crisis. For instance, thinking about positive outcomes or a promotion strategy may be more beneficial for analysis and consideration of the people elements of the crisis (Scheier & Carver, 1993), while negative outcomes and a prevention strategy may be more beneficial for analysis and consideration of technical and task-related aspects of the crisis. These potential mechanisms require future investigation. In particular, future research should examine the formation of mental models under different thinking

conditions. This suggested work would address one of the central limitations of the present study, as mental models were not examined.

Clearly, leaders must think, and as demonstrated in the present study, there are more and less effective approaches for do so. However, it is also true that leaders experience and display affect, build relationships with followers, and exert influence (Yukl, 2006). Therefore, the findings of the present study broach a question about the interaction of the cognitive, affective, and social-interactional dimensions of leadership – are there inconsistencies across these dimensions in terms of the general approach facilitating performance in each domain? If leaders, on the one hand, must think negatively about aspects of their work, but, on the other hand, must outwardly present a positive demeanor to followers, this inconsistency has fundamental implications pertaining to the complexity of leadership and leader performance.

An illustration of this implication may help elucidate this point. This proposition implies that the frame, or orientation, a leader applies in thinking about how to solve a problem in the confines of his or her office, may be quite different than the approach to be applied once a leader exits his or her office and communicates a plan or vision to followers. Indeed, even within this study, which only examined performance with respect to cognitive dimensions of a leaders' work, namely problem-solving and vision articulation, the conditions facilitating effectiveness with respect to vision articulation differed somewhat from the conditions facilitating problem-solving. Thus, even with respect to performance on tasks requiring complex thinking, effective leaders must be able to shift their approach depending on the demands of the task. Clearly, shifting

approaches across cognitive, affective, and social-interactional dimensions would likely induce stress – a proposition requiring examination in future research.

In the present study, cognitive fatigue was examined after task performance as one important psychological well-being variable, and it was found that the conditions promoting a balanced thinking approach produced the lowest reported cognitive fatigue. If, as suggested, the balanced approach facilitated examination of the problem and the development of a more sophisticated mental model, then it is not surprising that cognitive fatigue was lowest under these conditions. It was also possible that these conditions could have been more demanding given the required shift in approach, but, at least with respect to fatigue, these conditions did not appear to be more demanding for participants.

In this study, however, cognitive fatigue was examined after performance in just the cognitive domain. Different findings might result if fatigue, or stress, was measured following switching between positive and negative approaches with respect to a cognitive task followed by an interaction task. If indeed, these demands of leadership induce stress, then strategies for managing this stress would be necessary (Smith & Cooper, 1994). However, it may be that the positive approach displayed in affective and interactional aspects of a leaders work, in and of itself, serves as a compensatory mechanism to offset the negative, critical thinking that leaders must engage in. Research has demonstrated that capacities such as self-regulation and emotion management facilitate leader performance (Palmer, Walls, Burgess, & Stough, 2001; Sosik, Potosky, & Jung, 2002), perhaps in part because they help to monitor and manage shifts across these domains. Future research explicitly examining interactions between leader

performance on cognitive, affective, and social-influence tasks would shed light on these issues.

Of course, the present study examined just some factors that might influence leader cognition. Certainly, leaders must think about any number of other elements and in varying degrees of specificity. For instance, leaders might explicitly engage in analysis of causes (Marcy & Mumford, 2007), consideration of assumptions (Mitroff, Emshoff, & Kilmann, 1979), or analysis of stakeholder support (Bryson, 2004). These, and other, factors require attention in future research. For example, what are the effects of considering potential sources of stakeholder support versus potential sources of opposition?

In future investigations it is also important to examine other psychological and situational variables that might interact with how leaders think to influence the effectiveness leader cognition. In the present study, outcome framing and strategic orientation interacted to influence leader cognition, but the nature of these effects with regard to solution originality depended on whether responsibility was attributed internally or externally. The influence of a promotion orientation as a compensatory strategy under conditions of negative outcome framing was especially pronounced when responsibility was attributed internally, whereas when external attributions of responsibility were made, a negative outcome-prevention strategy resulted in original solutions, and compensation was not necessary. In keeping with this finding, responsibility attribution interacted with strategic orientation to influence solution elegance such that when attributions were internal, a promotion orientation yielded more elegant solutions, but a prevention orientation produced more elegant solutions

under conditions of external attribution. External attributions turn attention outward to the situation, while internal attributions focus blame inward and might be constraining (Tennen & Affleck, 1990). Certainly, there are any number of other variables that may also be central to leader cognition or may play a role in shaping the influence of thinking approaches on the effectiveness of problem solutions and visions. Situational variables, such as time pressure (Antes & Mumford, 2009) and interpersonal conflict (Katz, 1977), might induce stress (Schwarzer, 1998) and thus affect mental model formation and thus leader cognition.

Clearly, additional research is necessary, but the present findings suggest one rather important practical implication. Generally speaking, in thinking through a problem or crisis, it appears that it is advisable for a leader to take steps to consider the problem from a balanced perspective. In particular, if the most salient potential outcomes are positive or represent opportunity, then a leader should think about how to avoid derailment. On the other hand, if negative outcomes are salient, then a leader should think about how he or she might promote successfully addressing the problem. Additional research will likely suggest other techniques and compensatory strategies that might facilitate leader cognition.

The theoretical and practical implications discussed here should be considered in light of the limitations of this study. First, this study was based on an experimental paradigm. Although the study simulated a real-world organizational problem calling for leader cognition, the simulation was nonetheless low-fidelity (Motowidlo, Dunnette, Carter, 1990) and could not exactly mimic the real-world. Future investigations must address whether these findings generalize to leadership in real-world settings where

crises and consequences are more salient, history exists among organizational stakeholders, and any number of situational variables are operating (Uhl-Bien, Marion, & McKelvey, 2007). An additional potential limitation pertains to the sample used in this study. It is possible that these findings may not fully generalize to leaders who have more expertise (Ericsson & Charness, 1994).

Another limitation concerns the manipulation of responsibility attribution. Although the manipulation check indicated that participants in the internal attribution condition believed that they were at fault for the crisis, it is likely that perceptions of responsibility were not as salient as they would be in a real-world setting. Thus, the effect of this variable may have been attenuated in this study. Indeed, although the manipulated variables examined in this study demonstrated statistically significant effects, the effect sizes were relatively small.

In this study, participants generated their solution and vision statement in consecutive order, which may not reflect how leaders typically generate solutions and visions. The order in which participants generated their solution and vision statement was counterbalanced to control for order effects, but nevertheless the effects of the variables of interest may have differed if the generation of solutions and vision statements were separated in time.

Finally, it is unclear whether the solutions rated highest in quality would in fact address the organizational crisis and facilitate long-term organizational success. Additionally, it is uncertain whether the judges' ratings of vision utility would translate to real-world effectiveness. However, scores for vision appeal obtained from naïve judges comparable to individuals likely to work at a firm like the one in this study,

provided evidence that the visions receiving higher utility ratings were also likely to be more favorably viewed by these mock employees. Nonetheless, leaders and followers would have an established relationship which would influence follower reactions to the vision articulated by the leader (Conger, Kanungo, & Menon, 2000; Graen & Uhl-Bien, 1995).

Given the wide range of complex functions that leaders must perform, whether persuading others or devising a problem solution, perhaps it is not all that surprising that this study provides preliminary evidence suggesting that the general approach contributing to effective performance with respect to one leadership dimension may be different, or even somewhat inconsistent, with the approach contributing to effective performance with regard to other dimensions. Nevertheless, leaders must perform leadership functions in concert with one another. How leaders perform these complex behaviors in conjunction and do so effectively remains a critical matter for future investigation. Research examining leader cognition remains in its infancy, but clearly it has important theoretical implications for understanding leadership. This research will also provide valuable practical recommendations for facilitating leader performance.

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Table 1. Means, Standard Deviations, and Intercorrelations

| | <i>M</i> | <i>SD</i> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|------------------------------|----------|-----------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1 Need for Cognition | 3.30 | .63 | 1.00 | | | | | | | | | | | | | |
| 2 Conscientiousness | 3.72 | .62 | .28 | 1.00 | | | | | | | | | | | | |
| 3 Openness to Experience | 3.63 | .67 | .54 | .14 | 1.00 | | | | | | | | | | | |
| 4 Promotion Regulatory Focus | 3.81 | .57 | .33 | .45 | .19 | 1.00 | | | | | | | | | | |
| 5 Task Motivation | 3.66 | .83 | .40 | .29 | .27 | .21 | 1.00 | | | | | | | | | |
| 6 Task Order | 1.48 | .50 | -.09 | -.07 | -.08 | .08 | -.01 | 1.00 | | | | | | | | |
| 7 Interest in Technology | 3.18 | 1.17 | .17 | .16 | .25 | .05 | .22 | -.08 | 1.00 | | | | | | | |
| 8 Psychology Courses | 2.04 | .45 | -.06 | -.04 | -.07 | -.09 | .02 | -.06 | -.07 | 1.00 | | | | | | |
| 9 Solution Quality | 2.85 | .72 | .23 | .08 | .14 | .05 | .25 | -.10 | .20 | .05 | 1.00 | | | | | |
| 10 Solution Originality | 2.65 | .68 | .19 | .01 | .15 | .13 | .19 | -.03 | .15 | .09 | .74 | 1.00 | | | | |
| 11 Solution Elegance | 2.48 | .54 | .22 | .20 | .06 | .18 | .14 | -.12 | .17 | .08 | .73 | .57 | 1.00 | | | |
| 12 Vision Utility | 2.82 | .71 | .21 | .20 | .12 | .25 | .22 | .13 | .04 | .03 | .28 | .26 | .27 | 1.00 | | |
| 13 Vision Appeal | 2.67 | .68 | .25 | .19 | .15 | .17 | .15 | .14 | .02 | -.03 | .19 | .19 | .19 | .77 | 1.00 | |
| 14 Cognitive Fatigue | 2.72 | 1.36 | -.26 | -.37 | -.29 | -.28 | -.32 | -.08 | -.22 | .15 | -.21 | -.17 | -.19 | -.18 | -.09 | 1.00 |

Note. All correlations with an absolute value greater than .15 significant at $p < .05$ level. *M* = mean, *SD* = standard deviation.

Table 2. Analysis of Covariance for Solution Quality, Originality, and Elegance

| | Quality | | | | Originality | | | | Elegance | | | |
|--|----------|-----------|----------|----------|-------------|-----------|----------|----------|----------|-----------|----------|----------|
| | <i>F</i> | <i>df</i> | <i>p</i> | η^2 | <i>F</i> | <i>df</i> | <i>p</i> | η^2 | <i>F</i> | <i>df</i> | <i>p</i> | η^2 |
| <u>Covariates</u> | | | | | | | | | | | | |
| Need for Cognition | 4.28 | 1, 179 | .04* | .023 | 9.29 | 1, 181 | .00** | .049 | 7.19 | 1, 180 | .00** | .038 |
| Task Motivation | 4.52 | 1, 179 | .04* | .025 | | | | | | | | |
| Interest in Technology | 3.95 | 1, 179 | .04* | .022 | | | | | | | | |
| Conscientiousness | | | | | | | | | 2.77 | 1, 180 | .09† | .015 |
| <u>Main Effects</u> | | | | | | | | | | | | |
| Responsibility Attribution | 1.81 | 1, 179 | .18 | .010 | 0.29 | 1, 181 | .59 | .002 | 0.53 | 1, 180 | .47 | .003 |
| Outcome Framing | 0.05 | 1, 179 | .82 | .000 | 0.49 | 1, 181 | .49 | .003 | 0.00 | 1, 180 | 1.00 | .000 |
| Strategic Orientation | 0.69 | 1, 179 | .41 | .004 | 2.24 | 1, 181 | .14 | .012 | 0.38 | 1, 180 | .54 | .002 |
| <u>Interactions</u> | | | | | | | | | | | | |
| Resp. Att. * Outcome Framing | 1.00 | 1, 179 | .32 | .006 | 2.25 | 1, 181 | .14 | .012 | 0.08 | 1, 180 | .77 | .000 |
| Resp. Att. * Strategic Orientation | 1.99 | 1, 179 | .16 | .011 | 1.76 | 1, 181 | .19 | .010 | 4.10 | 1, 180 | .04* | .022 |
| Outcome Framing * Strategic Orientation | 4.35 | 1, 179 | .04* | .024 | 0.67 | 1, 181 | .41 | .004 | 4.85 | 1, 180 | .03* | .026 |
| Resp. Att. * Out. Framing * Strategic Ori. | 0.06 | 1, 179 | .80 | .000 | 3.82 | 1, 181 | .05* | .021 | 0.11 | 1, 180 | .74 | .001 |

Note. *F* = F-ratio, *df* = degrees of freedom, *p* = p-value, **p* < .05, ***p* < .01, † *p* < .10, η^2 = partial eta-squared effect size.

Table 3. Analysis of Covariance for Vision Utility

| | Utility | | | |
|---|----------|-----------|----------|----------|
| | <i>F</i> | <i>df</i> | <i>p</i> | η^2 |
| <u>Covariates</u> | | | | |
| Promotion Regulatory Focus | 6.63 | 1, 179 | .01* | .036 |
| Task Motivation | 7.07 | 1, 179 | .01* | .038 |
| Task Order | 2.77 | 1, 179 | .10† | .015 |
| <u>Main Effects</u> | | | | |
| Responsibility Attribution | 0.38 | 1, 179 | .54 | .002 |
| Outcome Framing | 0.07 | 1, 179 | .79 | .000 |
| Strategic Orientation | 0.66 | 1, 179 | .42 | .004 |
| <u>Interactions</u> | | | | |
| Resp. Att. * Outcome Framing | 0.24 | 1, 179 | .63 | .001 |
| Resp. Att. * Strategic Orientation | 0.48 | 1, 179 | .49 | .003 |
| Outcome Framing * Strategic Orientation | 3.72 | 1, 179 | .05* | .020 |
| Resp. Att. * Out. Framing * Strategic Orientation | 1.62 | 1, 179 | .21 | .009 |

Note. *F* = F-ratio, *df* = degrees of freedom, *p* = p-value, **p* < .05, ***p* < .01, † *p* < .10, η^2 = partial eta-squared effect size.

Table 4. Analysis of Covariance for Post-Task Cognitive Fatigue

| | Cognitive Fatigue | | | |
|---|-------------------|-----------|----------|----------|
| | <i>F</i> | <i>df</i> | <i>p</i> | η^2 |
| <u>Covariates</u> | | | | |
| Task Motivation | 13.78 | 1, 176 | .00** | .073 |
| Openness to Experience | 9.67 | 1, 176 | .00* | .052 |
| Psychology Courses | 5.34 | 1, 176 | .02* | .029 |
| <u>Main Effects</u> | | | | |
| Responsibility Attribution | 0.12 | 1, 176 | .73 | .001 |
| Outcome Framing | 2.50 | 1, 176 | .12 | .014 |
| Strategic Orientation | 0.43 | 1, 176 | .51 | .002 |
| <u>Interactions</u> | | | | |
| Resp. Att. * Outcome Framing | 0.96 | 1, 176 | .33 | .005 |
| Resp. Att. * Strategic Orientation | 1.99 | 1, 176 | .16 | .011 |
| Outcome Framing * Strategic Orientation | 5.06 | 1, 176 | .03* | .028 |
| Resp. Att. * Out. Framing * Strategic Orientation | 1.95 | 1, 176 | .17 | .011 |

Note. *F* = F-ratio, *df* = degrees of freedom, *p* = p-value, **p* < .05, ***p* < .01, η^2 = partial eta-squared effect size, *N* = 186.

Figure 1. Business Scenario Background

EDUTECH BUSINESS SCENARIO

Your Background

You are **Alex Grant**, a co-founder of EDUTECH. EDUTECH specializes in cutting-edge educational technology and is located in the southwestern region of the U.S. You and three of your college classmates started the company 8 years ago when you graduated. You have a degree in Business Administration and a minor in Psychology and you worked as a manager for a local business during college. Given your background and leadership skills, you were appointed President of EDUTECH. You are looking for guidance concerning all aspects of the business. Founding and leading a company has been a challenging but exciting experience for you so far.

You credit much of your success to guidance from **Frank Graham**, your mentor during the last 8 years of leading the company. He was your favorite professor in college and offered to provide you with advice any time that you need it. Frank has many years of business experience; he owns his own company and has a Ph.D. in management. You trust his advice very much.

Co-Founders

Mark Freedman is the technological brains of the company. He majored in computer science in college and is fascinated with computers and technology. He designed most of EDUTECH's current computer software products and is currently learning about virtual reality and 3-D simulation.

Susan Tipton has the educational background of the group. She majored in education in college and is especially knowledgeable about educational psychology which explains how people learn. She has been the key to developing effective instructional tools that help people to learn.

Jaime Lewis has a degree in marketing and a minor in computer graphics. She has outstanding graphical design abilities that she uses for both marketing products and for giving input about how to make the products themselves look flashy and realistic.

Company Philosophy

EDUTECH's slogan is "21st Century Technology for the 21st Century Learner." The company prides itself on developing innovative, state-of-the-art technological educational products. EDUTECH is devoted to ongoing product testing to ensure quality and especially emphasizes research to ensure that products promote learning. The key goals of the company include:

- Ongoing technological research and innovation
- Products based on educational and learning research
- Custom design and fabrication to meet customer specification
- Honesty in all business operations
- Unsurpassed product quality
- Top-notch customer service

Figure 1 (continued). Business Scenario Background

Products

EDUTECH offers standard and customized products. Customized products are designed and developed to meet the specific needs of customers. Products initially covered a limited number of subjects, such as writing, math, and history, but expanded as customers demanded additional areas such as human anatomy, language, literature, and psychology. The largest group of customers has been high schools and colleges.

The majority of products are computer software lessons that present subject matter followed by practice activities that present realistic examples of the material. For example, a biology lesson about the anatomy of animals might be followed by computerized dissection of animals. Instead of merely reading about topics or being lectured about them, learners actually see them and interact with them. A new focus of the company is on products that adapt to the learning style, pace, and skill level of the learner. The technology will be able to determine the specific needs of each person and tailor the lessons and practice activities accordingly. EDUTECH is also considering simulations that would replicate actual real-world experiences for the learner.

Departments

You, Mark, Susan, and Jaime are responsible for the top leadership responsibilities of the company, and you hired managers to run the day-to-day operations of the six departments described below. Currently, 55 employees are employed by EDUTECH.

Research and Development focuses on staying up-to-date on the latest educational research and technological innovations and designs and researches products.

Production is responsible for developing products designed by Research and Development and troubleshoots technical problems discovered during testing.

Sales and Marketing focuses on informing potential customers of EDUTECH's quality, innovative products and also emphasizes that customized products can be developed.

Customer Satisfaction and Technical Support monitors customer relations in order to promote customer satisfaction and provides technical support to customers.

Finance and Accounting manages all the financial aspects of the company.

Human Resources hires, trains, and compensates employees.

Current Situation

Although EDUTECH's success has surpassed your expectations, recently EDUTECH has been struggling. About a year ago, EDUTECH purchased a small technology company, Xtreme Technology, and merged the company with EDUTECH's existing operations. Since this time, things have been going downhill. You are concerned that the company's current direction will not provide long-term success. As the top leader of the company, you must develop a solution to the problem and a new vision for the future of the company. Two things have been done so far:

- 1) A consulting firm came to EDUTECH to analyze the company's current situation and determine who was responsible for causing the problem.
- 2) You emailed your mentor, Frank, to ask for advice.

Figure 2. Consultant Report

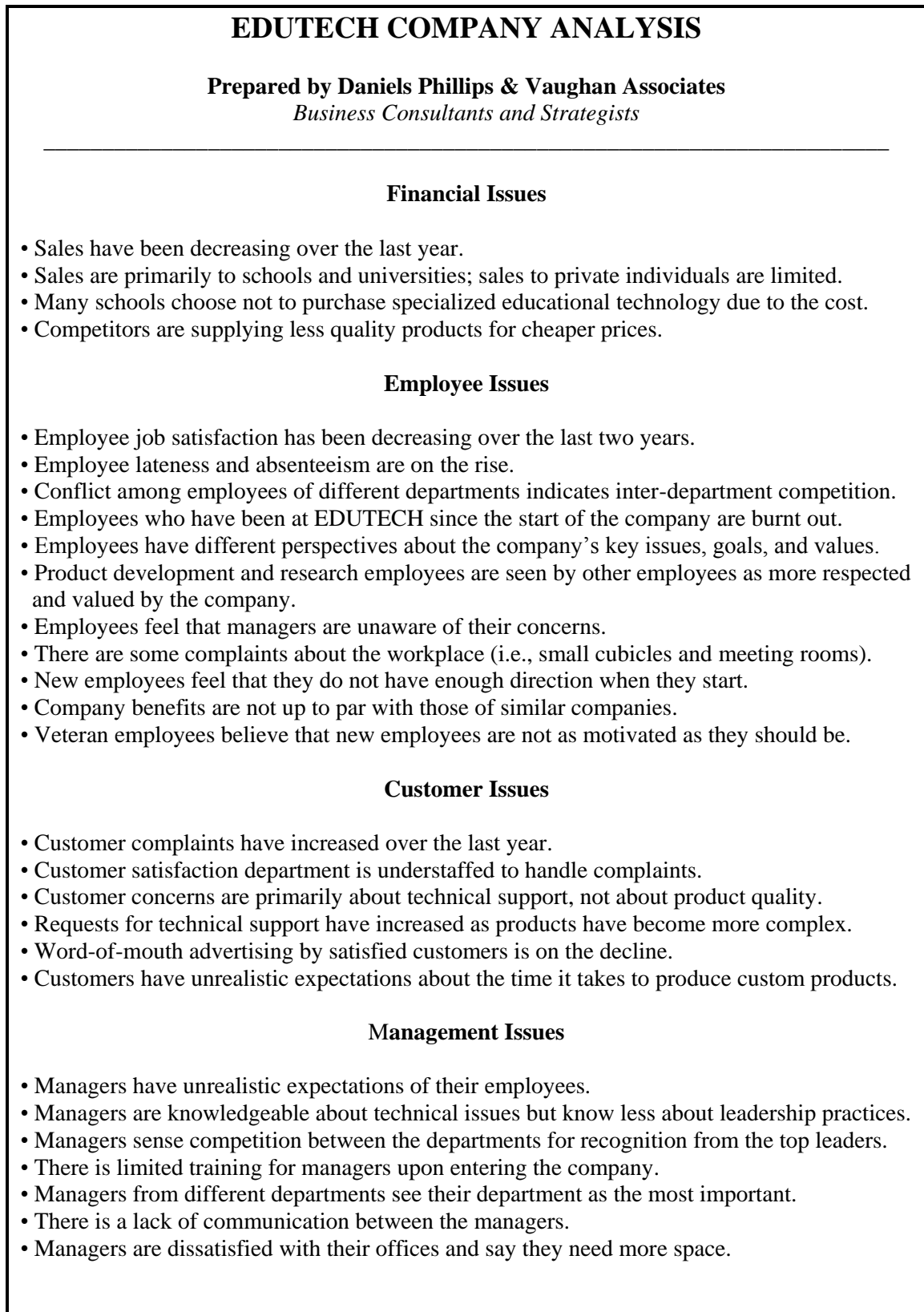


Figure 2 (continued). Consultant Report

Product Issues

- Products are well made and respected by the public.
- Customized products are much more expensive to produce than standard products.
- Product lines are not well defined; potential new clients are unclear about what is offered.
- There is increasing demand for products in different languages.
- The creation of new products needs to be strategic with a focus on future needs.
- Product lines have focused heavily on traditional students.

Research and Development Issues

- Research has not been focused; instead it has been somewhat random.
- Inappropriate balance between research money and time spent on existing product testing versus new product development.
- There is no systematic process for conceiving of product ideas and carrying them out.
- Not enough research to ensure that the focus on adaptable products will be successful.
- Product development has not considered globalization of society.
- No programs to ensure that employees are learning what they need to be effective researchers and product developers.

Advertising and Marketing Issues

- EDUTECH has a good reputation with supplier companies, customers, and investors.
- Long-term plan for selling new products is not well defined.
- More sophisticated, more expensive products will be more difficult to sell to customers.
- College students learning to become teachers are not learning about classroom technology.
- The benefits of EDUTECH products relative to the costs are not understood by customers.
- Many people think that the use of computers, computer software, and other technology for learning is really just the same as playing computer games.
- Product capabilities and the research behind them are difficult for people to understand.
- EDUTECH is the primary supplier in the local area, but holds little of the market share outside of the local area.
- People are unaware of the research that supports the effectiveness of EDUTECH products.
- Schools and universities are either: 1) completely dedicated to technology in the classroom, 2) reluctant but persuadable to use technology in the classroom, or 3) committed to traditional classroom techniques, refusing to move to the use of technology.
- Older teachers and parents are especially resistant to the use of technology for learning.

Figure 3. Benchmark Rating Scale for Problem Solution Quality

Dimension

Quality – the solution is complete, coherent, and useful.

Completeness: The participant understands the critical issues and fully addresses them.

Coherence: The response is well thought-out and logical.

Usefulness: The response is feasible and appropriate for addressing the problem.

Markers of Quality

- Solution seems to be balanced in terms of weighting relevant information and timeframe
- Could be implemented; provides a stepping-off point
- Specifies ways to evaluate progress/determine if plan is working
- Capitalizes on strengths of company and overcomes company weaknesses
- Reasonable resource demand
- Likely to be accepted by stakeholders
- Likely to create long-term opportunities and to be workable in the long-term

Rating Scale – To what extent is the participant's solution of quality?

1 – Not at all

First, we might have to let some employees go. Our overall concerns are time and money. With the employees left, it would be important to gain their support and trust. To make sure they're on board an increase in complements, maybe a few personal visits from me to their office. I also have to improve the attitudes of management and make sure they realize how valuable the employees are. They should be mature enough to stop being so big-handed, but if not, I will do what I need to do to ensure they change their views. Once everyone is on the same page, I will work with management and the consulting firm to devise steps we need to take to move forward. Personally, I would look into gradually cutting out Xtreme Technology since our problems started when we joined businesses.

2 – To a small extent

3 – To a moderate extent

Absenteeism is not acceptable, so we will start a 3-strike policy. However, managers will allow for flexible schedules to address employees concerns. We will also increase workspace as soon as money is available. New employees will receive more intense training. Customers will receive a survey after each transaction, so that their opinions are heard. We will have a technical support hotline at all times. Managers will have mandatory leadership seminar 2 weekends out of every quarter. We are all one, so no competition.

4 – To a large extent

5 – To a very large extent

We need to improve our client base. We will start advertising to private schools. We will also give incentives for referring schools for ordering with us. We also need to improve customer service, and to do so we will better educate our representatives. This will enable them to better answer questions and more efficiently. We also should contact local colleges to teach a class using our product so people see a live demonstration. We need to decrease production time by streamlining the development to production process. Better communication between departments will be the first step in this regard, followed by updated software systems to track product development and provide reports regarding whether we are meeting our production time goals. We will also work on employee satisfaction through rewarding people for their accomplishments and the improvements of the company. We will also look to improve employee and managerial training upon hiring and also over the course of tenure with the company.

Figure 4. Benchmark Rating Scale for Vision Utility

Dimension

Utility – the ideas are presented in a well thought-out manner and they will work; the vision will provide followers with a sense of direction and common commitment, ultimately causing change.

Markers of Utility

- Presents a simple and idealistic picture of the desirable future
- Provides direction and provokes motivation
- Expresses confidence in followers and sets high expectations for them
- Persuasive and credible; appears feasible to followers
- Well articulated, easily understood
- Fits with company values and goals
- Focuses on playing up strengths and overcoming weaknesses
- Communicates a strategy for attaining vision
- Reduces stress, anxiety, and confusion; bounds the problem

Rating Scale –To what extent does the participant’s vision demonstrate utility?

1 – Not at all

My vision is to become a successful business and be rich. To be able to not worry about money problems and have the chance to say I work for a successful business and the people I work with are great. To be excited to come to work in the morning.

2 – To some extent

3 – To a moderate extent

This company cares about the people who build this company, the people who run this company, and the people who keep this company thriving. This company will do everything in its power to satisfy every contributor to the company. We will work towards better satisfaction for everyone involved with new and enhanced working facilities and broader aspects of products, such as different learning styles and languages to make everyone feel equal and knowledgeable. We will also manage time and money more efficiently.

4 – To a large extent

5 – To a very large extent

Eight years ago, EDUTECH was started to provide quality service and products to customers across the nation. Today, I feel that this vision needs to be redefined. This refocused vision will guide our company through a period of changes made to adapt to our current struggles with as little difficulty and as much unity as possible. This vision can be summed up as the answer to two questions that any successful company must answer. First, “What is our service?” and second, “How do we serve?” Answering these questions we will progress from a successful past to an even more successful future. We will provide quality products to prepare students of all ages for life ahead by making learning easier and an interactive experience. Everyone is necessary for this to happen. To work together to make innovative, successful products, we need to support each other and resolve conflicts when they arise. Quality service for our customers means thinking about each other and the customers more than ourselves. We must go the extra mile for customers. I challenge you to embrace this vision and invite you to pursue it with me.