MOVING FORWARD FROM PROJECT FAILURE:

NEGATIVE EMOTIONS, AFFECTIVE COMMITMENT AND LEARNING FROM THE EXPERIENCE[*]

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ABSTRACT

Project failures are common. We theorized and found that while time heals wounds (reduces the negative emotions from project failure), it heals differently depending on the strength of specific coping orientations and that the "wound" is shallower for those who perceive their organization to normalize failure. From this study—which conjointly considers learning from failure and affective commitment to an organization to determine individuals' moving forward from project failure—studies that consider moving forward solely as learning from failure would likely overstate the benefits of a loss orientation, and understate the benefits of both a restoration and an oscillation orientation.

INTRODUCTION

There is a considerable theoretical movement towards an enhanced understanding of organizational knowledge, which includes organizational learning theory, evolutionary economics, the knowledge-based theory of the firm, and organizational memory (Fiol & Lyles, 1985; Grant, 1996; Nelson & Winter, 1982; Walsh & Ungson, 1991). In this literature, "organizational knowledge is seen as the set of expectations and assumptions held by an organization's members about the cause-and-effect linkages in their domains of activities (Huber, 1991; Walsh & Ungson, 1991). In essence, organizational knowledge is an organization's internal representation of the world (Daft & Weick, 1984)", which influences the actions of organizational members (Madsen and Desai, 2010: 452). Although empirical research on knowledge at the organizational level has grown, it has primarily focused on knowledge transfer and acquisition (Ahuja, 2000; Hansen, 1999) with less attention focused on how new knowledge is created (McFadyen & Cannella, 2004). An important exception is research on how a person's inter-relationships (social capital) can facilitate new knowledge creation (e.g., McFadyen & Cannella, 2004; Yli-Renko, Autio, & Sapienza, 2001). However, despite this recent theory on social capital as a source of new knowledge creation, we understand little regarding how organizational members create new knowledge from their own experiences that is actionable by the organization. Consistent with a sensemaking perspective, actionable knowledge in an organizational context is created when an organizational member learns from *experience* (Huy, 1999; Kim, 1993) *and* is committed to acting on that new knowledge to benefit the organization (Kanter, 1968; Leonard-Barton, 1995).

Failure is believed to be an important *experience* from which learning can take place. Project failure, in particular, is a common occurrence—especially for those in entrepreneurial (Burgelman & Valikangas, 2005; Shepherd & Cardon, 2009; Sminia, 2003) and science-based research-and-development (R&D) organizations (DiMasi, Hansen, & Grabowski, 2003) as well as for those in organizations that face dynamic (Deeds, Decarolis, & Coombs, 2000; McGrath, Keil, & Tukiainen, 2006), complex (Gassmann & Reepmeyer, 2005; Iacovoc & Dexter, 2005), and high-velocity (Keil & Robey, 1999) environments. In this context, project failure refers to *the termination of an*

initiative to create organizational value that has fallen short of its goals (Hoang & Rothaermel, 2005; McGrath, 1999; Shepherd, Covin & Kuratko, 2009).[1] Because failure "upsets the status quo" (Chuang & Baum, 2003) and leads decision makers to search for possible solutions (McGrath, 2001; Petrovski, 1985), researchers have suggested that organizational members can learn more from their failures than from their successes, including engineers (Petrovski, 1985), scientists (Popper, 1959), and managers (Sitkin, 1992). As such, we define *learning from failure* as "the sense that one is acquiring, and can apply, knowledge and skills" (Spreitzer, Sutcliffe, Dutton, Sonenshein, & Grant, 2005: 538). Consistent with a sensemaking perspective, this definition emphasizes individuals' subjective interpretation of learning (Huy, 1999; Kim, 1993; Weick, 1979). However, the opportunity to learn from a failure experience may not translate into actionable knowledge for the organization because the information revealed by the failure may not be effectively processed (Weick, 1990; Weick & Sutcliffe, 2007) and/or the failure may generate negative emotions that diminish the individual's commitment to acting for the organization's benefit. Building on psychological theories of coping with loss (Archer, 1999; Stroebe & Schut, 2001; Shepherd, 2003), we examine both learning from failure and affective commitment to the organization—both of which are important to moving forward from project failure.

In developing and testing our theoretical model, we extend important aspects of knowledge-based logic. Although failure is believed to be an important source for knowledge creation (McGrath, 1999; Sitkin, 1992), there are substantial obstacles to learning. More specifically, obstacles at the individual level include a history of success (Ellis & Davidi, 2005), low learning-goal orientation (Dweck & Leggett, 1988), and cognitive biases (Kahnemann, Slovic & Tversky, 1982), and obstacles at the organizational level include a non-supportive work environment (Edmondson, 1996), reward systems that punish failure (Sitkin, 1992), and an organizational culture that stigmatizes failure (Cannon & Edmondson, 2001). These obstacles are so pervasive that most organizations still have difficulty learning from their failures (Cannon & Edmondson, 2001;

[1] For example, interviews with research scientists reveal that they refer to project failure in terms of the project being "over" (a research scientist in chemistry), "buried" (a research scientist in theoretical physics), and having reached a "dead end" (research scientist in biochemistry) and that project termination is an inherent part of their work.

Prahalad & Oosterveld, 1999). We focus special attention on the contribution of coping to overcome obstacles to learning from project failure. Our results suggest that a greater consideration of time since project failure and the strength of individuals' coping orientations are vital for a more complete understanding of how organizational members learn from project failure.

Second, in testing this theoretical model, we extend important aspects of affective commitment to an organization within an emotions-based logic. Management scholars have acknowledged the importance of affective commitment to organizations for understanding organizational members' willingness to invest effort and (new) knowledge to achieving organizational goals (Allen & Meyers, 1990; O'Reilly & Chatman 1986). We focus on negative emotions (over project failure) in explaining individuals' affective commitment to an organization and pay special attention to the contributions of coping with loss to reducing negative emotions. Our results suggest that those who experience more negative emotions from failure have lower affective commitment toward the organization. Additionally, we find support for the theorized direct effect of both time and individuals' perception of the organizational environment as normalizing failure on the negative emotions over project failure and for the moderating role of coping orientations on the relationship between time since project failure and the negative emotions over that failure.

Lastly, we extend important aspects of moving forward from failure within the sensemaking logic. Organizational research has typically focused on explaining either learning (Huy, 1999; McGrath, 2001) or affective commitment to the organization (Baron, 2008; Cardon, Zietsma, Saparito, Matherne, & Davis, 2005; Goss, 2005)), but rarely does it consider both. A conjoint consideration of these processes is important because what may enhance one may diminish the other. Given that organizational performance is enhanced by both learning from project failure (McGrath, 1999) and affective commitment to an organization (Gong et al., 2009), understanding the potential tradeoffs between these two factors for organizational members who have experienced project failure is an important research step. Our results suggest that if an individual's understanding of moving forward from project failure focuses exclusively on learning from the experience (without considering affective commitment), then inferences about moving forward would overstate the long-

run benefits of one coping orientation while understating the long-run benefits of other coping orientations.

We tested our theory with data on project failure and organizational members' reactions and responses to such failure from a sample of scientists involved in R&D projects at research organizations. In our study, the research scientists include chemists, biologists, physicists, material scientists, economists, and other researchers working on projects that create intellectual capital for their organizations that can be used for competitive advantage. This is an appropriate sample to investigate the model of moving forward from project failure for several reasons: 1) new knowledge creation is central to the role of research scientists (Nelson, 1959; Rynes, Bartunek & Daft, 2001); 2) high levels of commitment are an essential prerequisite for project (and thus organizational) success (Wolpert & Richards, 1997); 3) project failure is relatively common because research scientists pursue projects in high-uncertainty environments (DiMasi, Hansen, & Grabowski, 2003); 4) learning from failure is an important job requirement (Starkey, 1998); 5) research scientists typically design projects to obtain clear and definite feedback (Nelson, 1959; Martin & Irvine, 1983) and are trained to search for the underlying causes of project failure to move beyond simple descriptions to understand why failure occurred (Hunter et al., 2007; Kuhn, 1996); and 6) as Cardinal (2001: 19) noted, "insights into understanding the management of technological innovation can be gained by the study of R&D professionals."

THEORY AND HYPOTHESES

Psychological theories of coping with loss (Archer, 1999; Shepherd, 2003; Stroebe & Schut, 2001) are the theoretical foundations for our model of organizational members' moving forward from project failure. We illustrate this model in Figure 1. Moving forward from project failure involves approaching projects as vehicles for testing assumptions, approaching project failure as feedback on those assumptions, and redirecting resources to new/alternative projects based on that feedback (McGrath, 1999). This requires that organizational members both learn from project failure and commit to changing their beliefs in order to achieve the goals of the organization. Building on theories of coping with loss and changed beliefs, we investigate how project failure is

processed as feedback—affected by the time since project failure, individuals' coping orientation, and their perceptions of the organizational environment as normalizing failure—to enable learning from the failure experience. Furthermore, expanding theories of coping with loss and commitment, we investigate how negative emotions over project failure can impact an organizational member's affective commitment to achieving the goals of the organization, how the time since project failure and perceptions of the organizational environment as normalizing failure directly affect negative emotions, and how the strength of coping orientations—namely, loss, restoration, and oscillation orientations—moderate the relationship between the time since project failure and the negative emotions over that failure. To provide richness to our theorizing we conducted semi-structured interviews with seven research scientists (consistent with those in our sample) in chemistry, biochemistry, mechanical engineering, behavioral economics, theoretical physics, aerospace engineering, and biology. We report on these interviews throughout the paper and in Appendix 2.

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Insert Figure 1 about here

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The psychology literature on coping has a long tradition of investigating why some individuals are able to "recover" from and "grow" as a result of a major loss (Archer, 1999; Shepherd, 2003; Stroebe & Schut, 2001). Empirical research has found that losing something important—that is, a major loss—is likely to generate a negative emotional reaction (Archer, 1999). In the context of this study, projects are often important to the research scientists working on them (although to differing degrees). Indeed, research scientists (and their organizations) typically invest a large percentage of their time and energy in their research projects. For example, in our interviews, a research scientist who had led a team of 50 researchers on a mechanical engineering project said that "I put my entire heart, my blood, my entire skill, my entire motivation into the [failed] project," and a theoretical physicist who had worked with three colleagues on the development of a new semiconductor material rephrased our question: "You are better to ask how many hours I did not invest in my work—there are very few." Due to these substantial investments of time and effort, many research scientists' identities are tightly linked to their projects (Jain, George, & Maltarich, 2009). Failure of these projects may lead them to question the meaning of

their work and threaten their identification with the organization. For example, in an interview, a research scientist in mechanical engineering reported that all of his team members "had self-doubts after the failure, and we also felt a bit of shame. You experience it as a personal defeat...It [the project failure] was like a personal failure. Some of the core team members were so frustrated that they left the firm." Establishing that projects are important to research scientists is a step towards recognizing and addressing the emotional obstacles to moving forward from project failure—obstacles to both learning from project failure and committing to the organization. Therefore, we turn to this point now.

Time, Negative Emotions, and Moving Forward from Project Failure

Despite the general agreement that one should learn from failure, the lessons to be learned may not be immediately apparent. The causes of failure are often complex. Untangling these complex, interrelated relationships to learn from failure and devise new strategies for future projects can take time. Specifically, the period after a project's failure represents the time needed to scan for relevant information, process it, and learn from it (Daft & Weick, 1984; Gioia & Chittipeddi, 1991; Thomas, Clark, & Gioia, 1993; K. Weick, 1979). That is, from a sensemaking perspective, learning from failure involves the process of continuously developing plausible retrospective accounts that inform current action (Weick, Sutcliffe, & Obstfeld, 2005). Accounts are plausible to the extent that individuals believe they can be true (Epley & Gilovich, 2006), and they become more plausible as thoughts and actions to test the proposed images produce sufficient evidence to change beliefs about why projects fail. These changed beliefs, in turn, alter actions directed toward enhancing the likelihood of success with future projects.

Therefore, because sensemaking involves "the reciprocal interaction of information seeking, meaning ascription, and action (Gioia & Chittipeddi, 1991; Weick, 1979)" (Thomas et al., 1993: 240), it takes time before an individual is able to revise his or her belief system (Huy, 1999; Kim, 1993; Rudolph, Morrison, & Carroll, 2009). Learning emerges from the interplay of action and interpretation over time (Schwandt, 2005; Weick, 1979). Without the creation and use of an increasingly more plausible account for a negative event (such as a project failure), "anxiety may

paralyze decision making and action" (Luscher & Lewis, 2008; Smircich & Morgan, 1982). Consequently, this lack of action will reduce the experimentation and social interactions needed for learning (Balogun & Johnson, 2004; Maitlis, 2005). An assumption of sensemaking is that constraints (such as those that caused a project to fail) are self-imposed and that the environment is not pre-determined nor is it beyond one's sphere of influence, which are concepts that are consistent with the notion of an enacted environment (Daft & Weick, 1984; Gioia & Chittipeddi, 1991).

From a different psychology perspective, attribution theory notes that people do not always think that constraints are self-imposed, especially immediately after a failure event.[2] Indeed, social psychologists have found that people tend "to attribute instances of personal success to internal, personal (dispositional) causes, and to attribute instances of personal failure to external, situational (environmental) causes" (Wagner & Gooding, 1997: 276). When attributing project failure to external causes that are beyond one's control, many individuals may assume that there is less to be learned—that is, there is less change in beliefs about oneself (but there are still likely to be changes in beliefs about how to act toward subsequent projects given these external causes—the nature of others, the organization, and/or the environment). However, time appears to lead to a change in attribution (Lau, 1984; Pronin & Ross, 2006) through a change in perspective. Unlike immediately after an event occurs, when individuals consider a past event (at which they were present), they generally perceive it as if they were an external observer instead of a participant (Nigro & Neisser, 1983; Libby & Eibach, 2002). This perspective of an external observer leads such individuals to attribute the causes of failure to more internal sources (Frank & Gilovich, 1989) and, thus, to take more personal responsibility for the outcome (Pronin & Ross, 2006). As a result, this change in attribution provides greater opportunities for learning.

Looking back at the past can also lead to counterfactual thinking—that is, "thoughts of what might have been" (Roese, 1997: 145). Discussing counterfactual thinking in the entrepreneurial context, Baron proposed that by "imagining outcomes other than those which actually occurred

[2] As Manusov and Spitzberg (2008) pointed out, "the various attribution theories lean toward a logical-empirical view of the world"; whereas sensemaking represents an interpretive perspective (Gioia & Chittipeddi, 1991). For further details on these philosophical differences, see Rudolph et al. (2009).

individuals often gain added insight into the factors that produced the outcomes they actually experienced. Such insight may then contribute to improved performance in several ways, for example, by suggesting better strategies (e.g., Johnson & Sherman, 1990), increasing expectancies of positive results (e.g., Landman, Vandewater, Stewart, & Malley, 1995) and increasing feelings of personal control (McMullen, Markman, & Gavanski, 1995; Olson, Roese and Zanna, 1996)" (Baron, 1999: 81). He concludes that "failures by entrepreneurs to learn from their mistakes in this way can be disastrous" (Baron, 2004: 234). Although we acknowledge (and detail below) that counterfactual thinking can generate feelings of regret (Baron, 1999; Gilovich & Medvec, 1995; Markman, Balkin & Baron, 2002), these reflections over time can provide insights that lead to changed beliefs. Thus,

Hypothesis 1. Organizational members with greater time since their project failed learn more from the failure experience than organizational members with less time since their project failed.

Projects are often important to organizational members because membership in a team can help satisfy individuals' basic psychological needs for competency, autonomy, and belonging (Ryan & Deci, 2000; Shepherd & Cardon, 2009). To the extent that a project is important to organizational members, they will likely feel a negative emotional reaction to its loss (resulting from project failure). For example, some of the emotions that research-team members report after project failure include denial, anger, personal pain, sadness, dismay, worry, anxiety, annoyance, frustration, and depression (Dillon, 1998; Murray & Cox, 1989). Our interviews with research scientists also yielded a number of different negative emotions from project failure. For example, when asked how they felt after their last failed project, comments from research scientists included: "To see that you and the team were not able to lead it [a project] to a successful completion was altogether disappointing" (economics); "There was this huge effort put into the project, and to accept that is was for nothing was really difficult" (economics); "I was completely frustrated" (chemistry); "It was really painful…I think, we were all equally depressed" (biochemistry); "When the project does not work out, you start thinking whether your work makes any sense or not…you start doubting [the work] more and more" (mechanical engineering); "It was really frustrating, I was quite furious…For example, to reduce the anger whenever I got an email [from a project team member], I read it only the next day. I had to sleep on it to deal with all the frustration" (theoretical physics). Further, one

project leader in the field of aerospace physics reported that "[after project failures] we had people that were nervous wrecks, breaking into tears, and some were ill for a long period of time… Some were extremely upset."

These negative emotions can diminish individuals' ability to remember important information about the past and can lead them to feel detached from and avoid closeness to others in their personal and work communities (Hogan, Greenfield, & Schmidt, 2001). Specifically, these negative emotions generated by project failure are likely to influence individuals' affective commitment to their organization. Affective commitment refers to *an individual's identification with and involvement in an organization* (O'Reilly & Chatman 1986) and reflects his or her willingness to "give energy and loyalty to the organization" (Kanter, 1968: 499). Employees' affective commitment to an organization has been associated with higher individual (Sinclair, Tucker, Cullen, & Wright, 2005; Vandenberghe, Bentein, & Stinglhamber, 2004) and organizational (Gong et al., 2009) performance. The failure of a project can be interpreted as a form of negative feedback on an organizational member's work efforts. Empirical research has shown that experiencing negative emotions mediates the relationship between negative feedback received and the regulation of individual goals (Ilies & Judge, 2005), suggesting that individual and organizational goals are not as congruent as before the failure occurred. Indeed, it appears that the negative emotions generated by feedback (such as the termination of a project) generally diminish employees' affective commitment to their organizations (Belschak & Hartog, 2009). However, time allows for the emotional ties to the failed project to break gradually such that thoughts of the project or the events surrounding the project failure generate a less negative emotional reaction over time. New projects, activities, and relationships that form are perceived as important and begin to replace or satisfy the psychological needs thwarted by the project failure and may re-build the organizational members' affective commitment to the organization. Thus,

Hypothesis 2(a). Organizational members with higher negative emotions over a project's failure have less affective commitment to the organization than those with less negative emotions over a project's failure.

Hypothesis 2(b). Organizational members with greater time since the project failure will have fewer negative emotions over that experience than those with less time since the project failure.

Coping Orientations and Moving Forward from Project Failure

There are two different approaches believed to help individuals cope with loss and a third approach that combines the two. Coping orientations can be classified as a loss orientation, a restoration orientation, and an orientation towards oscillating between the two (Shepherd, 2003; Stroebe & Schut, 1999).[3] Each of these approaches is now addressed in terms of its impact on learning from project failure and its impact on how organizational members use the period since their project failure to "manage" the negative emotions generated by that failure.

A **loss orientation** refers to *working through and processing aspects of a loss to break the emotional bonds to the object lost* (Stroebe & Schut, 1999). This coping orientation requires individuals to focus on the events leading up to the failure in order to construct an account for why the project failed. Considerations of the course of and reasons for project failure can provide valuable learning opportunities (Corbett, Neck, & DeTienne, 2007; McGrath, 1999; Sitkin, 1992) when the organizational members compare the project performance at the time of failure to the performance that was projected in the original plans. The negative emotions generated by the failure signal the importance of the loss, which directs organizational members' attention towards scanning and processing information related to the failure event (Clore, 1992; Ellis & Chase, 1971; Schwarz & Clore, 1988). This comparison and scanning provides the organizational members with information about the failure (and the events leading up to the failure), which can be used to revise their belief systems regarding why projects fail and what should be done in future projects. Further, uncovering the reasons for why the project did not yield the desired end results can increase individuals' exploration for information about alternative actions and routes that could have been taken (Baron, 1999; Kim & Miner, 2007). Finally, organizational members who identify project routines that contributed to failure and need to be changed for future projects may acknowledge a

[3] These orientations are independent. An individual can be low in both loss and restoration orientation by neither focusing attention on grief work or on restoration, such as by pretending the failure and its consequences did not occur. An individual can focus on one orientation (e.g., high loss orientation) but not the other (e.g., low restoration orientation), or an individual can be high in both, which is reflected by the considerable time and effort he or she is engaged in grief work (high loss orientation) and the considerable time and effort he or she spends addressing secondary causes of stress (high restoration orientation). Individuals high in both a loss and restoration orientation can be high or low in oscillation orientation depending on the individual's orientation toward switching between the two. The independence of these orientations is reflected in the analyses that follow.

general need for flexibility and change. This can lead them to develop capabilities to change processes, strategies, procedures, or actions when necessary during future projects (Eisenhardt & Martin, 2000). Thus,

Hypothesis 3. Organizational members with a stronger loss orientation will learn more from a project failure than those with a weaker loss orientation.

By focusing on the loss and building an account for why a project failed, the loss takes on new meaning, and the organizational members are able to begin breaking their emotional bonds to the failed project. The new plausible account of the project's failure induces a change in the individuals' view of themselves and their environment (Archer, 1999), thereby allowing them to regulate their emotions such that the loss no longer triggers such a negative emotional reaction (Gross, 1998). An organizational member with a strong loss orientation immediately undertakes "grief work" and makes progress in developing an understanding of why the project failed. For example, one aerospace engineering scientist reported the following: "[After a failure,] I look back… It is certainly necessary to make a rational analysis." However, grief work is exhausting. Eventually thoughts can turn from the events leading up to the failure to the failure event itself and the subsequent emotions. Such thoughts can generate negative emotions of their own (Bonanno, 1994). For example, the scientist continued: "I then start asking myself too often 'was this right' and so on…and I then bedevil myself at points where no concrete conclusion can be drawn… [and then] only entropy [disorder within the system] is produced." Indeed, over time a strong loss orientation can lead to ruminations—behaviors and thoughts that focus attention on one's negative emotions and the implications of those negative emotions (Nolen-Hoeksema, 1991). Furthermore, to the extent that this "grief work" involves counterfactual thinking, it may generate feelings of regret, disappointment, and/or anxiety over missed opportunities to avoid the failure (cf. Baron, 1999, 2000, 2004; Roese, 1997). These emotions from rumination (including those from counterfactual thinking) can exacerbate feelings of loss. It appears that despite the potential of effectively lowering negative emotions early, over time a loss orientation can eventually begin to generate negative emotions that exacerbate the emotional aspects of failure. Thus,

Hypothesis 4. Organizational members with a strong loss orientation will have fewer negative emotions over project failure than those with a weaker loss orientation when the period after the failure is short but will have more negative emotions over project failure when the period after

the failure is long.

Next, a **restoration orientation** refers to *the suppression of feelings of loss and proactiveness toward secondary sources of stress that arise from a loss* (Stroebe & Schut, 1999). This definition implies that there are two dimensions to a restoration orientation—avoidance (toward the primary stressor, i.e., project failure) and proactiveness (toward secondary stressors). Neither of these dimensions contributes to learning from failure, but both are likely to "keep a lid on" and lower negative emotions, respectively. Avoidance involves using distractions to turn one's attention away from the failure and the events leading up to it. For example, the organizational members may focus on addressing other stressors, such as "What is my role in the organization after the failed project?" and "How can I best fit in with my new team?" While proactively addressing these secondary sources of stress allows organizational members to distract themselves from the failure and go on with their organizational lives, it provides little opportunity for them to learn from the failure because it does not inform a more plausible account for why the project failed and, thus, does not suggest what can be done differently.

Therefore, we do not believe there to be a relationship between the strength of a restoration orientation and learning from failure, but the strength of a restoration orientation appears to influence individuals' negative emotional reactions to an important loss. By avoiding thinking about the failure, individuals do not consciously recognize the loss, so it does not generate a (or minimizes the) negative emotional reaction. Indeed, a focus on other activities replaces the individuals' thoughts and feelings about the project failure with alternate thoughts and feelings. Such alternate thoughts can be of other work-related successes that generate positive emotions (Christen, Iyer & Soberman, 2003). Furthermore, proactiveness towards secondary causes of stress likely means that when these stressors are eliminated (or minimized), the original loss no longer looms as large and will, therefore, not generate as great a negative emotional reaction. These gains may also generate positive emotions (Ganster, 2005) (in this case generated from successes with distractions and/or tasks addressing secondary stressors), which can help "undo" the negative emotions (Fredrickson, 2001) generated by project failure.

However, repressing emotions is typically exhausting (Archer, 1999) and can result in

negative physical (Gross, 1998) and psychological (Prigerson et al., 1997) consequences. Furthermore, it may be difficult to maintain emotional repression for extended periods of time, as the negative emotions may eventually emerge (Holahan & Moos, 1987; Repetti, 1992) and lead to increased distress and future problems (Menaghan, 1982), thereby further exacerbating the failure experience. Thus, like for a loss orientation, it appears that for a short period after the project failure, a strong restoration orientation can help minimize the resulting negative emotional reaction and perhaps lower it, but when maintained for an extended period of time, negative emotions emerge such that the advantages of a strong restoration orientation become a disadvantage in terms of the level of negative emotions. Thus,

> *Hypothesis 5. Organizational members with a strong restoration orientation will have fewer negative emotions over project failure than those with a weaker restoration orientation when the period after the failure is short but will have more negative emotions over project failure when the period after the failure is long.*

An **oscillation orientation** *involves moving backward and forward between a loss orientation and a restoration orientation* (Shepherd, 2003; Stroebe & Schut, 1999), thereby allowing individuals to obtain the benefits of each while minimizing the downsides of pursing one orientation for too long. The initial experience of negative emotions from failure triggers the autonomous nervous system, drawing the individual's attention toward information about the causes of failure (Fineman, 1996; Frank, 1993; Hirshleifer, 1993; Weick, 1990). As individuals "work through their grief," they may begin to ruminate and generate further negative emotions, including feelings of regret. These escalating negative emotions can serve to narrow individuals' attention (Derryberry & Tucker, 1994; Staw, Sandelands, & Dutton, 1981) and make them miss the "forest for the trees," so to speak, and they may also interfere with their information processing (Lyubomirsky & Nolen-Hoeksema, 1995; Weick, 1990). Therefore, the escalating negative emotions from an extended period of loss orientation can begin to narrow the individual's attention, reduce his or her capacity to process information, and reduce feelings of control (Carver, Scheier & Weintraub, 1989; Lyubomirsky & Nolen-Hoeksema, 1995), which, in turn, adversely impacts learning.

Switching to a restoration orientation can help break the cycle of rumination by redirecting an individual's attention away from the failure event toward other activities, including successfully

addressing secondary sources of stress. When these gains help reduce the individual's level of negative emotions and increase his or her information-processing capacity (Fredrickson, 2001), those with a strong oscillation orientation can switch back to a loss orientation to use this capacity to make sense of the project failure further. An organizational member with a strong oscillation orientation will learn more from a failed project arising from this focused reflection on the failure interlaced with periods of emotional recuperation and a focus on secondary sources of stress. However, an organizational member with a weaker oscillation orientation may stay too long in either orientation and may thus become either cognitively overloaded by thinking about the negative emotions (in a loss orientation) or unable to sufficiently develop a plausible account for the project failure (in a restoration orientation). Thus,

Hypothesis 6. Organizational members with a stronger oscillation orientation will learn more from project failure than those with a weaker oscillation orientation.

Besides increased learning, an oscillation orientation likely enhances an individual's ability to more quickly reduce the negative emotions generated by a project failure by capturing the benefits of a loss orientation and a restoration orientation for "dealing with" negative emotions, thereby minimizing the emotional cost of maintaining either for an extended period of time. As long as a loss orientation allows an individual to generate a more plausible account for the project failure, it can help him or her reduce negative emotions by giving the loss some meaning (Archer, 1999). As discussed above, an extended period of loss orientation can activate a network of negative emotions and the retrieval of negative beliefs about the self and the world (Lyubomirsky & Nolen-Hoeksema, 1995; Nolen-Hoeksema, 1991). This, in turn, can create a vicious spiral of escalating negative emotions. When thinking about the failure begins to generate negative emotions, organizational members with a strong oscillation orientation will then switch to a restoration orientation and take action towards diminishing secondary causes of stress, which can help reduce the emotional magnitude of the failure itself. This period provides an opportunity for emotional recuperation and a switch back to a loss orientation (without immediately activating ruminations of negative thoughts and emotions) to further break the emotional bonds the individual has to the failed project. Over time, a strong oscillation orientation can, therefore, reduce the negative emotions generated by the

project failure. A weak oscillation orientation represents a less effective approach because the organizational members may stay in either orientation for too long. Thus,

> *Hypothesis 7. Organizational members' negative emotions from project failure decrease more with the length of time after the failure for those with a stronger oscillation orientation than for those with a weaker oscillation orientation.*

Perceptions of Organizations' Normalizing of Failure and Moving Forward from Project Failure

Organizations differ in their culture towards failure. Some explicitly or implicitly punish failure; that is, they have an anti-failure bias (McGrath, 1999). Organizational members' perceptions of their work environment and its norms towards failure are likely to influence the extent to which they learn from project failure and generate negative emotions from the failure experience. Recognizing that negative emotions can be generated by a culture that punishes failure, some organizations try to create a culture that **normalizes project failure** *such that organizational members view failure as something normal, thereby diminishing its salience and significance*. When project failures are treated as nothing extraordinary, individuals will have less severe emotional reactions to those failures (Ashforth & Kreiner, 2002). That is, organizational members become inoculated through a culture that has reframed, recalibrated, and/or refocused the meaning of project failure (consistent with Ashforth & Kreiner (1999), Gusterson (1996), and Palmer (1978)). By reframing project failure as an opportunity to learn, normalization negates some of the failure's negative value. For example, the negative emotional reaction to a project failure can be reduced by refocusing attention from the downsides of the failure (e.g., the dismantling of a team) to its upsides (e.g., the chance to meet new team members).

Top managers and project leaders can actively create an organizational culture in which project failure is normalized. Farson and Keyes (2002) proposed that project leaders can establish a culture of failure tolerance by placing less emphasis on evaluating project outcomes and more emphasis on interpreting individual steps during the course of a project. They suggested that failure-tolerant leaders create a culture that does not praise success and punish failure but one that emphasizes the analysis of those events and tries to understand their underlying causes and mechanisms. In our interviews with the research scientists, some reported that their project leaders

tried to establish a culture that normalizes failure. For example, one research scientist (biochemistry) stated the following: "We have a clear acceptance for failure. The boss simply knows that you have invested everything," and another (in economics) reported that after a project failure, the group leader told her "that in research, you need to accept that things sometimes go wrong." This culture may contribute to organizational members' ability to overcome their fear of failure and the negative emotions associated with project failure and encourage "intelligent risk taking" with subsequent R&D projects (Farson & Keyes, 2002; Sitkin, 1992). Thus,

Hypothesis 8. Organizational members who perceive failure as highly normalized within their organizational environment will have lower negative emotions over project failure than those who perceive failure as less normalized within their organizational environment.

By rendering an extraordinary event as something seemingly ordinary (Ashforth & Kreiner, 2002: 217), normalization can change individuals' perception of a failure event so that it is less disruptive and problematic (Ashforth, Kreiner, Clark, & Fugate, 2007). Sitkin (1992: 243) argued that individuals' analysis of failure and their subsequent learning can be facilitated if "1) they [i.e., the projects undertaken] result from thoughtfully planned actions, 2) have uncertain outcomes, 3) are of modest scale, 4) are executed and responded to with alacrity, and 5) take place in domains that are familiar enough to permit effective learning." Alacrity requires that individuals experience no or only limited negative emotional reactions to failure, which can be achieved through normalization.

Rendering an extraordinary event as something seemingly ordinary (Ashforth & Kreiner, 2002) can also help the organization build an informed culture, which enables its members to learn more from their failure experiences. The building blocks of an informed culture are encouraging organizational members to report errors and near misses; to apportion blame justly when something goes wrong; and to have the flexibility to act swiftly in order to learn by reconfiguring assumptions, frameworks, and actions (Weick & Sutcliffe, 2001). Normalization facilitates an informed culture because organizational members face less personal criticism (from the self and from others) for a failure and are, therefore, less likely to engage in strategies to protect their egos from such criticisms. Ego-protective strategies can screen out error signals to maintain high self-esteem (Reich, 1949; Sedikides, 1993), which undermines the reporting of errors that may have contributed to a project's failure. Furthermore, to protect the self from criticisms, individuals often engage in impression

management that deflects blame to others (Lee & Robinson, 2000), which undermines the just apportionment of project-failure sources. Similarly, the fear and anxiety over being criticized for mistakes (Moss & Sanchez, 2004; Moss, Valenzi & Taggart, 2003) can lead to rigidity (Mackie, Devos, & Smith, 2000; Miller, Cronin, Garcis, & Branscombe, 2009), which undermines the flexibility needed for swift action. By rendering a failure event as "ordinary", normalization helps to build an informed culture by decreasing the likelihood that those organizational members will engage strategies that protect the ego but constrain learning. Thus,

Hypothesis 9. Organizational members who perceive failure as highly normalized within their organizational environment will learn more from project failure than those who perceive failure as less normalized within their organizational environment.

METHOD

Sample

The sample of organizational members consists of scientists who are members of project teams at research institutes. A total of 585 research scientists were chosen randomly from the websites of 12 different research institutes in a region of Germany. A trained research assistant personally visited these research scientists, explained the purpose of the study, asked for participation, and handed over a survey booklet and envelope in which participants could enclose the completed survey in order to assure anonymity. To encourage participation further, we offered 10 Euros for each completed booklet. We contacted the research scientists via email one week later and personally collected completed surveys. Those who had not completed the questionnaire were reminded of the importance of the study and were again asked to participate. One week later, we sent a reminder email and collected the remaining completed surveys. All together, 257 usable questionnaires were returned, representing a response rate of 44%. The participating scientists were on average 30.84 (sd. = 6.47) years old; 44% were male; 93% were Germans; 16 % held a PhD degree as their highest qualification, 70% had a Master's degree ("diploma" in Germany), and the rest had at least a Bachelors degree or equivalent. Additionally, the mean time with the current organization was 4.40 years (sd. = 3.95), and 74% had experienced project failure in their current organization. For the organizational members in our sample, the mean time from their last failed

project was 9.08 weeks (sd. = 15.11); the mean number of projects worked on in their current job was 4.84 (sd. = 5.51); and the mean percentage of those projects that had failed was 22.58 (sd. = 21.12).

With respect to their affiliations, 28 scientists were from a materials science institute, 16 from an pharmacy institute, 15 from a physics institute, 28 from a microbial phytopathology institute, 10 from a geography institute, 21 from a zoology institute, 4 from a medicine institute, 35 from a chemical ecology institute, 18 from a biogeochemistry institute, 36 from an economics institute, 18 from an ageing institute, and 28 from a biochemistry institute. As can be seen by the number of institutes represented in this sample, the individuals who participated in the survey were involved in a variety of different scientific research projects, including investigations of bacterial adaptation, nanomaterials, and age-dependent effects on cerebral pressure. Participants estimated that 26% (sd. = 19%) of their organization's projects were failures. Details on the institutes' research areas and examples of typical projects are provided in the Appendix 1, and examples of project failures and research scientists' reactions to them are detailed in Appendix 2.

Given that data collection took part in Germany, we administered the survey in German. We followed the back-translation procedure recommended by Brislin (1970) to test the accuracy of the translation (Richard W. Brislin, 1970; R. W. Brislin, 1980; Craig & Douglas, 2006). The bilingual co-author, whose native language is German, translated the survey into German. An independent bilingual translator, whose native language is English, translated the survey from German to English. The original and the back-translated versions were reviewed for categorical, functional, and conceptual equivalence and were deemed to be equivalent, so no further changes were made to the survey.

Item Generation

New measures were developed in order to capture several of the model's constructs. Specifically, measures were developed for *negative emotions over project failure*, *learning from failure*, *coping orientations*, and *perceived organizational normalization*. For the development of all of the new scales, we followed the rigorous development process outlined in Netemeyer and

colleagues (Netemeyer, Bearden, & Sharma, 2003). We generated items based on extensive reviews of relevant literature, and these were distributed, along with the appropriate theoretical definitions of each construct, to a panel of experts for review of both construct and face validity. Our panel of experts consisted of three professors with expertise in innovation and emotion as well as six doctoral students currently studying management. The expert panel was used for a Q-sort exercise—they reviewed each of the generated items and compared them against the supplied theoretical definitions of the constructs they were designed to reflect in order to determine the initial validity of the items generated (Anderson & Gerbing, 1991). For situations in which additional specification to the theoretical definitions was necessary (e.g., defining the boundaries of "physical symptoms" versus "physiological reactions"), additional material was included to specify the precise nature of the key theoretical components. The experts were instructed to keep only those items that they believed accurately and sufficiently tapped into only the core construct for which they had been tentatively assigned. For the final survey instrument, we eliminated all items that were deemed to be either deficient or contaminated. Specifically, we only incorporated into the survey those items that were agreed to successfully tap into the construct of interest by a minimum of seven of the nine experts. If an item received agreement from only six of the nine reviewers, it was reviewed and either reworded and sent for additional review or dropped from use in the survey. We dropped from consideration items that received agreement from fewer than six of the nine experts and/or those that had disagreement from at least two of the professors on the panel. Items that received one dissenting opinion from a professor on the panel were revised and then reviewed again by the panel.

Negative emotions over project failure. Item generation for the negative emotions over project failure scale began by adapting an inductively-generated scale of grief over the death of a loved one *to* a scale for the failure of projects in the organizational context. The Hogan Grief Reaction Checklist (HGRC) (Hogan, Greenfield, & Schmidt, 2001) consists of six categories from an original set of 100 items—despair, panic behavior, blame and anger, disorganization, detachment, and personal growth.[4] A major difference exists between HGRC and our negative emotions over

[4] The Hogan Grief Reaction Checklist (HGRC) (Hogan et al., 2001) was empirically developed from data collected from adults who had experienced the death of a loved one. Items for the HGRC were generated from interviews and anecdotal

project failure scale: after reviewing the items and labels, our panel of experts believed that personal growth was not a dimension of grief but rather an outcome of it. This assessment was consistent with that made by the panel of experts in the original HGRC study: "The personal growth items reflect bereaved individuals becoming transformed by the grief, experiencing positive changes as an outcome of the bereavement process" (Hogan et al., 2001: 5). After excluding the personal growth dimension, the final version of the survey, which contained a total of 14 items relating to negative emotions over project failure, asked participants "How do your feelings now differ from how you felt prior to project failure?"

Learning from project failure. Based on a review of the literature, we identified two primary sources of learning that result from failure: learning related to the individual's performance (e.g., project-related learning) (McGrath, 1999; Minniti & Bygrave, 2001) and learning related to the individual's personal attributes (e.g., personal-related learning) (Cope & Watts, 2000; Hogan, et al., 2001). From this review, we generated initial items to tap into both the project and personal dimensions of learning from failure. The items generated from the project dimension of learning from failure focused on (1) the causes of the failure and how to recognize the signals of such issues better in the future (e.g. "I can see earlier the signs that a project is in trouble") and (2) the self-assessed ability to perform their assigned roles better in future projects and the increased likelihood that subsequent projects would be successful as a result of the knowledge they gained from past failure events (e.g. "I can more effectively run a project"). The items generated from the personal dimension of learning from failure came from adapting the items for "personal growth" from the HGRC (Hogan et al., 2001). These items captured learning that was related to the "self" (e.g. "I am a more forgiving person at work") as well as to "others" (e.g. "I am more tolerant of others' shortcomings"). Indeed, Lankau and Scandura (2002) found that a similar form of "personal learning" was an important aspect of learning effectiveness when it comes to exploratory projects in

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data from these adults. The wording of the items was consistent with the language used by those interviewed. There appeared to be six categories for the 100 items—despair, panic behavior, blame and anger, disorganization, detachment, and personal growth. A panel of experts was asked to assign items to seven groups, one of which was a "no-fit" category. After some wording changes, the scale was tested on a sample of 586 adults who had experienced the loss of a loved one and was then tested on different samples.

large organizations. After expert review, we included a total of 21 items to measure learning from failure: 9 for the project dimension and 12 for the personal dimension. We instructed participants to review these items and rate how their personal views had changed during the period of time since their most recent project failure.

Coping orientations. We initially generated a large pool of items that were believed to capture each of the three coping orientations (Shepherd, 2003; Stroebe & Schut, 1999). For the loss orientation scale, we generated items focusing on confronting the events leading up to the failure that helped individuals make sense of the failed project. In generating these items, it appeared that there were two dimensions: namely, those dealing with the "self" and those focused on "others." The items initially generated to tap into the "self" dimension (10 in total) focused on how individuals confronted their own thoughts and emotions related to the failure (e.g. "I work through my negative emotions generated by the project's failure"). Items initially generated to tap into the "others" dimension (11 in total) centered on how individuals leveraged their relationships with others to help them make sense of the project failure (e.g. "I actively work with others to make sense of the failure"). From the initial pool of 21 items, our expert panel determined that 10 were appropriate for inclusion in the survey: 6 related to the "self" dimension and 4 related to the "others" dimension. We generated 15 items for the restoration orientation scale to incorporate both the avoidance and proactiveness dimensions highlighted in the literature (Shepherd, 2003; Stroebe & Schut, 1999). The avoidance items centered on the individual's tendency to engage in activities that reduce or eliminate the time spent confronting the failure event (e.g. "I keep my mind active, so it does not focus on the loss of the project"), while the proactiveness items focused on the individual's attempts to confront secondary sources of stress (e.g. "I make adjustments to the way I approach work to match the new reality"). Upon expert review, the final survey instrument consisted of 11 items related to restoration orientation: 6 for the avoidance dimension and 5 for the proactiveness dimension. For the oscillation orientation scale, we generated an initial pool of 10 items to capture an individual's ability to alternate back and forth between both a loss and restoration orientation (e.g. "After thinking about the failure for a while, I give my mind a rest"). From the initial pool of items,

the expert panel determined that four were appropriate for use in the final survey. For all coping orientation scales, participants were instructed to reflect upon how they respond to project failures and report how much they agree with whether or not the individual items reflected their own personal approach following a failure event.

Perceived organizational normalization. Two of the main processes by which normalization occurs include failure being viewed as nothing out of the ordinary and a reduction in the mismatch between expectations and outcomes (Ashforth & Kreiner, 2002). As such, we included items that tap into both types of these processes to capture the theoretical domain of the perceived normalization construct fully. Of the 12 items created, 6 were constructed to capture the "nothing-out-of-the-ordinary" aspect of perceived normalization (e.g. "As far as the organization is concerned, failure is not seen as anything extraordinary"), and 6 were developed to capture the "mismatch-of-expectations" aspect of perceived normalization (e.g. "In our firm, you are encouraged to get used to the fact that projects will fail"). After submitting the initial item pool for review, six items were determined to be acceptable for use in the final survey. For this scale, participants were instructed to consider how their organization deals with project failure and to rate the individual items accordingly.

Measurement Model and Fit of Developed Scales

We used confirmatory factor analysis (CFA) to examine the validity of the measurement models for each of the new constructs. Following the procedure detailed by Hinkin (1998), we ran both an initial CFA for item reduction and validity examination and a second CFA to substantiate the results of the initial analysis further through replication. To do so, we randomly split the initial sample into two smaller subsamples (Hinkin, 1998). It is important to note that although the initial sample was split for the purpose of factor analyses, the total sample was used for testing the hypotheses. In the initial CFA, we analyzed a sample of 155 research scientists to test the fit of the proposed models (which met the required 5 to 10 samples-per-item threshold for each sample [Anderson & Gerbing, 1991; Hinkin, 1998]). For this and all subsequent analyses, we used Lisrel 8.80 (Jöreskog & Sörbom, 2006) with raw data as the input method and maximum likelihood as the

model-estimation technique. Skewness for all scale items ranged between -0.70 and 1.37, and kurtosis ranged between -0.28 and 1.26 (with both of these ranges being within the acceptable -2 to +2 range). In Table 1, we list the final dimensions, items, and reliabilities for each new scale. As detailed, all coefficient alpha reliabilities exceed the accepted 0.7 threshold (Cronbach, 1951).[5]

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Insert Table 1, Table 2, and then Table 3 about here

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In Table 2, we report the results of the initial CFA for each of the new constructs. All constructs were modeled as first-order factor models with the items corresponding to each construct modeled as reflective indicators. As illustrated in Table 2, perceived normalization and oscillation orientation were both uni-dimensional constructs with each having three items. The constructs of negative emotions over project failure, learning from failure, loss orientation, and restoration orientation contained two dimensions with each being comprised of three to five items for each construct dimension. It is important to note that although these constructs were found to be multi-dimensional, for analysis purposes, all of the items for a given scale were parceled to create a single measure.[6] In the first sample, the results indicated that all of the models had excellent fit with the data (see Table 3). All models applied to the first sample had χ^2 to df ratios of less than 2.0 with the exception of the restoration orientation model (2.11). However, it should be noted that when applied to the second sample, this ratio for the restoration orientation model dropped below the 2.0 threshold. In general, the values for Bentler and Bonett's Normed Fit Index (NFI) and Non-Normed Fit Index (NNFI) (P. M. Bentler & Bonett, 1980), Bentler's (1990) Comparative Fit Index (CFI) and Incremental Fit Index (IFI), Bollen's Relative Fit Index (RFI) (K. A. Bentler, 1986), and Jöreskog

[5] It should be noted that there were several more items included in the survey than were actually retained for the final scales. Through subsequent analysis (and consistent with convention [Hinkin, 1998]), items that had a poor fit within the measurement model were dropped from the scale. Therefore, it was necessary to generate a surplus of items for each construct in order to ensure that the final items-to-constructs ratio was adequate (at least 3:1) (Anderson & Gerbing, 1991; Hinkin, 1998). As a general guideline, "approximately one half of the created items will be retained for use in the final scales, so at least twice as many items as will be needed in the final scales should be generated to be administered in a survey questionnaire" (Hinkin, 1998:109). Because of this, there is a noticeable, but necessary, discrepancy between the number of items included in the survey and those that were actually included on the final measurement scales.

[6] While the debate on parceling is ongoing, the technique has been shown to be advantageous in terms of greater reliability and communality, larger ratios of common-to-unique factor variance, and a lower likelihood of distributional violations (Richard P. Bagozzi & Heatherton, 1994; Kishton & Widaman, 1994; Little, Cunningham, Shahar, & Widaman, 2002).

and Sörbom's (1984) Goodness of Fit Index (GFI) met or exceeded all of the stringent standards for model fit proposed by Hu and Bentler (Hu & Bentler, 1999) with all but one of the reported fit indices meeting the threshold value of 0.95. The exception was the RFI value for the restoration orientation (0.94).

To confirm the overall fit of the initial models, we analyzed a second sample of 102 research scientists. The proposed models had a good fit with the second sample: the overall χ^2 to df ratios for all models were acceptable (below the 2.0 threshold [Table 3]). Additionally, all of the other fit indices indicated a good fit with all but two reported values meeting or exceeding the 0.95 threshold. The two exceptions were the reported GFI value for the learning from failure model and the RFI for the restoration orientation model, both of which were still at the acceptable levels of 0.94 and 0.92, respectively. When considered with the analysis of the first sample, these results indicate a strong fit for all of the models. As the next step in the CFA, we examined the hypothesized path coefficients. It is recommended that all item loadings on their respective factors exceed a 0.70 threshold (Fornell & Larcker, 1981). Of the 32 items analyzed in all of the models, all but 5 met this threshold in sample 1, and all but 3 items met the threshold in sample 2 (Table 2). Of the items that did not meet the 0.70 threshold, only one (R6) did not exceed this value in at least one sample. However, R6 still showed moderate loading values in both samples (0.54 and 0.57, respectively).

Discriminant Validity, Convergent Validity, and Social Desirability

To possess convergent validity, the new scales should be related to other instruments that are designed to measure similar perceptions (Mowday, Steers, & Porter, 1979). Although no comparable measures of the constructs of interest currently exist, we tested their hypothesized relationships with other variables in the analyses below, which provides evidence of convergent validity. In order to establish discriminant validity, it is necessary to demonstrate that the newly constructed measures were significantly distinguishable from existing constructs with which they are theoretically unrelated (Bagozzi, Yi, & Phillips, 1991). To investigate discriminant validity, the new measures were analyzed against the 18-item, 5-point Likert-type Material Values Scale (MVS) (Richins & Dawson, 1992). According to Richins and Dawson (1992: 304), materialism refers to a

"devotion to material needs and desires, to the neglect of spiritual matters; a way of life, opinion, or tendency based entirely upon material interests." Our results indicated that the measure of materialism had no significant correlations with any of the newly constructed scales, thereby providing initial evidence of the new scales' discriminant validity (see Table 4). Although no comparable measures of the constructs of interest currently exist, we tested their hypothesized relationships with other variables in the analyses below, which provides evidence of convergent validity. Based on the evidence presented in Table 4, social desirability—using the Paulhus Deception Scale (PDS) (Paulhus, 1984)—posed little threat to any of the new scales.

Affective Commitment to the Organization and Time since Project Failure

We measured *affective commitment* to the organization using the established Affective Commitment Scale (Allen & John, 1990). The Affective Commitment Scale is an 8-item, 7-point, Likert-type scale developed to measure an individual's affective commitment to his or her organization. For example, participants were asked the extent to which they agree with the following statements: "This organization has a great deal of meaning for me" and "I would be very happy to spend the rest of my career with this organization." *Time since project failure* was measured by asking "How long ago did you experience your last project failure?" in terms of months, which we converted to weeks. Therefore, all time measures related to the project listed in the remaining sections are reported in weekly units.

Control Variables

There is a potential for individuals to differ in ways that could potentially confound the results. For example, age (Mroczek & Kolarz, 1998), gender (Hankin & Abramson, 2001), emotional intelligence (Salovey & Mayer, 1990), and experience (Cropanzano, James, & Konovsky, 1993) could all potentially impact the level of negative emotions experienced as well as individuals' overall learning from project failure. As such, we included these variables as controls. To determine age and gender, participants were asked to "list the year in which [they] were born" and "indicate [their] gender." To capture emotional intelligence, we used the emotional intelligence self-description inventory scale (EISDI; 24-item, 7-point, Likert-type scale) (Groves, McEnrue, & Shen,

2008). For example, participants were asked the extent to which they agree with the following statements: "I can usually imagine what another person is feeling," and "I often use how I feel about a problem to define [the] attention I give to it." We captured experience with a number of control variables. Because the way one deals with failure may depend on his or her tenure with the organization and prior successes and failures (Ellis & Davidi, 2005), we controlled for "organizational tenure," the "number of projects," and "percentage of project failures." Organizational tenure was operationalized as the difference (in years) between the time respondents began employment at their current organization and the date at which the survey response was submitted. Employment start dates were obtained from organizational records and professional statements listed for individual respondents. Participants were asked to "indicate the total number of projects (they) had participated in while at their current position" as well as what the "overall percentage of failures (they) had experienced with those projects." We also used a dummy variable to control for whether the organizational member had a PhD (or not).

Additionally, the relative importance that individuals assigned to a given project as well as the amount of time they had worked on the project before it failed and the project failure rate for the organization as a whole could also influence the organizational members' overall learning from project failure, their affective commitment to the organization, and/or the negative emotions they experience from failure. Therefore, we controlled for these potential influences as well. Project importance was measured with items based on the self-determination scale (10-item, 7-point, Likert-type scale) (e.g., Elliot & McGregor, 2001). Items in this scale asked participants the extent to which they agree with various statements, such as "I feel that I make a substantial contribution towards the project's development," "I have considerable autonomy in my role with the project," and "I feel belongingness with the project team." In order to measure the amount of time individuals had been with the project before it failed, participants were asked "how long did you work on your last failed project" in terms of weeks. Finally, in order to capture the relative frequency of failure within the organization as a whole, participants were asked "in your organization, what percentage of projects are failures?" We also used dummy variables to control for the organization.

RESULTS

Table 1 presents the means, standard deviations, and bivariate correlations among all of the study variables.[7] We used hierarchical linear regression to test all hypotheses. Table 5 details the results of the models for the dependent variables of learning from failure (testing H1, H3, H6 and H9), affective commitment to the organization (testing H2a), and negative emotions (H2b, H4, H5, H7, H8), respectively. The hierarchical approach is particularly appropriate when analyzing potentially correlated independent variables or when investigating multiplicative terms (R. P. Bagozzi, 1984; Cohen, 1978; Cohen & Cohen, 1983).

In Models 1 and 2 of Table 5, the dependent variable is learning from project failure. The base model (including the control variables only) explains a significant amount of the variance in learning from failure ($R^2 = 0.187$; $p < 0.01$). The next step of the analysis addressed the universal influence of loss orientation, restoration orientation, oscillation orientation, time since project failure, and perceived normalization on learning from project failure over and above the base model. As displayed in Model 2 ($R^2 = 0.324$; $p < 0.01$), the addition of these five variables accounted for 14.0% of the variance in learning from failure over and above the base model. Hypothesis 1 proposed that the greater the time since the project failed, the greater the learning from that experience. The results indicate a significant, positive relationship between time since project failure and learning from failure ($\beta = 0.191$; $p < 0.01$), thereby providing support for H1. Hypothesis 3 stated that the stronger the loss orientation, the greater the learning from failure. The results indicate a significant, positive relationship between a loss orientation and learning from project failure ($\beta = 0.142$, $p < 0.05$). This finding provides support for Hypothesis 3. Hypothesis 6 specifies that the stronger an organizational member's oscillation orientation, the greater his or her learning from project failure will be. The results indicate a significant, positive relationship between an oscillation orientation and learning from project failure ($\beta = 0.182$, $p < 0.05$), providing support

[7] In line with several recent studies (e.g., Datta, Guthrie, & Wright, 2005; Guthrie, 2001; Krishnan, Martin, & Noorderhaven, 2006), we tested for non-response bias by comparing early and late respondents. Armstrong and Overton (1977) argued that late respondents share similar qualities with non-respondents and, therefore, could be used as representatives for the non-response group. We ran a MANOVA analysis and found no significant differences (Wilks' lambda = 0.654) between early and late respondents on the characteristics of project importance, loss orientation, restoration orientation, oscillation orientation, normalization, learning, emotional intelligence, affective commitment, time since project failure, age, gender, negative emotions, and time on project before failure.

for Hypothesis 6. Hypothesis 9 stated that the more organizational members perceive failure as normalized within their organizational environment, the greater their learning from project failure will be. However, the relationship between perceived normalization and learning from failure was shown to be non-significant ($\beta = 0.044$, $p > 0.05$); thus, Hypothesis 9 is not supported. Although not hypothesized, we also found a significant, positive relationship between emotional intelligence (control variable, $\beta = 0.191$, $p < 0.01$) and the amount of learning from project failure.

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In Models 3 and 4 of Table 5, the dependent variable is affective commitment to the organization. Model 3 demonstrates that the base model (control variables only) explains a significant amount of the variance in affective commitment to the organization ($R^2 = 0.282$; $p < 0.01$), and the addition of the negative emotions variable (Model 4) explains a significant amount of variance in affective commitment to the organization ($R^2 = 0.303$; $p < 0.01$). This finding represents a significant increase over and above the base model ($\Delta R^2 = 0.021$; $p < 0.01$). Hypothesis 2a proposed that the greater the level of negative emotions, the lower the overall affective commitment to the organization. The results indicate that the negative emotions resulting from project failure are negatively and significantly related to affective commitment to the organization ($\beta = -0.089$, $p < 0.01$), thereby providing support for H2a.

In Models 5, 6, and 7 of Table 5 the dependent variable is negative emotions over project failure. There are three models in this set: the base model (control variables only), the main-effects-only model (includes the control variables and the main effects), and the full model (includes the controls, the main effects, and the interaction terms). The base model (Model 5) explains a significant amount of variance in negative emotions ($R^2 = 0.140$, $p < 0.01$). The main-effects model (Model 6) also explains a significant amount of variance in negative emotions ($R^2 = 0.293$, $p < 0.01$) and a significant amount of variance over and above the base model ($\Delta R^2 = 0.153$; $p < 0.01$). Additionally, the full model (Model 7) explains a significant amount of the variance in negative emotions ($R^2 = 0.319$; $p < 0.01$) and a significant amount of variance over and above the main-effects-only model ($\Delta R^2 = 0.026$; $p < 0.01$). Hypothesis 8 stated that the more organizational

members perceive failure as normalized within their organizational environments, the lower their negative emotions over project failure will be. The results reveal a significant negative relationship between the perception of normalization and the level of negative emotions ($\beta = -0.255$, $p < 0.01$), which provides support for H8. Hypothesis 2b proposed that the greater the time since project failure, the lesser the current negative emotions over that experience will be. The results shown in Model 6 indicate a non-significant relationship between the time since project failure and the level of negative emotions ($\beta = 0.018$; $p > 0.05$); therefore, H2b is not supported. However, care must be taken in interpreting the significance of the main-effect relationships in the presence of significant interactions (Cohen, Cohen, Stephen, & Leona, 2003).

The findings for the full model demonstrate a significant positive interaction term for time since project failure and loss orientation on the level of negative emotion from project failure ($\beta = 0.143$, $p < 0.05$), and they demonstrate a significant negative interactive effect of time since project failure and oscillation orientation on the level of negative emotions ($\beta = -0.179$, $p < 0.05$). In terms of Hypothesis 5, which stated that organizational members with a strong restoration orientation will have less negative emotions than those with a weaker restoration orientation when the period after the failure is short but will have more grief when the period after the failure is long, the interactive term was non-significant ($\beta = 0.108$, $p > 0.05$); thus, H5 was not supported.

To determine the nature of the significant interactive effects, based on the regression coefficients, we plotted the time since project failure on negative emotions for the given values of both loss orientation and oscillation orientation (Figures 2 and 3, respectively). The values for loss and oscillation orientation were set at one standard deviation above and below their mean, and we entered a range of values for time since project failure as suggested by Cohen and Cohen (1983). Hypothesis 4 proposed that organizational members with a strong loss orientation will have fewer negative emotions than those with a weaker loss orientation when the period after the failure is short but will have more negative emotions when the period after failure is long. The nature of the interaction shown in Figure 2 indicates that when the time since project failure is longer, individuals with a strong loss orientation experience greater levels of negative emotions associated with the

project failure; whereas, individuals with a weak loss orientation will experience comparatively lower levels of negative emotions associated with the failure (and vice versa for short time periods). This provides support for H4. Hypothesis 7 proposed that negative emotions from project failure decrease more with the length of time after the failure for those with a stronger oscillation orientation than for those with a weaker oscillation orientation. The interaction shown in Figure 3 indicates that organizational members' negative emotions from project failure decrease more with the length of time after failure for those with a strong oscillation orientation than for those with a weak oscillation orientation. This finding provides support for H7.

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Insert Figures 2 & 3 about here
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Common Method and Source Error

Although several arguments have been presented as to the minimal influence common method and source variances have on self-report instruments (Spector, 1987, 2006), we took measures to ensure the validity of the reported results. To assess the effects of common method and source variances, we applied a partial correlation procedure (Podsakoff & Organ, 1986). In this approach, we examined whether or not the significant relationships of interest still existed after the common method factor had been controlled for. The results were consistent with those reported above. Although such tests cannot unequivocally prove that common method error was not present, it does suggest that it is unlikely to have a significant impact on the results.

DISCUSSION

Although knowledge-based research at the organizational level has provided a deeper understanding of strategic management and entrepreneurship, few empirical studies have helped researchers understand how organizational members create new knowledge from their experiences and commit these new knowledge resources to the organization. Prior knowledge-based work has primarily focused on knowledge transfer and acquisition (Ahuja, 2000; Hansen, 1999) despite scholars' recognition of the importance of knowledge creation (McFadyen & Cannella, 2004), the fact that the knowledge created needs to be acted upon to benefit the organization (Bettis & Prahalad, 1995), and the pervasive belief that we can learn most from our failure experiences

(Chuang & Baum, 2003; Sitkin, 1992). In the current study, we begin to fill this gap by investigating how and when coping with loss affects moving forward from project failure. Using a sensemaking perspective we argued that moving forward from failure involves organizational members learning from the experience and being affectively committed to investing their resources (including new knowledge) to achieve organizational goals. With psychological theories of loss as the theoretical underpinnings of our model, we made two sets of theoretical arguments. First, negative emotions over failure undermine organizational members' commitment to the organization, and coping with loss—either in preparation (perceived organizational culture of normalizing failure) or over time (time since project failure, coping orientation, and the interaction of the two)—affects the negative emotions over project failure. Second, coping with the loss—through perceived organizational culture of normalization, time since project failure, and coping orientation—affects organizational members' learning from the experience. The findings largely support these theoretical arguments and provide a number of theoretical contributions related both to knowledge-based theories and research and to theory and research on affective commitment.

Critical Findings

In this study, we theorized and found that negative emotions decrease with the time since the project failed (H1), but also that negative emotions reduced more quickly for those with a stronger oscillation orientation (H7). The level of negative emotions from project failure was lower for those who perceive their organization to normalize failure (H8), and lower for those with a stronger loss orientation when the period after failure is short but higher when the period after failure is long (H4). In this study we conjointly considered learning from failure and affective commitment to an organization to determine individuals' progress in moving forward from project failure. We found that learning from the failure of a project increases with the time since the project failed (H1) and for those with a stronger loss orientation (H3) and a stronger oscillation orientation (H6). We found our results indicate lower affective commitment toward the organization for those who experience more negative emotions from failure (H2a). We now offer the implications of these findings.

Implications for Knowledge-Based Theories and Research

A contribution of this research comes from examining the role of learning from failure within a knowledge-based logic. This contribution arises from the empirical support of the two sets of theoretical arguments. First, time does appear to provide individuals with the opportunity to learn more from a project failure. We proposed that it takes time to build a plausible account for the failure, to gain a deeper understanding of the complex relationships between the contributors and project failure, and to develop the personal reflection necessary to adjust thinking. These notions are consistent with the organizational learning literature in that organizational members do appear to search for and process information about the failure event. Specifically, project failure likely stimulates individuals to search for what went wrong so that beliefs can be revised to inform subsequent action (Cannon & Edmondson, 2001, 2005; Gioia & Chittipeddi, 1991).

Second, we complemented and extended the organizational learning literature by our theorizing and finding that organizational members' vary in their ability to learn from failure, which can be explained by the strength of their various coping orientations and their perceptions of the extent to which their organizations normalize failure. Organizational members with a stronger loss orientation tend to learn more from failure, which is consistent with the notion that "grief work" is necessary to explore the events leading up to a loss in order to build an account for why it occurred. We also found that a stronger orientation toward oscillation is associated with learning from failure. Therefore, while learning from failure is recognized as important, it does not appear to be instantaneous or automatic. It takes time to learn from an experience, and depending on the strength of their coping orientation, some learn more than others. What makes this particularly interesting is the likelihood that individuals can improve their ability to learn from failure. For example, it is proposed that individuals can learn to engage an oscillation orientation (Shepherd, 2004). The findings here suggest that such a skill/ability is one that individuals may be well-advised to develop, especially for those more frequently facing project failure.

We did not find a significant relationship between the perception of the extent to which the organization normalizes failure and learning from failure. Therefore, we did not find evidence supporting the notion of "intelligent failure," where learning from failure is maximized when failure

is not considered an extraordinary event (Sitkin, 1992). It could be that the notion of approaching failure with alacrity suffers the same criticism of learning from small wins—in both situations, the event generates so little emotion that it does not "capture" sufficient amounts of the individual's attention for him or her to scan, process, and learn from the event. It could also be that our measure does not sufficiently capture the environments in which failure is normalized or that the organizational member's perception of that environment does not influence his or her thoughts and feelings about failure. However, this is an unlikely explanation given the significant relationship between perceived normalization and the level of negative emotions. Future research can offer a more fine-grained investigation of the nature of the relationship between perceived normalization and reduced emotional stimulation for scanning information to learn from the failure experience, on the one hand, and between perceived normalization and increased interference for information processing obstructing learning from the failure experience, on the other hand. As such, the measures developed in this study may be useful for this research.

Implications for Theory and Research on Affective Commitment

Another contribution of this research comes from examining affective commitment to the organization with an emotions-based logic. This contribution arises from empirical support of three sets of theoretical arguments. First, affective commitment to the organization has long been recognized as an important aspect for organizational success (e.g., Gong et al., 2009). We find that project failure generates negative emotions and that these negative emotions are associated with lower levels of the individual's affective commitment toward his or her organization. It appears that emotions as outcomes may influence emotions as inputs for subsequent projects at least in terms of the negative emotions of project failure (output) and affective commitment to the organization (input).

Second, we take an important step towards explaining organizational members' level of negative emotions over a project failure. At first, it appears that time does heal wounds, where wounds are the negative emotions generated from project failure. However, we theorized and found that the relationship between time and negative emotions from project failure is more complex; it

depends on the strength of the individuals' different coping orientations. Time "heals" wounds differently depending on how that time is used. We found that when the time since project failure was short, those who used a strong loss orientation had lower levels of negative emotions from the experience. However, for longer periods since project failure, those with a stronger loss orientation did less well. This has important implications for research on coping with the negative emotions of project failure. Depending on the research design used to capture the negative emotions after project failure, the results on the effectiveness of a stronger loss orientation will vary considerably—so much so that results with different time periods may come up with opposite results. Indeed, there are mixed results in the literature on coping with loss (Stroebe & Schut, 2001). The varying time periods of this study are sufficient to highlight this important implication, but the cross-sectional design does not provide the opportunity to explore this temporal issue further. Recognizing the very real challenges of tracking emotions over time, perhaps the use of new methods may open up such possibilities (e.g., Uy, Foo, & Aguinis, 2010; see Foo, Uy, & Baron, 2009).

What we find to be even more interesting is the moderating role of an oscillation orientation on the time-negative-emotion relationship. It appears that an oscillation orientation itself is not universally beneficial. When the time since project failure is short, those with a strong oscillation orientation have greater negative emotions than those with a weaker orientation. It is only over an extended period of time since project failure that a stronger oscillation orientation provides superior benefits. This finding has implications for scholars of loss, coping, and emotional recovery. While an oscillation orientation may overcome the costs of holding a loss orientation or a restoration orientation for too long, it may not be the panacea for reducing negative emotions. It could be that in the short run, there are costs to a stronger oscillation orientation. Perhaps the recognition of the need to switch into and out of different orientations initially creates anxiety until the individual "gets into the swing of it." Perhaps a hybrid coping strategy is more appropriate—an initial extended period of a strong loss orientation and then the activation of an oscillation orientation. Future research can build on the current findings and use the measures introduced in this study to investigate the conditions in which a strong oscillation orientation may be a liability.

Finally, we found that organizational members' levels of negative emotions over project failure are lower when they perceived their organization's culture as one that "treats" failure as a "nothing-out-of-the-ordinary" event. Given the negative relationship between negative emotions and affective commitment to an organization, future research could further investigate the nuances of the relationship between a culture of normalization and affective commitment to the organization. It could be more complicated than that implied from the above results. An organization runs the risk that by taking emotion out of the outcome, it might also remove emotion as an input to the project-development process. Indeed, more research is needed on the experiences of failure (absolute number relative to successes and frequency) to better understand the emotional inputs and outcomes of the entrepreneurial process. These are fruitful topics for future research.

Although we used theory to focus on the variables of most interest and used various control variables in our analyses, there are a number of other promising variables to empirically test future theorizing on project failure, including individual-level variables (e.g., self-esteem and self-identity, self-efficacy as a scientist, and personality, such as openness to experience, conscientiousness, and neuroticism), firm-level variables (e.g., entrepreneurial orientation, slack resources, and a real options reasoning approach to projects), and environmental-level variables (e.g., hostility, dynamism, and complexity). Additionally, perhaps there are differences among members of a project in terms of their perceptions on whether a project has failed or not. Future research on such differences could help explain within-group dynamics, including conflict, which may impact the ability of the organization to move forward. Finally, further research is required to test and extend the generalizability of the current study. As detailed earlier, a sample of research scientists is appropriate to test the theoretical model, but care must be taken in generalizing the results to other groups where project failure is less frequent and occurs when projects are older, feedback is more ambiguous, less directed to the individual, and delayed, and the determination of project failure is more ambiguous.

There are a number of managerial implications. First, managers need to recognize that organizational members feel bad when their projects fail and it takes time for these emotions to

subside. Second, some organizational members possess coping orientations that can more quickly reduce these emotions—to maintain commitment to the organization—and learn from the experience. Managers could try to select members for highly uncertain projects that have these orientations and/or use training to develop these orientations. Finally, to reduce negative emotions generated by project failure, managers could provide failure experiences that render project failure less salient and/or develop an organizational culture that reinforces the notion that project failure is an ordinary and expected consequence of the organization's strategy and goals. As we research these topics further, managerial implications will become more fine-grained.

CONCLUSION

Project failure is a way of life for members in many organizations. Organizational members' ability to learn from those failures and the willingness to continue to support the organization are important for an organization to move forward. We theorized and found that learning from failure is not instantaneous (but requires time) and is not automatic (organizational members differ in the strength of their coping orientations and these differences matter). We also theorized and found that while time heals wounds (reduces the negative emotions from project failure), it heals differently for those with stronger specific coping orientations and that the "wound" is shallower for those who perceive their organization to normalize failure. Based on the theorizing and findings of this study—which conjointly considers learning from failure and affective commitment to an organization to determine individuals' progress in moving forward from project failure—studies that consider moving forward solely in terms of learning from failure would likely ignore the benefits of a restoration orientation, overstate the long-run benefits of a strong loss orientation, and understate the long-run benefits of a strong oscillation orientation. In the end, we provided some preliminary evidence on moving forward after project failure and validated several new measures, which we hope stimulate further conversation and research on project failure.

REFERENCES

Ahuja, G. 2000. Collaboration networks, structural holes, and innovation: A longitudinal study. ***Administrative Science Quarterly***, 45(3): 425-455.

Allen, T.J. 1977. ***Managing the flow of technology*.** Cambridge, MA: MIT Press.

Anderson, J. C., & Gerbing, D. W. 1991. Predicting the performance of measures in a confirmatory factor analysis with a pretest assessment of their substantive validities. ***Journal of Applied Psychology***, 76(5): 732-740.

Archer, J. 1999. ***The nature of grief: The evolution and psychology of reactions to loss*.** New York: Routledge.

Armstrong, J. S., & Overton, T. S. 1977. Estimating nonresponse bias in mail surveys. ***Journal of Marketing Research***, 14(3): 396-402.

Ashforth, B. E., & Kreiner, G. E. 1999. "How can you do it?": Dirty work and the challenge of constructing a positive identity. ***Academy of Management Review***, 24(3): 413-434.

Ashforth, B.E. & Kreiner G.E. 2002. Normalizing emotion in organizations: Making the extraordinary seem ordinary. ***Human Resource Management Review***, 12(2): 215-235.

Ashforth, B. E., Kreiner, G. E., Clark, M. A., & Fugate, M. 2007. Normalizing dirty work: Managerial tactics for countering occupational taint. ***Academy of Management Journal***, 50(1): 149-174

Bagozzi, R. P., Yi, Y., & Phillips, L. W. 1991. Assessing construct validity in organizational research. ***Administrative Science Quarterly***, 36(3): 421-458.

Balogun, J., & Johnson, G. 2004. Organizational restructuring and middle manager sensemaking. ***Academy of Management Journal***, 47(4): 523-549.

Baron, R. A. 1999. Counterfactual thinking and venture formation: The potential effects of thinking about "what might have been". ***Journal of Business Venturing***, 15(1): 79-91.

Baron, R. A. 2000. Psychological perspectives on entrepreneurship: Cognitive and social factors in entrepreneurs' success. ***Current Directions in Psychological Science***, 9(1): 15-18.

Baron, R. A. 2004. The cognitive perspective: A valuable tool for answering entrepreneurship's basic "why" questions. ***Journal of Business Venturing***, 19(2): 221-239.

Baron, R.A. 2008. The role of affect in the entrepreneurial process. ***Academy of Management Review***, 33(2): 328-340.

Belschak, F.D. & Hartog D.N.D. 2009. Consequences of positive and negative feedback: The impact on emotions and extra-role behaviors. ***Applied Psychology***, 58(2): 274-303.

Bentler, K.A. 1986. Sample size and Bentler and Bonett's nonnormed fit index. ***Psychometrika***, 51(3): 375-377.

Bentler, P.M. 1990. Fit indexes, lagrange multipliers, constraint changes and incomplete data in structural models. ***Multivariate Behavioral Research***, 25(2): 163-172.

Bentler, P.M. & Bonett, D.G. 1980. Significance tests and goodness of fit in the analysis of covariance structures. ***Psychological Bulletin***, 88(3): 588-606.

Bettis, R. A., & Prahalad, C. K. 1995. The dominant logic: Retrospective and extension. ***Strategic Management Journal***, 16(1): 5-14.

Brislin, R.W. 1970. Back-translation for cross-cultural research. ***Journal of Cross-Cultural Psychology***, 1(3): 185-216.

Burgelman, R.A. & Valikangas L. 2005. Managing internal corporate venture cycles. ***MIT Sloan Management Review***, 46(4): 26-34.

Cannon, M.D. & Edmondson A.C. 2001. Confronting failure: Antecedents and consequences of shared beliefs about failure in organizational work groups. ***Journal of Organizational Behavior***, 22(2): 161-177.

Cardinal, L.B. 2001. Technological innovation in the pharmaceutical industry: The use of organizational control in managing research and development. ***Organization Science***, 12: 19-36.

Carver, C. S., Scheier, M. F., & Weintraub, J. K. 1989. Assessing coping strategies: A theoretically based approach. ***Journal of Personality and Social Psychology***, 56(2): 267-283.

Christen, M., Iyer, G., & Soberman, D. 2006. Job satisfaction, job performance, and effort: A reexamination using agency theory. ***Journal of Marketing***, 70(1): 137-150.

Chuang, Y.T. & Baum, J.A.C. 2003. It's all in the name: Failure-induced learning by multiunit Ccains. ***Administrative Science Quarterly***, 48(1): 33-59.

Clore, G. L. 1992. Cognitive phenomenology: Feelings and the construction of judgement. In L.L. Martin & A. Tesser (Eds.), ***The construction of social judgements***: 133-164. Hillsdale, NJ: Erlbaum.

Cohen, J. & Cohen P. 1983. ***Applied multiple regression/correlation analysis for the behavioral sciences*** (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.

Cohen, J., Cohen, P., Stephen, G. W., & Leona, S. A. 2003. ***Applied multiple regression/correlation analysis for the behavioral sciences*** (3rd ed.). Mahwah, NJ: Lawrence Erlbaum Associates.

Cope, J. & Watts, G. 2000. Learning by doing - An exploration of experience, critical incidents and reflection in entrepreneurial learning. ***International Journal of Entrepreneurial Behavior & Research***, 6(3): 104-124.

Corbett, A.C., Neck, H.M., & DeTienne, D.R. 2007. How corporate entrepreneurs learn from fledgling innovation initiatives: Cognition and the development of a termination script. ***Entrepreneurship: Theory & Practice***, 31(6): 829-852.

Craig, C.S. & Douglas, S.P. 2006. Beyond national culture: implications of cultural dynamics for consumer research. ***International Marketing Review***, 23(3): 322-342.

Cronbach, L.J. 1951. Coefficient alpha and the internal structure of tests. ***Psychometrika***, 16(3): 297-334.

Cropanzano, R., James, K. & Konovsky, M.A. 1993. Dispositional affectivity as a predictor of work attitudes and job performance. ***Journal of Organizational Behavior***, 14(6): 595-606.

Daft, R.L. & Weick K.E. 1984. Toward a model of organizations as interpretation systems. ***Academy of Management Review***, 9(2): 284-295.

Datta, D. K., Guthrie, J. P., & Wright, P. M. 2005. Human resource management and labor productivity: Does industry matter? ***Academy of Management Journal***, 48(1): 135-145.

Derryberry, D., & Tucker, D. M. 1994. Motivating the focus of attention. In P.M. Neidenthal & S. Kitayama (Eds.), ***The heart's eye: Emotional influences in perception and attention***: 167-196. San Diego, CA: Academic Press.

Dillon, P. 1998. Failure is just part of the culture of innovation: Accept it and become stronger. ***Fast Company***, 18 Dec: 1-2. http://www.fastcompany.com/online/20/yu.html

DiMasi, J.A., Hansen, R.W. & Grabowski, H.G. 2003. The price of innovation: new estimates of drug development costs. ***Journal of Health Economics***, 22(2): 151-185.

Dweck, C.S. & Leggett, E.L. 1988. A social-cognitive approach to motivation and personality. ***Psychological Review***, 95(2): 256-273.

Edmondson, A.C. 1996. Learning from mistakes is easier said than done: Group and organizational influences on the detection and correction of human error. ***Journal of Applied Behavioral Science***, 32(1): 5-28.

Eisenhardt, K.M. & Martin J.A. 2000. Dynamic capabilities: what are they? ***Strategic Management Journal***, 21(10/11): 1105-1121.

Elliot, A. J., & McGregor, H. A.2001. A 2 X 2 achievement goal framework. *Journal of Peronality and Social Psychology, 80*: 501-519.

Ellis, S. H., & Chase, W. G. 1971. Parallel processing in item recognition. ***Perception & Psychophysics***, 10(5): 379-384.

Ellis, S. & Davidi, I. 2005. After-event reviews: Drawing lessons from successful and failed experience. ***Journal of Applied Psychology***, 90(5): 857-871.

Epley, N., & Gilovich, T. 2006. The anchoring-and-adjustment heuristic. ***Psychological Science***, 17(4): 311-318.

Farson, R. & Keyes, R. 2002. The failure-tolerant leader. ***Harvard Business Review***, 80: 64-71.

Fineman, S. 1996. Emotional subtexts in corporate greening. ***Organization Studies***, 17(3): 479-500.

Fiol, C. M., & Lyles, M. A. 1985. Organizational learning. ***Academy of Management Review***, 10: 803–813.

Foo, M-D., Uy, M. A., & Baron, R. A. 2009. How do feelings influence effort? An empirical study of entrepreneurs' affect and venture effort. ***Journal of Applied Psychology***, 94(4): 1086-1094.

Fornell, C. & Larcker D.F. 1981. Evaluating structural equation models with unobservable variables and measurement error. ***Journal of Marketing Research***, 18(1): 39-50.

Frank, M. G., & Gilovich, T. 1989. Effect of memory perspective on retrospective causal attributions. ***Journal of Personality and Social Psychology***, 57(3): 399-403.

Fredrickson, B. L. 2001. The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. ***American Psychologist***, 56(3): 218-226.

Ganster, D. C. 2005. Executive job demands: Suggestions from a stress and decision-making perspective. ***Academy of Management Review***, 30(3): 492-502.

Gassmann, O. & Reepmeyer, G. 2005. Organizing pharmaceutical innovation: From science-based knowledge creators to drug-oriented knowledge brokers. ***Creativity & Innovation Management***, 14(3): 233-245.

Gilovich, T., & Medvec, V. H. 1995. The experience of regret: What, when, and why. ***Psychological Review***, 102(2): 379-395.

Gioia, D.A. & Chittipeddi, K. 1991. Sensemaking and sensegiving in strategic change initiation. ***Strategic Management Journal***, 12(6): 433-448.

Gong. Y., Law, K.S., Chang, S. & Xin, K.R. 2009. Human resources management and firm performance: The differential role of managerial affective and continuance commitment. ***Journal of Applied Psychology***, 94(1): 263-275.

Gross, J.J. 1998. Antecedent- and response-focused emotion regulation: Divergent consequences for experience, expression, and physiology. ***Journal of Personality and Social Psychology***, 74(1): 224-237.

Groves, K.S., McEnrue, M.P. & Shen W. 2008. Developing and measuring the emotional intelligence of leaders. ***Journal of Management Development***, 27(2): 225-250.

Gusterson, H. 1996. ***Nuclear rites: A weapons laboratory at the end of the Cold War***. Los Angeles, CA: University of California Press.

Guthrie, J. P. 2001. High-involvement work practices, turnover, and productivity: Evidence from New Zealand. ***Academy of Management Journal***, 44(1): 180-190.

Hankin, B.L. & Abramson, L.Y. 2001. Development of gender differences in depression: An elaborated cognitive vulnerability-transactional stress theory. ***Psychological Bulletin***, 127(6): 773-796.

Hansen, M. T. 1999. The search-transfer problem: The role of weak ties in sharing knowledge across organization subunits. ***Administrative Science Quarterly***, 44(1): 82-111.

Hinkin, T. R. 1998. A brief tutorial on the development of measures for use in survey questionnaires. ***Organizational Research Methods***, 1(1): 104-121.

Hirshleifer, J. 1993. The affections and the passions: Their economic logic. ***Rationality and Society***, 5(2): 185-202.

Hoang, H., & Rothaermel, F. T. 2005. The effect of general and partner-specific alliance experience on joint R&D project performance. ***Academy of Management Journal***, 48(2): 332-345.

Hogan, N.S., Greenfield, D.B., & Schmidt, L.A. 2001. Development and validation of the Hogan Grief Reaction Checklist. ***Death Studies***, 25(1): 1-32.

Holahan, C.J. & Moos, R.H. 1987. Personal and contextual determinants of coping strategies. ***Journal of Personality and Social Psychology***, 52(5): 946-955.

Hu, L. & Bentler, P.M. 1999. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. ***Structural Equation Modeling***, 6(1): 1-55.

Huber, G. P. 1991. Organizational learning: The contributing processes and the literatures. ***Organization Science***, 2: 88–115.

Hunter, A. B., Laursen, S. L., & Seymour, E. 2007. Becoming a scientist: The role of undergraduate research in students' cognitive, personal, and professional development. ***Science Education***, 91(1): 36-74.

Huy, Q.N. 1999. Emotional capability, emotional intelligence, and radical change. ***Academy of Management Review***, 24(2): 325-345.

Ilies, R. & Judge, T.A. 2005. Goal regulation across time: The effects of feedback and affect. ***Journal of Applied Psychology***, 90(3): 453-467.

Jain, S., George, G. & Maltarich, M. 2009. Academics or entrepreneurs? Investigating role identity modification of university scientists involved in commercialization activity. ***Research Policy***, 38(6): 922-935.

Johnson, M. K., & Sherman, S. J. 1990. Constructing and reconstructing the past and the future in the present. In E.T. Higgins & R.M. Sorrentino (Eds.), ***Handbook of motivation and cognition: Foundations of social behavior***: 482-526. New York: Guilford Press.

Joreskog, K.G. & Sorbom, D. 1984. ***LISREL VI: Analysis of Linear Structural Relationships by the Method of Maximum Likelihood.*** Chicago: National Educational Resources, Inc.

Joreskog, K.G. & Sorbom, D. 2006. ***LISREL 8.80.*** Chicago: Scientific Software International.

Kahneman, D., Slovic, P., & Tversky, A. 1982. ***Judgement under uncertainty: Heuristics and biases***. New York: Cambridge University Press.

Kanter, R. M. 1968. Commitment and social organization: A study of commitment mechanisms in utopian communities. ***American Sociological Review***, 33(4): 499-517.

Keil, M. & Robey, D. 1999. Turning around troubled software projects: An exploratory study of the deescalation of commitment to failing courses of action, ***Journal of Management Information Systems***, 15(4): 63-87.

Kim, D.H. 1993. The link between individual learning and organizational learning. ***Sloan Management Review***, 35(1): 379-500.

Kim, J.Y. & Miner, A.S. 2007. Vicarious learning from the failures and near-failures of others: Evidence from the U.S. commercial banking industry. ***Academy of Management Journal***, 50(3): 687-714.

Krishnan, R., Martin, X., & Noorderhaven, N. G. 2006. When does trust matter to alliance performance? ***Academy of Management Journal***, 49(5): 894-917.

Kuhn, T. S. 1996. ***The structure of scientific revolutions*** (3rd ed.). Chicago: University of Chicago Press.

Landman, J., Vandewater, A. A., Stewart, A. J., & Malley, J. E. 1995. Missed opportunities: Psychological ramifications of counterfactual thought in midlife women. ***Journal of Adult Development***, 2(2): 87-97.

Lankau, M. J., & Scandura, T. A. 2002. An investigation of personal learning in mentoring relationships: Content, antecedents, and consequences. ***Academy of Management Journal***, 45(4): 779-790.

Lau, R. R. 1984. Dynamics of the attribution process. ***Journal of Personality and Social Psychology***, 46(5): 1017-1028.

Lee, F., & Robinson, R. J. 2000. An attributional analysis of social accounts: Implications of playing the blame game. ***Journal of Applied Social Psychology***, 30(9): 1853-1879.

Leonard-Barton, D. 1995. ***Wellsprings of Knowledge.*** Boston, MA: Harvard Business School Press.

Libby, L. K., & Eibach, R. P. 2002. Looking back in time: Self-concept change affects visual perspective in autobiographical memory. ***Journal of Personality and Social Psychology***, 82(2): 167-179.

Little, T.D., Cunningham, W.A., Shahar, G. & Widaman, K.F. 2002. To parcel or not to parcel: Exploring the question, weighing the merits. ***Structural Equation Modeling***, 9(2): 151-173.

Luscher, L. S., & Lewis, M. W. 2008. Organizational change and managerial sensemaking: Working through paradox. ***Academy of Management Journal***, 51(2): 221-240.

Lyubomirsky, S., & Nolen-Hoeksema, S. 1995. Effects of self-focused rumination on negative thinking and interpersonal problem solving. ***Journal of Personality and Social Psychology***, 69(1): 176-190.

Mackie, D. M., Devos, T., & Smith, E. R. 2000. Intergroup emotions: explaining offensive action tendencies in an intergroup context. ***Journal of Personality and Social Psychology,***79: 602-616.

Madsen, P. M. & Desai, V. 2010. Failing to learn? The effect of failure and success on organizational learning in the global orbital launch vehicle industry. ***Academy of Management Journal***, 53: 451–476.

Maitlis, S. 2005. The social processes of organizational sensemaking. ***Academy of Management Journal***, 48(1): 21-49.

Manusov, V., & Spitzberg, B. H. 2008. Attribution theory: Finding good cause in the search for theory. In L.A. Baxter & D.O. Braithwaite (Eds.), ***Engaging Theories in Interpersonal Communication: Multiple Perspectives***: 37-50. Thousand Oaks, CA: Sage Publications.

Markman, G. D., Balkin, D. B., & Baron, R. A. 2002. Inventors and new venture formation: The effects of general self-efficacy and regretful thinking. ***Entrepreneurship: Theory & Practice***, 27(2): 149-165.

Martin, B. R., & Irvine, J. 1983. Assessing basic research : Some partial indicators of scientific progress in radio astronomy. ***Research Policy***, 12(2): 61-90.

McFadyen, M. A., & Cannella, A. A., Jr. 2004. Social capital and knowledge creation: Diminishing returns of the number and strength of exchange. ***Academy of Management Journal***, 47(5): 735-746.

McGrath, R.G. 1999. Falling forward: Real options reasoning and entrepreneurial failure. ***Academy of Management Review***, 24(1): 13-30.

McGrath, R. G. 2001. Exploratory learning, innovative capacity and managerial oversight. ***Academy of Management Journal***, 44(1): 118-131.

McGrath, R.G., Keil T. & Tukiainen T. 2006. Extracting value from corporate venturing. ***MIT Sloan Management Review***, 48(1): 50-56.

McMullen, M. N., Markman, K. D., & Gavanski, I. 1995. Living in neither the best nor the worst of all possible worlds: Antecedents and consequences of upward and downward counterfactual thinking. In N.J. Roses & J.M. Olsen (Eds.), ***What Might Have Been: The Social Psychology of Counterfactual Thinking***: 133-167. Mahwah, NJ: Erlbaum.

Menaghan, E. 1982. Measuring Coping Effectiveness: A panel analysis of marital problems and coping efforts. ***Journal of Health and Social Behavior***, 23(3): 220-234.

Miller, D. A., Cronin, T., Garcis, A. L., & Branscombe, N. R. 2009. The relative impact of anger and efficacy on collective action is affected by feelings of fear. ***Group Process & Intergroup Relations,*** 12: 445.

Minniti, M. & Bygrave, W. 2001. A dynamic model of entrepreneurial learning. ***Entrepreneurship: Theory & Practice***, 25(3): 5-17.

Moss, S. E., & Sanchez, J. I. 2004. Are your employees avoiding you? Managerial strategies for closing the feedback gap. ***Academy of Management Executive,*** 18(1): 32-44.

Moss, S. E., Valenzi, E. R., & Taggart, W. 2003. Are you hiding from your boss? The development of a taxonomy and instrument to asses the feedback management behaviors of good and bad performers. ***Journal of Management,*** 29(4): 487-510.

Mowday, R.T., Steers, R.M. & Porter L.W. 1979. The measurement of organizational commitment. ***Journal of Vocational Behavior***, 14(2): 224-247.

Mroczek, D.K. & Kolarz, C.M. 1998. The effect of age on positive and negative affect: A developmental perspective on happiness. ***Journal of Personality and Social Psychology***, 75(5): 1333-1349.

Murray, C. & Cox, C.B. 1989. ***Apollo: the race to the moon*.** New York: Simon & Schuster.

Nelson, R. R. 1959. The simple economics of basic scientific research. ***The Journal of Political Economy***, 67(3): 297-306.

Nelson, R. R., & Winter, S. G., 1982. ***An evolutionary theory of economic change***. Cambridge, MA: Belknap.

Netemeyer, R.G., Bearden, W.O. & Sharma S. 2003. ***Scaling Procedures*.** Thousand Oaks, CA: Sage Publications.

Nigro, G., & Neisser, U. 1983. Point of view in personal memories. ***Cognitive Psychology***, 15(4): 467-482.

Nolen-Hoeksema, S. 1991. Responses to depression and their effects on the duration of depressive episodes. ***Journal of Abnormal Psychology***, 100(4): 569-582.

O'Reilly, C.A. & Chatman J. 1986. Organizational commitment and psychological attachment: The effects of compliance, identification, and internalization on prosocial behavior. ***Journal of Applied Psychology***, 71(3): 492-499.

Olsen, J. M., Roese, N. J., & Zanna, M. P. 1996. Expectancies. In E.T. Higgins & A.W. Kruglanski (Eds.), ***Social Psychology: Handbook of Basic Principles***: 211-238. New York: Guilford.

Palmer, S. E. 1978. Fundamental aspects of cognitive representation. In E. Rosch & B.B. Lloyds (Eds.), ***Cognition and categorization***: 259-303. Hillsdale, NJ: Erlbaum.

Paulhus, D.L. 1984. Two-component models of socially desirable responding. ***Journal of Personality and Social Psychology***, 46(3): 598-609.

Petrovski, H. 1985. ***To engineer is human, the role of failure in successful design.*** New York: St. Martins Press.

Podsakoff, P.M. & Organ, D.W. 1986. Self-Reports in Organizational Research: Problems and Prospects. ***Journal of Management***, 12(4): 531-544.

Popper, K.R. 1959. ***The logic of scientific discovery*****.** New York: Hutchinson & Co.

Prahalad, C.K. & Oosterveld, J.P. 1999. Transforming internal governance: The challenge for multinationals. ***Sloan Management Review***, 40(3): 31-39.

Prigerson, H.G., Bierhals, A.J., Kasl, S.V &, Reynolds, C.F., 3rd, Shear MK, Day N, Beery LC, Newsom JT, Jacobs S. 1997. Traumatic grief as a risk factor for mental and physical morbidity. ***American Journal of Psychiatry***, 154(5): 616-623.

Pronin, E., & Ross, L. 2006. Temporal differences in trait self-ascription: When the self is seen as an other. ***Journal of Personality and Social Psychology***, 90(2): 197-209.

Reich, W. 1949. ***Character analysis***. New York: Oregon Institute Press.

Repetti, R.L. 1992. Social withdrawal as a short-term coping response to daily stressors. In H. S. Friedman (Eds.), ***Hostility, coping, & health***: 151-165. Washington, D.C.: American Psychological Association.

Richins, M.L. & Dawson S. 1992. A consumer values orientation for materialism and its measurement: Scale development and validation. ***Journal of Consumer Research***, 19(3): 303-316.

Roach, M.J. & Kitson G.C. 1989. Impact of forewarning on adjustment to widowhood and divorce. In D. A. Lund (Eds.), ***Older Bereaved Spouses: Research with Practical Applications***: 185-200. New York: Hemisphere.

Roese, N. J. 1997. Counterfactual thinking. ***Psychological Bulletin***, 121(1): 133-148.

Rudolph, J. W., Morrison, J. B., & Carroll, J. S. 2009. The dynamics of action-oriented problem solving: Linking interpretation and choice. ***Academy of Management Review***, 34(4): 733-756.

Ryan, R.M. & Deci, E.L. 2000. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. ***American Psychologist***, 55(1): 68-78.

Rynes, S. L., Bartunek, J. M., & Daft, R. L. 2001. Across the great divide: Knowledge creation and transfer between practitioners and academics. ***Academy of Management Journal***, 44(2): 340-355.

Salovey, P. & Mayer, J.D. 1990. Emotional intelligence. ***Imagination, Cognition, and Personality***, 9(3): 185-211.

Schwandt, D. R. 2005. When managers become philosophers: Integrating learning with sensemaking. ***Academy of Management Learning & Education***, 4(2): 176-192.

Schwarz, N., & Clore, G. L. 1988. How do I feel about it? The informative function of affective states. In K. Fiedler & J.P. Forgas (Eds.), ***Affect, cognition, and social behavior***: 44-62. Gottingen, Germany: Hogrefe.

Sedikides, C. 1993. Assessment, enhancement, and verification determinants of the self-evaluation process. ***Journal of Personality and Social Psychology***, 65(2): 317-338.

Shepherd, D.A. 2003. Learning from business failure: Propositions of grief recovery for the self-employed. ***Academy of Management Review***, 28(2): 318-328.

Shepherd, D.A. 2004. Educating entrepreneurship students about emotion and learning from failure. ***Academy of Management Learning and Education***, 3(3): 274-288.

Shepherd, D.A. & Cardon, M.S. 2009. Negative emotional reactions to project failure and the self-compassion to learn from the experience. ***Journal of Management Studies***, 46(6): 923-949.

Shepherd, D.A., Covin, J.G. & Kuratko, D.F. 2009. Project failure from corporate entrepreneurship: Managing the grief process. ***Journal of Business Venturing***, 24(6): 588-600.

Sinclair, R.R., Tucker, J.S., Cullen, J.C. & Wright, C. 2005. Performance differences among four organizational commitment profiles. ***Journal of Applied Psychology***, 90(6): 1280-1287.

Sitkin, S.B. 1992. Learning through failure: The strategy of small losses. ***Research in Organizational Behavior***, 14: 231-266.

Smircich, L., & Morgan, G. 1982. Leadership: The management of meaning. ***The Journal of Applied Behavioral Science***, 18(3): 257-273.

Spector, P.E. 1987. Method variance as an artifact in self-reported affect and perceptions at work: Myth or significant problem? ***Journal of Applied Psychology***, 72(3): 438-443.

Spector, P.E. 2006. Method variance in organizational research: Truth or urban legend? ***Organizational Research Methods***, 9(2): 221-232.

Spreitzer, G., Sutcliffe, K., Dutton, J., Sonenshein, S., & Grant, A. M. 2005. A socially embedded model of thriving at work. ***Organization Science***, 16(5): 537-549.

Starkey, K. 1998. What can we learn from the learning organization? ***Human Relations***, 51(4): 531-546.

Staw, B. M., Sandelands, L. E., & Dutton, J. E. 1981. Threat rigidity effects in organizational behavior: A multilevel analysis. ***Administrative Science Quarterly***, 26(4): 501-524.

Stroebe, M.S. & Schut H. 1999. The dual process of coping with bereavement: Rationale and description. ***Death Studies***, 23: 197-224.

Stroebe, M. S., & Schut, H. 2001. Models of coping with bereavement: A review, ***Handbook of bereavement research: Consequences, coping, and care.***: 375-403. Washington, D.C.: American Psychological Association.

Thomas, J.B., Clark, S.M., & Gioia, D.A. 1993. Strategic sensemaking and organizational performance: Linkages among scanning, interpretation, action, and outcomes. ***Academy of Management Journal***, 36(2): 239-270.

Uy, M.A., Foo, M.D. & Aguinis, H. 2010. Using experience sampling methodology to advance entrepreneurship theory and research. ***Organizational Research Methods*****:** in press.

Vandenberghe, C., Bentein, K. & Stinglhamber, F. 2004. Affective commitment to the organization, supervisor, and work group: Antecedents and outcomes. ***Journal of Vocational Behavior***, 64(1): 47-71.

Viswanathan, M., Childers, T. L., & Moore, E. S. 2000. The measurement of intergenerational communication and influence on consumption: Development, validation, and cross-cultural comparison of the IGEN scale. ***Journal of the Acadmey of Marketing Science***, 28(3): 406-424.

Wagner, J. A., & Gooding, R. Z. 1997. Equivocal information and attribution: An investigation of patterns of managerial sensemaking. ***Strategic Management Journal***, 18(4): 275-286.

Walsh, J. P., & Ungson, G. R. 1991. Organizational memory. ***Academy of Management Review***, 16: 239–270.

Weick, K. 1979. ***The social psychology of organizing***. Readon, MA: Addison-Wesley.

Weick, K.E. 1990. The vulnerable system: An analysis of the Tenerife air disaster. ***Journal of Management***, 16(3): 571-593.

Weick, K. E., & Sutcliffe, K. M. 2001. ***Managing the unexpected: Assuring high performance in an age of complexity***. San Francisco, CA: Jossey-Bass.

Weick, K.E. & Sutcliffe, K.M. 2007. ***Managing the Unexpected. Resilient Performance in an Age of Uncertainty*** (2nd ed.). San Francisco, CA: Jossey-Bass.

Weick, K.E., Sutcliffe, K.M. & Obstfeld, D. 2005. Organizing and the process of sensemaking. ***Organization Science***, 16(4): 409-421.

Wilson, J.L. 1977. Anticipatory grief in response to threatened amputation. ***Maternal-Child Nursing Journal,*** 6(3): 177-186.

Wolpert L. & Richards, A. 1997. ***Passionate minds: The inner world of scientists*****.** Oxford, UK: Oxford University Press.

Yli-Renko, H., Autio, E., & Sapienza, H. J. 2001. Social capital, knowledge acquisition, and knowledge exploitation in young technology-based firms. ***Strategic Management Journal***, 22(6-7): 587-613.

Appendix 1: Characteristics of Research Institutes

Research Institute	Research Areas	Examples of Typical Recent Projects
Materials Science	Metals and Metallurgy	Development of biomaterials for tissue engineering
	Ceramics	Investigation of nanomaterials
	Semiconductors	Electrochemical parameters of bare nitrinol surfaces
	Composites	Biomimetic apatite formation on chemically treated titanium
Physics	Applied Optics	Strong field laser physics with ion beams
	Optics & Quantum	Inhibition of light tunneling in waveguide arrays
	Solid State Physics	Ghost anomalous dimension in quantum gravity
	Electronics	Low-mass visual binaries in the solar neighborhood
Pharmacy	Pharmaceutical Biology	Bivalent beta-carbolines as multi-target anti-Alzheimer agents
	Pharmaceutical Chemistry	Novel heterocyclic templates for butyrylcholinesterase inhibitors
	Pharmaceutical Technology	Modulators of dopamine receptor subtype affinity and selectivity
Microbial Phytopathology	Microbiology	Sexual Development in Schizophyllum commune
	Microbial Phytopathology	Spesific gene expression in ectomycorrhizal fungi
		Bacterial Phytopathology: signaling in bacteria-plant interactions
Zoology	Zoology	Plasticity of neuronal circuits in mammalian cortex
	Animal Physiology	Model systems for interneuropathies
		Genes and encoded proteins of neuropsychiatric disorders
Geography	Physical Geography	Influence of Roman occupation on landscape development in Spain
	Social Geography	Sedimentological - debris flows in lake Lago de Braies
	Geoinformatics	Modeling of water balance and transport of solids
	Economic Geography	Process analysis of complex geo-systems
Medicine	Cardiology	Genetic variant delays progression to AIDS in HIV-infected women
	Anasthesiology	Targeting PI3K in neuroblastoma
	Neurology	Age-dependent effects of decreases in cerebral perfusion pressure
	Nuclear Medicine	Cytomegalovirus infection and PML nuclear bodies
	Urology & Oncology	Antiviral compounds from Euphorbiaceae plants
Biochemistry	Biochemistry	Inhibitors of HDACs - effective drugs against cancer
	Biophysics	TSA downregulates Wilms tumor gene 1 (Wt1) expression
		Pharmacodynamic markers for histone deacetylase inhibitor
Aging	Genetics	Glucocorticoids attenuating osteoblast differentiation
	Endocrinology	Mechanism of amyloid plaque formation and Abeta pathogenicity
	Biochemistry	Increased skeletal VEGF enhances β-catenin activity
	Molecular Biology	Retinoic acid responsive controls wt1a expression in zebrafish
	Virology	Effects of dietary restriction on age-related phenotypes
Economics	Evolutionary Economics	(Un)Bounded rationality in economic decisions
	Strategic Interactions	Institutions as determinants of preference change
	Growth and Public Policy	Dialects and economic exchange between regions
Chemical Ecology	Molecular Ecology	Hormone regulation of nectar production
	Bioorganic Chemistry	Insect protection of offspring with antibiotics
	Evolutionary Neuroethology	Desert ants using scent for navigation
	Entomology	Hummingbirds' role as pollinators
Biogeochemistry	Biogeochemistry	Effects of forest disturbance on precipitation
	Meteorology	Longitudinal grassland biodiversity
	Ecology	Tree phenology and carbon dioxide fluxes
	Oceanography	Molecular turnover time of soil organic matter

Appendix 2: Comments by Research Scientists about their Project Failures

Scientist	Project that Failed	Reaction to Project Failure
Chemistry	"We investigated how the degree of methylation influences the reactivity of Xanthines. We had five candidates of chemical compounds. Four of them could not be prepared with sufficient purity, and one was not reactive. It took three months to find this out. Then the project was over."	"First you think that this is somehow awkward now and that you will come up with some idea. Or you think, well, it is only bad luck. And then you lie in bed in the evening and before you fall asleep you think: is it me, is it the compound, or is it the general topic. You are somehow in despair. […]. In the end, I would say it was 90 % the compound and 10 % us, that we somehow did not fight hard enough to find a possible solvent for the compound."
Biochemistry	"My boss had the following idea: you apply the inhibitor to the cells, you observe the reaction, but this reaction diminishes over time. And he was of the opinion that there must be some kind of counter-reactive mechanism. And we tried for months to make this work without any success. And the boss was so certain that it must work. But at some point in time we [the team] convinced him with a myriad of arguments that things are as they are, and that we have to stop now."	"In the end I put very much energy into the project, because I wanted to investigate really all the factors - - everything you can modulate - - just to really know, OK, it does not make sense. … This did not work, and that was that."
Mechanical Engineering	"We wanted to construct a steering device for hypersonic airplanes. Millions went into this project […] there were about 50 people involved. But in the end it was not realized because all configurations did not work."	"I first tried not to panic and to finish as much of the work as possible and document everything. Because particularly in aerospace the wheel is reinvented and I wanted to avoid this. Therefore I tried to document as much as possible and at the same time look for a new challenge."
Behavioral Economics	"We had laid out the theoretical model and the experimental design. I always do the theory first and then the design, the experiment, and last the analysis. This takes, say, one to two years. ... But the results were not as good … We then repeatedly said that we would expand the project so that we can at least write a paper. But in the end we never went back."	"It was really an unpleasant situation. In a sense, of course, you start a project and would like to have results that warrant publication, but you are not able to lead it to a good end. To see that you and the team were not able to lead it to a successful completion was altogether disappointing."
Theoretical Physics	"We worked on crystalline elastomers, basically rubber, that also has a preferred orientation which can be somewhat re-directed by fields."	"After the failure, I worked as much as before, but the motivation was not as high. … You do not really have the full drive then. In terms of working hours it was certainly not different, but it was really frustrating, I was quite furious."
Aerospace Engineering	"For example, we developed an airplane without a pilot, together with a larger manufacturer. The agreement was that the plane had to be able to reach certain spots alone on a particular day. That is, you start the thing and it has to be able to fly around alone. … But in the end, we could not deliver."	"Of course it is frustrating … You state that you can do everything and others cannot. … [And] if we do not deliver I experience it as personal disappointment and personal failure which depresses my soul."
Biology	"We work on insect-plant interactions. I tried to find out how a particular gene influences this interaction, how cankers eating the plant are affected and how the defense mechanisms of the plant can be regulated anew."	"We had a hypothesis that did not work out … We had to go back not only weeks or months, but almost two years. We completely rejected the hypothesis and started anew. This was not easy. … Imagine you work for half a year, do all the experiments, and all the graphs look the same … Motivation is difficult then. If the results are frustrating because the hypothesis was not right, you find yourself without energy."

FIGURE 1: A Model of Organizational Members' Moving Forward from Project Failure

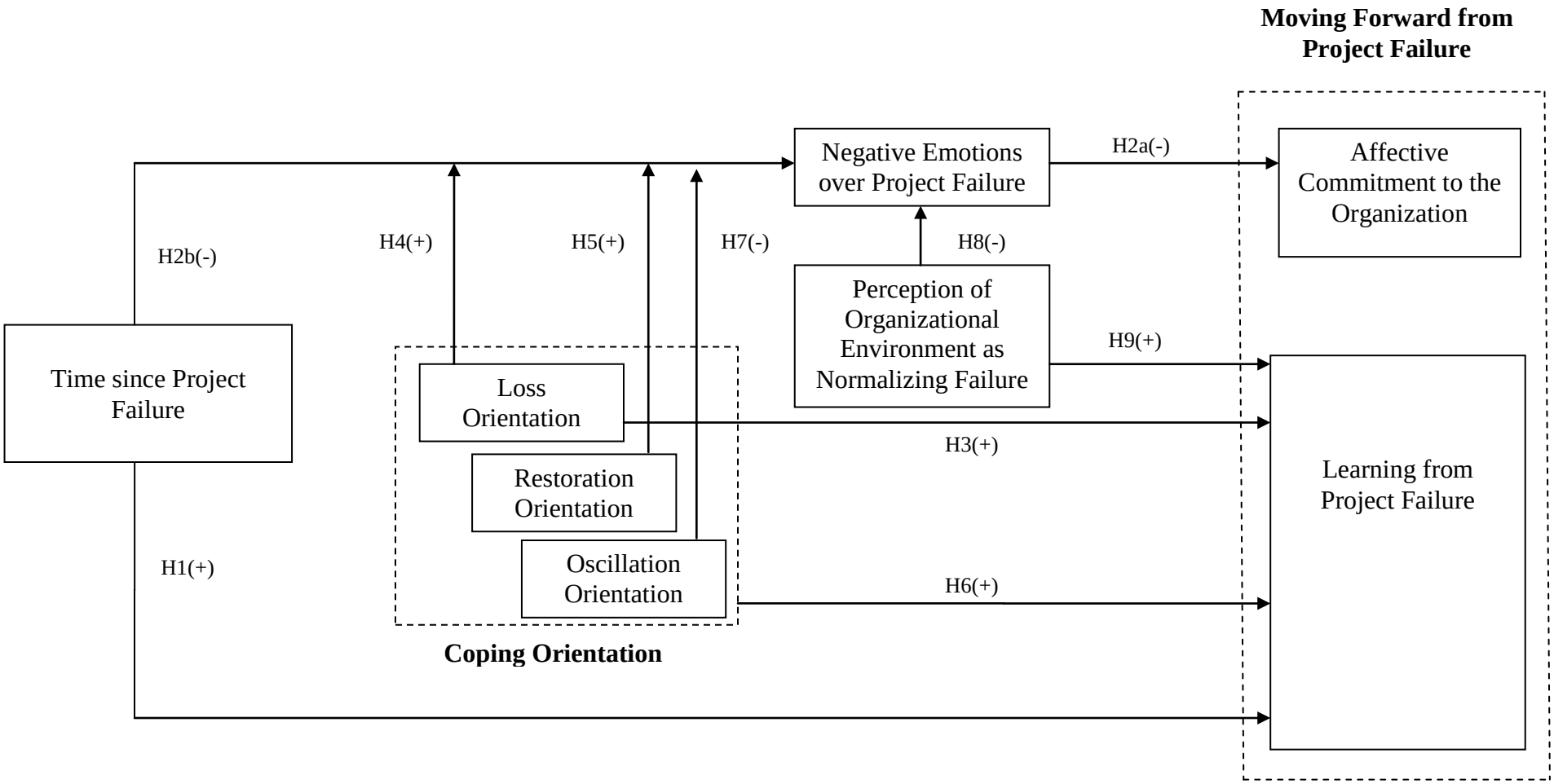

FIGURE 2: Time, Loss Orientation, and Negative Emotions

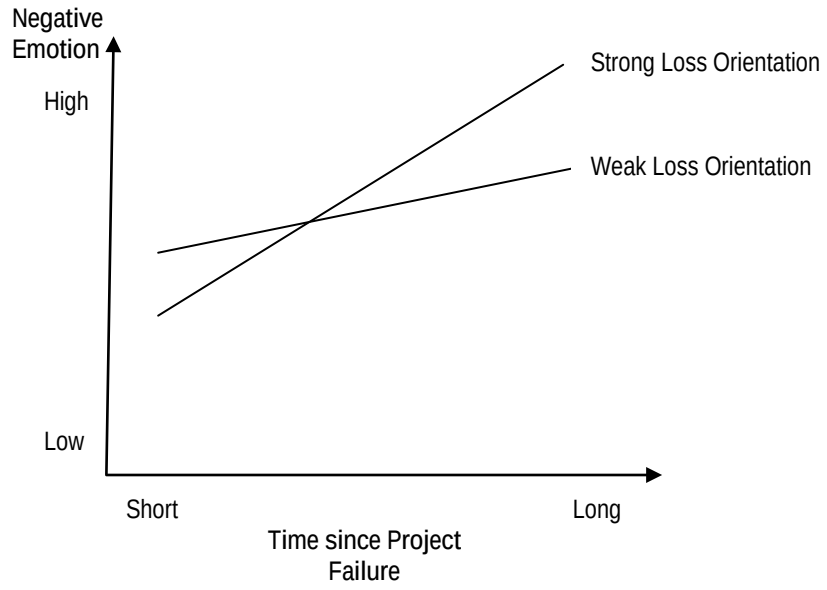

FIGURE 3: Time, Oscillation Orientation, and Negative Emotions

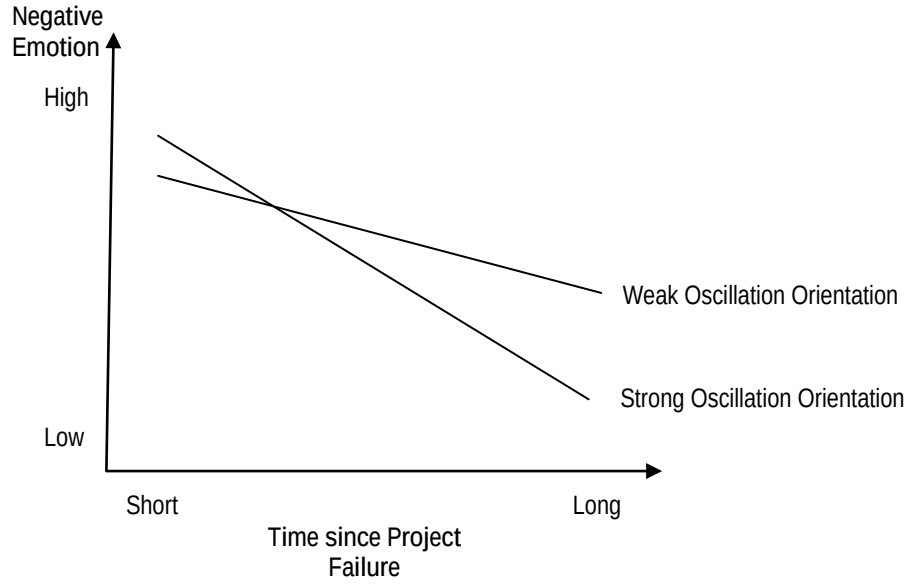

TABLE 1: Final Scale Dimensions, Items, and Reliabilities

Scale	Dimension	Item	Description	Dimension Coefficient α	Scale Coefficient α
Negative emotions over project failure	*Disorganization*	G1	I have difficulty remembering information important for successfully completing tasks	0.89	0.91
		G2	I have increased difficulty remembering things from past projects		
		G3	I more easily forgot things at work (e.g., important names, telephone numbers, …)		
	Detachment & despair	G4	The failure is an ongoing source of disappointment	0.88	
		G5	I avoid closeness with my fellow colleagues as a result experienced in the failure		
		G6	I feel more detached from co-workers		
Loss orientation	*Other*	LO1	I make sure I talk through my emotions about the failure with others	0.84	0.86
		LO2	I actively work with others to make sense of the failure		
		LO3	I frequently seek out people to talk about my negative feelings generated from the project's failure		
	Self	LO4	In my mind, I often go over the events leading up to the project's failure	0.85	
		LO5	I confront my thoughts about the failure of the project		
		LO6	I work through my negative emotions generated by the project's failure		
Restoration orientation	*Avoidance*	R1	I deliberately distract myself from thinking about the failure of the project	0.79	0.84
		R2	I seek people who talk about topics unrelated to the project's failure		
		R3	I keep my mind active so it does not focus on the failure of the project		
	Proactive	R4	I work hard to get "my life back in order" after the problems created by the project's failure	0.74	
		R5	I work hard on "cleaning up the mess" left by the project's failure		
		R6	I make adjustments to the way I approach work to match the new reality (post-project)		
Oscillation orientation	*Oscillation*	O1	After giving my emotions a rest, I confront my negative feelings arising from the project's failure	0.73	0.73
		O2	I recognize that after a period of thinking about the project failure I need to switch to thinking about something else and after a period of thinking about something else I need to switch back to thinking about the project failure		
		O3	After thinking about the failure for a while, I give my mind a rest		
Perceived normalization	*Perceived normalization*	N1	Organizational communications signal that failure is considered an ordinary occurrence	0.86	0.86
		N2	The organization takes failure in stride		
		N3	As far as the organization is concerned, failure is not seen as anything extra-ordinary		
Learning from project failure	*Personal*	LE1	I am more willing to help others deal with their failures	0.91	0.91
		LE2	I am more tolerant of others' shortcomings when it comes to projects		
		LE3	I am a more forgiving person at work		
	Project	LE4	I have learned to better execute a project's strategy	0.89	
		LE5	I can more effectively run a project		
		LE6	I have improved my ability to make important contributions to a project		
		LE7	I can "see" earlier the signs that a project is in trouble		
		LE8	I now realize the mistakes that we made that led to the project's failure		

TABLE 2: Factor Structures for Perceived Normalization, Negative Emotion, Learning from Project Failure, and Coping Orientation Scales

Scale	Item	Sample 1	Sample 2
Perceived normalization			
	N1	0.79	0.90
	N2	0.76	0.80
	N3	0.84	0.90
Negative emotion			
Disorganization	G1	0.79	0.84
	G2	0.93	0.87
	G3	0.85	0.85
Detachment & despair	G4	0.76	0.80
	G5	0.85	0.90
	G6	0.90	0.90
Learning from project failure			
Personal	LE1	0.85	0.83
	LE2	0.88	0.90
	LE3	0.86	0.93
Project	LE4	0.74	0.84
	LE5	0.85	0.88
	LE6	0.87	0.80
	LE7	0.70	0.81
	LE8	0.75	0.77
Loss orientation			
Others	LO1	0.80	0.79
	LO2	0.81	0.77
	LO3	0.81	0.84
Self	LO4	0.82	0.87
	LO5	0.88	0.91
	LO6	0.63	0.84
Restortation orientation			
Avoidance	R1	0.66	0.72
	R2	0.73	0.80
	R3	0.82	0.78
Proactive	R4	0.78	0.81
	R5	0.85	0.59
	R6	0.54	0.57
Oscillation orientation			
	O1	0.64	0.74
	O2	0.74	0.64
	O3	0.62	0.80

TABLE 3: Perceived Normalization, Negative Emotion, Learning from Project Failure, and Coping Orientation Model Fit Indices

Sample 1

	χ^2	df	χ^2/df	NFI	NNFI	CFI	IFI	RFI	GFI
Perceived normalization	10.50	8.00	1.31	0.98	0.99	0.99	0.99	0.96	0.98
Negative emotion	11.43	8.00	1.43	0.99	0.99	0.98	0.99	0.98	0.98
Learning from project failure	34.09	19.00	1.79	0.98	0.99	0.99	0.99	0.97	0.95
Loss orientation	14.58	8.00	1.82	0.97	0.98	0.99	0.99	0.95	0.97
Restoration orientation	16.85	8.00	2.11	0.97	0.97	0.98	0.98	0.94	0.97
Oscillation orientation	---------- N/A----------								

Sample 2

	χ^2	df	χ^2/df	NFI	NNFI	CFI	IFI	RFI	GFI
Perceived normalization	10.31	8.00	1.29	0.97	0.99	0.99	0.99	0.94	0.97
Negative emotion	11.96	8.00	1.50	0.98	0.99	0.99	0.99	0.96	0.96
Learning from project failure	27.55	19.00	1.45	0.97	0.99	0.99	0.99	0.96	0.94
Loss orientation	12.24	8.00	1.53	0.97	0.98	0.99	0.99	0.95	0.96
Restoration orientation	15.95	8.00	1.99	0.96	0.96	0.98	0.98	0.92	0.95
Oscillation orientation	---------- N/A----------								

*****For the Oscillation orientation, the model fit perfectly to the data in both sample 1 and sample 2; therefore, no fit indices values were computed for this model.

TABLE 4: Means, Standard Deviations, and Correlations of the Study Variables

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Project importance	5.38	0.89																		
2. Time on project before failure[a]	9.08	15.11	0.16*																	
3. # of projects	4.84	5.51	0.15*	-0.02																
4. % of project failures	22.58	21.12	-0.05	0.17**	-0.01															
5. EI	5.03	0.68	0.23**	0.12*	0.02	0.01														
6. Age[b]	30.84	6.47	0.09	0.12	0.23**	-0.01	0.11													
7. Gender	0.44	0.50	0.15*	0.11	0.06	-0.01	-0.19**	0.01												
8. Ph.D.	0.16	0.37	0.17**	0.12	0.23**	0.00	-0.01	0.36**	0.10											
9. Organization tenure[b]	4.40	3.95	-0.01	0.04	0.20**	0.02	0.11	0.88**	-0.11	0.17**										
10. Negative emotions	1.97	1.13	-0.28**	-0.05	-0.13*	0.01	0.03	-0.10	-0.16*	-0.13*	-0.08									
11. Loss orientation	4.57	1.21	0.14*	-0.05	0.04	0.04	0.39**	0.01	-0.11	0.01	0.03	0.64								
12. Restoration orientation	3.95	1.19	0.01	-0.14*	0.04	0.01	0.18**	0.08	-0.17**	-0.07	0.08	0.31**	0.41**							
13. Oscillation orientation	3.76	1.31	0.09	-0.12	0.09	0.01	0.12	0.01	-0.11	-0.02	0.04	0.20**	0.47**	0.51**						
14. Perceived normalization	4.59	1.50	0.22**	-0.05	0.10	-0.02	-0.04	0.07	0.09	0.04	0.03	-0.33**	0.02	-0.11	-0.01					
15. Learning from failure	4.66	0.90	0.20**	0.07	0.08	0.05	0.32**	0.11	-0.05	-0.02	0.15*	-0.01	0.41**	0.34**	0.37**	0.60				
16. Affective commitment	4.29	1.03	0.37**	-0.07	0.15*	-0.13*	0.10	0.24**	0.12	0.20**	0.21**	-0.22**	0.13*	0.04	0.11	0.25*	0.15*			
17. Time since project failure[a]	47.67	59.18	0.07	0.06	0.01	-0.08	-0.01	0.30**	-0.03	0.21**	0.28**	-0.03	-0.01	-0.05	-0.01	0.08	0.21**	0.10		
18. Material values	2.49	0.51	-0.14*	-0.09	-0.01	0.01	-0.01	-0.27**	-0.14*	-0.02	-0.26**	0.09	0.05	0.07	0.10	-0.12	-0.03	-0.06	-0.02	
19. Social desirability	4.41	0.67	0.12	-0.01	0.05	0.02	0.14*	0.16**	-0.10	0.14*	0.15*	-0.06	0.02	-0.02	0.00	0.07	0.02	0.08	0.09	-0.26**

*p < 0.05; **p < 0.01; [a]in weeks; [b]in years

TABLE 5: Results of hypothesis testing using hierarchical regression

	Learning from Project Failure		Affective Commitment		Negative Emotions from Project Failure		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Control Variables							
firm one	-0.037	-0.005	0.049	0.063	-0.018	-0.003	0.004
firm two	0.154	0.165	0.003	0.019	0.068	0.054	0.035
firm three	-0.018	0.064	0.006	0.009	0.026	-0.004	0.008
firm four	-0.050	-0.002	-0.033	-0.037	-0.047	-0.062	-0.063
firm five	-0.008	-0.007	-0.035	-0.043	0.028	-0.029	-0.015
firm six	-0.049	-0.039	-0.006	-0.021	-0.148	-0.167	-0.164
firm seven	-0.009	0.002	0.191	0.182	-0.084	-0.104	-0.107
firm eight	-0.095	-0.062	0.066	0.046	-0.015	-0.025	-0.014
firm nine	-0.090	-0.115	0.115	0.115	-0.019	-0.112	-0.109
firm ten	-0.171	-0.157	0.013	0.013	-0.023	-0.009	0.003
firm eleven	-0.013	0.037	0.069	0.078	0.051	0.084	0.074
firm twelve	-0.178	-0.045	0.094	0.094	-0.106	-0.052	-0.051
Project importance	0.177*	0.095	0.368**	0.344**	-0.266**	-0.172*	-0.159*
Time on project before failure[a]	-0.004	0.070	-0.117	-0.118	0.002	0.016	0.032
# of projects	-0.002	0.004	-0.029	-0.030	-0.052	-0.052	-0.054
% of project failures	0.072	0.050	-0.123	-0.126	0.007	0.060	0.055
EI	0.247**	0.191**	0.027	0.043	0.087	-0.001	0.000
Age[b]	0.017	0.020	0.114	0.091	-0.090	-0.117	-0.157
Gender	0.024	0.039	0.065	0.045	-0.113	-0.113	-0.120
Ph.D.	-0.034	-0.055	0.137*	0.137*	-0.045	-0.041	-0.025
Organization tenure[b]	0.126	0.030	0.131	0.134	-0.029	-0.012	0.001
Predictor Variables							
Loss orientation		0.142*				-0.044	-0.024
Restoration orientation		0.149				0.283**	0.335**
Oscillation orientation		0.182*				0.069	0.027
Time since project failure[a]		0.191**				0.018	0.036
Perceived normalization		0.044				-0.252**	-0.255**
Negative emotions				-0.089**			
Time X Loss orientation							0.143*
Time X Restoration orientation							0.108
Time X Oscillation orientation							-0.179*
R^2	0.187**	0.324**	0.282**	0.303**	0.140**	0.293**	0.319**
$Adj.\ R^2$	0.114**	0.237**	0.220**	0.229**	0.062**	0.202**	0.208**
ΔR^2	0.187**	0.137**	0.282**	0.021**	0.140**	0.153**	0.026**

Note: Standardized regression coefficients are displayed in the table
*p < 0.05
**p < 0.01
N = 257
[a]in weeks
[b]in years