© Academy of Management Journal
2011, Vol. 54, No. 6, 1229–1259.
http://dx.doi.org/10.5465.amj.2010.0102

MOVING FORWARD FROM PROJECT FAILURE: NEGATIVE EMOTIONS, AFFECTIVE COMMITMENT, AND LEARNING FROM THE EXPERIENCE

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Project failures are common. We theorized and found that although time heals wounds (reduces the negative emotions from project failure), it heals differently depending on the strength of individuals' specific coping orientations. Further, wounds are shallower for those who perceive that their organization normalizes failure. We conjointly consider learning from failure and affective commitment to an organization as determining how individuals move forward from project failure. Findings suggest that studies framing moving forward solely as learning from failure will likely overstate the benefits of a "loss orientation" and understate the benefits of both a "restoration" and an "oscillation orientation."

Considerable theoretical movement toward an enhanced understanding of organizational knowledge is underway in organizational learning theory, evolutionary economics, the knowledge-based theory of the firm, and organizational memory theory (Fiol & Lyles, 1985; Grant, 1996; Nelson & Winter, 1982; Walsh & Ungson, 1991). "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 actions of organization members (Madsen & 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), paying less attention to how new knowledge is created (McFadyen & Cannella, 2004). An important exception is research on how a person's relationships (his/her 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, researchers understand little regarding how an organization's members create new knowledge from their own experiences that is actionable by the organization. A "sensemaking" perspective suggests that actionable knowledge in an organizational context is created when a 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 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,

We thank Duane Ireland and three anonymous reviewers for helpful comments on previous versions of the article, and Nicki Breugst and Jeff Covin for helpful comments on the development of the new measures.

Editor's note: The manuscript for this article was accepted for publication during the term of *AMJ*'s previous editor-in-chief, Duane Ireland.

1999; Shepherd, Covin, & Kuratko, 2009).[1] Because failure upsets the status quo in an organization (Chuang & Baum, 2003) and leads decision makers to search for possible solutions (McGrath, 2001; Petrovski, 1985), researchers have suggested that organization members can learn more from their failures than from their successes. Engineers (Petrovski, 1985), scientists (Popper, 1959), and managers (Sitkin, 1992) have been cited in this regard. Thus, 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). In keeping 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 an 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; Shepherd, 2003; Stroebe & Schut, 2001), we examine both learning from failure and affective commitment to an 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 of knowledge creation (McGrath, 1999; Sitkin, 1992), there are substantial obstacles to learning from failure. More specifically, obstacles at the individual level include a history of success (Ellis & Davidi, 2005), a low learning-goal orientation (Dweck & Leggett, 1988), and cognitive biases (Kahneman, Slovic, & Tversky, 1982), and obstacles at the organization level include a nonsupportive 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; Prahalad & Oosterveld, 1999). We focus special attention on the contribution of coping to overcoming obstacles to learning from project failure. Our results suggest that a greater consideration of time elapsed since project failure and the strength of individuals' coping orientations is vital for a more complete understanding of how organization 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 organization members' willingness to invest effort and (new) knowledge in achieving organizational goals (Allen & Meyer, 1990; O'Reilly & Chatman, 1986). We focus on negative emotions (experienced over project failure) in explaining individuals' affective commitment to their 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 over failure have lower affective commitment toward their organization. Additionally, we find support for theorized direct effects of both time and individuals' perceptions of their organizational environment as normalizing failure on two outcomes: (1) negative emotions over project failure and (2) moderation by coping orientations of the relationship between time since project failure and the negative emotions about that failure.

Lastly, we extend consideration of important aspects of moving forward from failure within a sensemaking logic. Organizational research has typically focused on explaining either learning (Huy, 1999; McGrath, 2001) or affective commitment to an organization (Baron, 2008; Cardon, Zietsma, Saparito, Matherne, & Davis, 2005; Goss, 2005), but rarely does it address both. Joint consideration of these processes is important because what may enhance one may diminish the other. Given that both learning from project failure (McGrath, 1999) and affective commitment to an organization (Gong, Law, Chang, & Xin, 2009) enhance organizational performance, understanding the potential trade-offs between these two processes for organization 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 will 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 organization members' reactions and responses to such failure from a sample of scientists, includ-

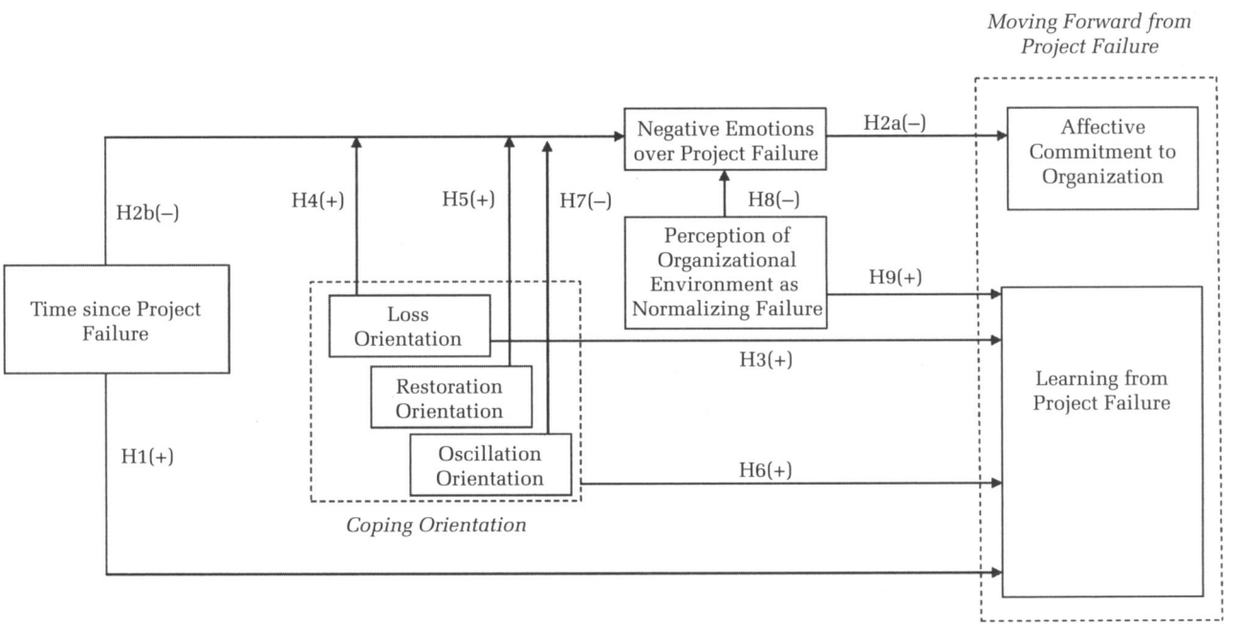
[1] For example, interviews with research scientists reveal that they refer to project failure in terms of the project being "over" (chemist), "buried" (physics theoretician), and having reached a "dead end" (biochemist) and that project termination is an inherent part of their work.

ing chemists, biologists, physicists, material scientists, economists, and others working on R&D projects that create "intellectual capital" that offers their organizations competitive advantage. This was an appropriate sample in which 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 highly uncertain environments (DiMasi, et al., 2003); (4) learning from failure is an important job requirement (Starkey, 1998); (5) research scientists typically design projects to obtain clear and definite feedback (Martin & Irvine, 1983; Nelson, 1959) and are trained to search for the underlying causes of project failure and move beyond simple descriptions to understand why failure occurred (Hunter, Laursen, & Seymour, 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 organization 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 using that feedback (McGrath, 1999). These activities require that members both learn from project failure and commit to changing their beliefs to achieve the goals of their organization. Building on theories of coping with loss and changed beliefs, we investigate how people process project failure as feedback—feedback that is affected by the time since project failure, the individuals' coping orientations, and their perceptions of their organizational environment as normalizing failure—to enable learning from the failure experience. Furthermore, expanding theories of coping with loss and commitment, we investigate these issues: how negative emotions about project failure can impact members' affective commitment to achieving organizational goals; how the time since project failure and perceptions of an organizational environment as normalizing failure directly affect negative emotions; and how the strength of three coping orientations—namely, "loss," "restoration," and "oscillation" (defined below)—moderates the relationship between the time since project failure and subsequent negative emotions.To provide richness to our theorizing, we

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



conducted semistructured interviews with seven research scientists (similar to 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 B.

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 shown that losing something important is likely to generate a negative emotional reaction (Archer, 1999). Research projects are often important to the scientists working on them (although to differing degrees). Indeed, 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, "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." Given these substantial investments of time and effort, many research scientists' identities are tightly linked to their projects (Jain, George, & Maltarich, 2009). The 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 toward recognizing and addressing the emotional obstacles to moving forward from project failure—obstacles both to learning from a 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 them 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; Weick, 1979). From a sensemaking perspective, learning from failure involves the process of continuously developing plausible retrospective accounts to 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 testing them produce sufficient evidence to change beliefs about a failure. 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" (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 the sensemaking perspective is that constraints (such as those that caused a project to fail) are self-imposed and that an individual's environment is not predetermined nor impervious to individual influence. These concepts are consistent with the notion of an "enacted environment" (Daft & Weick, 1984; Gioia & Chittipeddi, 1991).

According to a different psychology perspective, attribution theory, 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

[2] As Manusov and Spitzberg pointed out, "The various attribution theories lean toward a logical-empirical view of the world" (2008: 38), whereas sensemaking represents an interpretive perspective (Gioia & Chittipeddi, 1991). For further details on these philosophical differences, see Rudolph and colleagues (2009).

that are beyond their control, individuals may assume they have less to learn. Little change in beliefs about themselves may occur, although changes in beliefs related to others, the organization, and/or the environment may be numerous. However, time appears to lead to a change in attribution (Lau, 1984; Pronin & Ross, 2006) through a change in perspective. When individuals consider past events (at which they were present), they generally perceive the events as if they were external observers instead of participants (Libby & Eibach, 2002; Nigro & Neisser, 1983). This new perspective leads them to attribute failures to more internal sources (Frank & Gilovich, 1989) and, thus, to take more personal responsibility for the outcome (Pronin & Ross, 2006). 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 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, & Zanna, 1996)" (Baron, 1999: 81). He concluded 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. Organization members for whom the time since their project failed is greater learn more from the failure experience than organization members for whom that time is shorter.

Projects are often important to organization 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 organization members, they will likely have 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 are 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 stemming from project failure. For example, when asked how they felt after their last failed project, research scientists said: "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 e-mail [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 said this about others on the failed project team: "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 the ability of individuals 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, the 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 organization member's work efforts. Empirical research has shown that experiencing negative emotions mediates the relationship between negative feedback received and regulation of individual goals (Ilies & Judge, 2005): individual and organizational goals are not as congruent as they were before the failure occurred. Indeed, it appears that the negative emotions gen-

erated by feedback (such as the termination of a project) generally diminish employees' affective commitment to their organizations (Belschak & Hartog, 2009). However, the passage of time allows the emotional ties to a failed project to break gradually, so that thoughts of the project or the events surrounding its failure come to generate a less negative emotional reaction. New projects, activities, and relationships are perceived as important and begin to replace or satisfy the psychological needs thwarted by the project failure and may rebuild the members' affective commitment to their organization. Thus,

Hypothesis 2a. Organization members with more negative emotions over a project's failure have less affective commitment to their organization than those with less negative emotions over a project's failure.

Hypothesis 2b. Organization members for whom more time has passed since a project's failure have fewer negative emotions related to that experience than those for whom the time since project failure is less.

Coping Orientations and Moving Forward from Project Failure

We next turn to coping orientations, which can be classified as a loss orientation, a restoration orientation, and an oscillation orientation (Shepherd, 2003; Stroebe & Schut, 1999).[3] We now address each of these in terms of its impacts on learning from project failure and 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 a project's failure to construct an account of 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 they compare 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, thus directing members' attention to scanning and processing information related to the failure event (Clore, 1992; Ellis & Chase, 1971; Schwarz & Clore, 1988). This comparison and scanning provide them with information about the failure (and the events leading up to it) that they can use to revise their belief systems about why projects fail and what should be done in future projects. Further, uncovering the reasons for why a 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, organization members who identify project routines that contributed to failure and need to be changed for future projects may acknowledge a 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. Organization members with a stronger loss orientation learn more from a project failure than those with a weaker loss orientation.

Focusing on a loss and building an account of why a project failed infuses the loss with new meaning, and organization 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 so that the loss no longer triggers such a negative emotional reaction (Gross, 1998). An organization 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 exhaust-

[3] These orientations are independent. An individual can show both a low loss and a low restoration orientation by focusing attention neither on "grief work" nor restoration. For instance, he/she might pretend the failure and its consequences did not occur. An individual can strongly show one of the primary orientations (loss or restoration) but not the other or can strongly demonstrate both. For example, considerable time and effort spent on grief work and considerable time and effort spent addressing secondary causes of stress would indicate a high loss orientation and a high restoration orientation together. Then, individuals who show both high loss and restoration orientations can be high or low in oscillation orientation, which captures the inclination to switch between the two primary orientations. The analyses that follow reflect our assumption that these three orientations are independent.

ing. 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 aerospace 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 their implications (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. Roese, 1997). These emotions from rumination (including those from counterfactual thinking) can exacerbate feelings of loss. It appears that despite the potential to effectively lower negative emotions early, a loss orientation can eventually begin to generate negative emotions that exacerbate the emotional aspects of failure. Thus,

Hypothesis 4. Organization members with a strong loss orientation have fewer negative emotions in response to project failure than those with a weaker loss orientation when the period after a failure is short but have more negative emotions about the project failure when the period after the failure is long.

Next, a *restoration orientation* refers to suppression of feelings of loss and proactiveness toward secondary sources of stress that arise from a loss (Stroebe & Schut, 1999: 214). This definition implies that a restoration orientation has two dimensions: avoidance (of the primary stressor, i.e., project failure) and proactiveness (about secondary stressors). Neither of these dimensions contributes to learning from failure, but both are likely to lower negative emotions. Avoidance involves turning one's attention away from the failure and the events leading up to it. For example, the organization 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?" Although proactively addressing these secondary sources of stress allows 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 of why the project failed and, thus, does not suggest what can be done differently.

Therefore, we do not believe that the strength of a restoration orientation is related to learning from failure, but this orientation does appear to influence individuals' negative emotional reactions to loss. By avoiding thinking about the failure, individuals do not consciously recognize the loss, so it does not generate (or generates little) negative emotional reaction. Indeed, a focus on other activities replaces thoughts and feelings about the failure with alternate thoughts and feelings. Such alternate thoughts can be of work-related successes that generate positive emotions (Christen, Iyer, & Soberman, 2006). Furthermore, proactively addressing 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), which can help undo the negative emotions (Fredrickson, 2001) generated by project failure.

However, repressing emotions is typically exhausting (Archer, 1999) and can have 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), lead to increased distress and future problems (Menaghan, 1982), and thereby exacerbate the failure experience. Thus, as for a loss orientation, it appears that for a short period after project failure, a strong restoration orientation can help minimize a negative emotional reaction, but over time, a strong restoration orientation may increase negative emotions. Thus,

Hypothesis 5. Organization members with a strong restoration orientation have fewer negative emotions in response to project failure than those with a weaker restoration orientation when the period after the failure is short but have more negative emotions about the project failure when the period after the failure is long.

An *oscillation orientation* refers to 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 their downsides. The initial experience of negative emotions in response to failure triggers the autonomous nervous system, drawing the individual's attention toward information about the causes of failure (Fineman, 1996; Frank & Ekman, 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 narrow individuals' attention (Derryberry & Tucker, 1994; Staw, Sandelands, & Dutton, 1981), make them "miss the forest for the trees," and also interfere with their information processing (Lyubomirsky & Nolen-Hoeksema, 1995; Weick, 1990). Therefore, the escalating negative emotions stemming from an extended period of maintaining a loss orientation can begin to narrow an 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 impact 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 individuals' negative emotions and increase their 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 organization 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, a member with a weaker oscillation orientation may stay too long with a loss or a restoration orientation and may thus become either cognitively overloaded by thinking about the negative emotions (with a loss orientation) or unable to sufficiently develop a plausible account for the project failure (with a restoration orientation). Thus,

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

Besides increasing 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 both primary orientations 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 of 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 maintaining a 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). These, in turn, can create a vicious spiral of escalating negative emotions. When thinking about a failure begins to generate negative emotions, organization members with a strong oscillation orientation switch to a restoration orientation and act to diminish 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 ruminative 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 project failure. A weak oscillation orientation represents a less effective approach because the organization member may stay in either orientation for too long. Thus,

Hypothesis 7. Organization members' negative emotions stemming from a 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 approaches to failure. Some explicitly or implicitly punish failure; that is, they have an antifailure bias (McGrath, 1999). Organization members' perceptions of their work environment and its norms about failure are likely to influence the extent to which they learn from project failure and generate negative emotions from a failure experience. Recognizing that a culture that punishes failure can generate negative emotions, some organizations try to create a culture that normalizes project failure. In such a culture, organization members view failure as something normal, and this view diminishes its salience and significance. When project failures are treated as nothing extraordinary, individuals will have less severe emotional reactions to them (Ashforth & Kreiner, 2002). Members become inoculated against these reactions by their organization's reframing, recalibratating, and/or refocusing the meaning of project failure (cf. Ashforth & Kreiner, 1999; Gusterson, 1996; Palmer, 1978). By reframing project failure as an opportunity to learn, normalization negates some of a 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 instead emphasizes analysis of those events and their underlying causes and mechanisms. In our interviews with research scientists, some reported that their project leaders tried to establish a culture that normalized failure. For example, a biochemist stated, "We have a clear acceptance for failure. The boss simply knows that you have invested everything," and an economist 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. Organization members who perceive failure as highly normalized in their organizational environment will have lower negative emotions over project failure than those who perceive failure as less normalized in their organizational environment.

By rendering an extraordinary event as something seemingly ordinary (Ashforth & Kreiner, 2002: 217), normalization can change individuals' perceptions of a failure so that it is less disruptive and problematic (Ashforth, Kreiner, Clark, & Fugate, 2007). Sitkin argued that individuals' analysis of failure and their subsequent learning can be facilitated if "(1) [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" (1992: 243). Here, "respond with alacrity" implies that individuals experience no or few negative emotional reactions to failure, which can be achieved through normalization.

Rendering an extraordinary event ordinary (Ashforth & Kreiner, 2002) can also help an 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 members to report errors and near misses; to apportion blame justly when something goes wrong; and to flexibly and swiftly learn by reconfiguring assumptions, frameworks, and actions (Weick & Sutcliffe, 2001). Normalization facilitates an informed culture because organization members face less personal criticism (from themselves and from others) for a failure and are, therefore, less likely to engage in strategies to protect their egos. People enacting ego-protective strategies can screen out error signals to maintain high self-esteem (Reich, 1949; Sedikides, 1993), and such screening undermines the reporting of errors that may have contributed to a project's failure. Furthermore, to protect themselves from criticisms, individuals often engage in "impression management" that deflects blame to others (Lee & Robinson, 2000) and undermines the just apportionment of project failure responsibility. Similarly, fear and anxiety about 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 failure ordinary, normalization helps to build an informed culture by decreasing the likelihood that members engage in strategies that protect egos but constrain learning. Thus,

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

METHODS

Sample

Our sample consisted of scientists who were members of project teams at research institutes. We randomly chose 585 research scientists from the websites of 12 different research institutes in a region of Germany. A trained research assistant personally visited these individuals, explained the purpose of the study, asked for participation, and handed over a survey booklet and envelope in which participants could enclose completed surveys to assure anonymity. To encourage participation further, we offered ten euros for each completed booklet. We contacted the research scientists via e-mail 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 e-mail and collected the remaining completed surveys. All together, 257 usable questionnaires were returned, representing a response rate of 44 percent. The participating scientists were on average 30.84 (s.d. = 6.47) years old; 44 percent were male; 93 percent German; 16 percent held a Ph.D. degree as their highest qualification; 70 percent held a master's degree (a "diploma" in Germany); and the rest had at least a bachelor's degree or equivalent. Additionally, the mean time with the current organization was 4.40 years (s.d. = 3.95), and 74 percent had experienced project failure in their current organization. The mean time from their last failed project was 9.08 weeks (s.d. = 15.11); the mean number of projects worked on in their current job was 4.84 (s.d. = 5.51); and the mean percentage of those projects that had failed was 22.58 (s.d. = 21.12).

With respect to their affiliations, 28 scientists were from a materials science institute, 16 from a 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 aging 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 percent (s.d. = 19%) of their organizations' projects were failures. Appendix A provides details of the institutes' research areas and examples of typical projects, and Appendix B gives examples of project failures and research scientists' reactions to them.

Given that data collection took part in Germany, we administered the survey in German. We used back-translation to test accuracy (Brislin, 1970, 1980; Craig & Douglas, 2006). One of the authors, a native speaker, translated the survey into German. An independent translator whose native language was English translated it from German to English. We reviewed the original and the back-translated versions for categorical, functional, and conceptual equivalence and deemed them to be equivalent, so no further changes were made.

Item Generation

We developed new measures to capture several of the model's constructs: negative emotions about project failure, learning from failure, coping orientations, and perceived organizational normalization. For all of the new scales, we followed the rigorous development process outlined by Netemeyer, Bearden, and Sharma (2003). We based items on extensive literature reviews and distributed the items and the theoretical definitions of each construct to a panel of experts for review of both construct and face validity. Our panel consisted of three professors with expertise in innovation and emotion as well as six doctoral students studying management. In a Q-sort exercise, they reviewed each item and compared it with the supplied theoretical definition to determine its initial validity (Anderson & Gerbing, 1991). When additional specification of a theoretical definition was necessary (e.g., defining the boundaries of "physical symptoms" in contrast to "physiological reactions"), we included additional material. The experts were instructed to keep only those items that they believed accurately and sufficiently tapped only the core construct to which they had been tentatively assigned. We eliminated all items deemed either deficient or contaminated from the final survey instrument, using only items that a minimum of seven of the nine experts agreed tapped the construct of interest. If only six experts endorsed an item, we either reworded it and sent it for additional review or dropped it. Items endorsed by fewer than six of the experts were dropped. Items that one panel member contested were revised and then reviewed again by the panel.

Negative emotions over project failure. Item generation for our scale tapping negative emotions stemming from project failure (negative emotions over project failure) began by adapting an inductively generated scale of grief about the death of a loved one, the Hogan Grief Reaction Checklist (HGRC; Hogan et al., 2001), which includes six categories: despair, panic behavior, blame and anger, disorganization, detachment, and personal growth.[4] A major difference exists between the HGRC and our negative emotions over project failure scale: after reviewing the items and labels, our panel of experts believed that personal growth

[4] Hogan et al. generated 100 items for the HGRC from interviews and anecdotal data from adults who had experienced the death of a loved one. The wording of the items was consistent with the language used by those interviewed. They categorized the items into six categories after 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.

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. From a review of the literature, we identified two primary sources of learning from failure: learning related to an individual's performance (project-related learning [McGrath, 1999; Minniti & Bygrave, 2001]) and learning related to the individual's personal attributes (person-related, or personal, learning [Cope & Watts, 2000; Hogan et al., 2001]). From this review, we generated initial items to tap both the project and personal dimensions of learning from failure. The items for the project dimension 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 failures (e.g., "I can more effectively run a project"). The items for personal dimension were adapted HGRC personal growth items capturing learning that was related to both self (e.g., "I am a more forgiving person at work") and 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 large organizations. After expert review, we included 21 items measuring 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 elapsed since their most recent project failure.

Coping orientations. For all three coping orientation scales, participants were instructed to reflect upon how they respond to project failures and report how much they agreed that an item reflected their own personal approach.

We initially generated large pools of items that we believed captured the three coping orientations (Shepherd, 2003; Stroebe & Schut, 1999). For the *loss orientation* scale, items focused on confronting the events leading up to failures that helped individuals make sense of them. Two dimensions emerged from item generation: self and others. The 10 items initially generated to tap the self dimension 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"). The 11 items initially generated to tap the others dimension 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 self items and 4 others items.

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 an individual's tendency to engage in activities that reduce or eliminate time spent confronting failures (e.g., "I keep my mind active, so it does not focus on the loss of the project"), and 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"). After expert review, the final survey instrument consisted of 11 items related to restoration orientation: 6 for avoidance and 5 for proactiveness.

For the *oscillation orientation* scale, we initially generated ten items to capture an individual's ability to alternate between loss and restoration orientations (e.g., "After thinking about the failure for a while, I give my mind a rest"). The expert panel determined that four were appropriate for use in the final survey.

Perceived organizational normalization. For the scale assessing perceived organizational normalization of failure, participants were instructed to consider how their organization deals with project failure and to rate items accordingly. We initially constructed 12 items, 6 for each of two main processes by which such normalization occurs (Ashforth & Kreiner, 2002): viewing failure as ordinary (e.g., "As far as the organization is concerned, failure is not seen as anything extraordinary") and reducing mismatch between expectations and outcomes (e.g., "In our firm, you are encouraged to get used to the fact that projects will fail"). The expert review determined 6 items to be acceptable for use.

TABLE 1
Final Scale Dimensions, Items, and Reliabilities

Scale	Dimension	Item	Description	Dimension α	Scale α
Negative emotions over project failure	Disorganization	G1	I have difficulty remembering information important for successfully completing tasks.	.89	.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 and despair	G4	The failure is an ongoing source of disappointment.	.88	
		G5	I avoid closeness with my fellow colleagues as a result experienced in the failure.		
		G6	I feel more detached from coworkers.		
Loss orientation	Other	LO1	I make sure I talk through my emotions about the failure with others.	.84	.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.	.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.	.79	.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.	.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.	.73	.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.	.86	.86
		N2	The organization takes failure in stride.		
		N3	As far as the organization is concerned, failure is not seen as anything extra-ordinary.		

(Continued)

TABLE 1
(Continued)

Scale	Dimension	Item	Description	Dimension α	Scale α
Learning from project failure	Personal	LE1	I am more willing to help others deal with their failures.	.91	.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.	.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.		

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 Hinkin's (1998) procedure, we ran both an initial CFA for item reduction and validity examination and a second one to substantiate those results through replication. To do so, we randomly split the initial sample into two smaller subsamples (Hinkin, 1998); however, the total sample was later used for testing the hypotheses. In the initial CFA, we analyzed data from a sample of 155 research scientists to test the fit of the proposed models (a number that met the required threshold of 5–10 samples per item [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 limits). 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]

In Table 2, we report the results of the initial CFA for each new construct. 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 an oscillation orientation were both unidimensional constructs with three items each. The constructs of negative emotions over project failure, learning from failure, loss orientation, and restoration orientation contained two dimensions, each comprising three to five items. Although these constructs were found to be multidimensional, for analyses we parceled all items for a given scale to create a single measure.[6] For data from our first sample, the results indicated that all the models had excellent fit; Table 3 presents fit index values. All models applied to the first sample had chi-square to degrees of freedom 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 the normed fit index (NFI) and non-

[5] Several more items were included in the survey than were retained for the final scales. Through subsequent analysis (and following convention [Hinkin, 1998]), we dropped items that had a poor fit within the measurement model. Therefore, it was necessary to generate a surplus of items for each construct to ensure that the final items-to-construct ratio was 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 in the final measurement scales.

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

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
Restoration 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

normed fit index (NNFI; Bentler & Bonett, 1980), Bentler's (1990) comparative fit index (CFI) and incremental fit index (IFI), Bollen's relative fit index (RFI; Bentler, 1986), and Jöreskog and Sörbom's (1984) goodness-of-fit index (GFI) met or exceeded Hu and Bentler's (1999) stringent standards, with all but one of the reported fit indexes 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 also exhibited good fit to data from the second sample: the overall chi-square to degrees-of freedom ratios for all models were acceptable (below the 2.0 threshold [Table 3]). Additionally, all other fit indexes indicated a good fit, with all but two reported values meeting or exceeding the 0.95 threshold. The two exceptions were the GFI 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 did so 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 existed, we tested their hypothesized relationships with other variables in the analyses below, which provided evidence of

TABLE 3
Model Fit Indexes

Sample 1 Variable	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[a]									

[a] For the oscillation orientation, the model fit perfectly to the data in both sample 1 and sample 2; therefore, we computed no fit index values for this model.

convergent validity. To establish discriminant validity, it is necessary to demonstrate that newly constructed measures are significantly distinguishable from existing constructs with which they are theoretically unrelated (Bagozzi, Yi, & Phillips, 1991). We compared the new measures with Richins and Dawson's (1992) 18-item material values scale 1992). According to Richins and Dawson, 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" (1992: 304). 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. Table 4 provides descriptive statistics and correlations. Although no comparable measures of the constructs of interest currently exist, we tested their hypothesized relationships with other variables in the analyses below, obtaining evidence of convergent validity. The evidence presented in Table 4 indicates that social desirability bias—measured using the Paulhus Deception Scale (PDS; Paulhus, 1984)—posed little threat to any of the new scales.

Affective Commitment to Organization and Time Since Project Failure

We measured *affective commitment* to an organization using Allen and Meyer's (1990) eight-item scale developed to measure an individual's affective commitment to his or her organization. For example, participants were asked the extent (on a seven-point response scale) to which they agreed 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 project-related time measures listed in the remaining sections are reported in weekly units.

Control Variables

Individuals may differ in ways that could confound 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 overall learning from project failure. Thus, we included these variables as controls. We asked participants 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 items with a seven-point response scale [Groves, McEnrue, & Shen, 2008]). For example, participants were asked the extent to which they agreed 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 an organization member deals with failure may depend on his or her organizational tenure and prior successes and failures (Ellis & Davidi, 2005), we controlled for organizational tenure, 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 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 an organization member had a Ph.D. or did not.

Additionally, the relative importance that individuals assigned to a given project, the amount of time they had worked on it before it failed, and the project failure rate for the organization as a whole could also influence members' overall learning from project failure, affective commitment to the organization, and/or negative emotions experienced over failure. Therefore, we controlled for these potential influences as well. Project importance was measured with items based on the self-determination scale (ten items assessed on a seven-point response scale [e.g., Elliot & McGregor, 2001]). Items in this scale asked participants the extent to which they agreed with 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." To measure the amount of time individuals had been with a project before it failed, we asked, "How long did you work on your last failed project" (number of weeks). Finally, to capture the relative frequency of failure within in an 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 identity of each organization.

TABLE 4
Descriptive Statistics and Correlations of the Study Variables

Variable	Mean	s.d.	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	.16*																	
3. Number of projects	4.84	5.51	.15*	−.02																
4. Percentage of project failures	22.58	21.12	−.05	.17**	−.01															
5. Emotional intelligence	5.03	0.68	.23**	.12*	.02	.01														
6. Age[b]	30.84	6.47	.09	.12	.23**	−.01	.11													
7. Gender	0.44	0.50	.15*	.11	.06	−.01	−.19**	.01												
8. Ph.D.	0.16	0.37	.17**	.12	.23**	.00	−.01	.36**	.10											
9. Organization tenure[b]	4.40	3.95	−.01	.04	.20**	.02	.11	.88**	−.11	.17**										
10. Negative emotions	1.97	1.13	−.28**	−.05	−.13*	.01	.03	−.10	−.16*	−.13*	−.08									
11. Loss orientation	4.57	1.21	.14*	−.05	.04	.04	.39**	.01	−.11	.01	.03	.64								
12. Restoration orientation	3.95	1.19	.01	−.14*	.04	.01	.18**	.08	−.17**	−.07	.08	.31**	.41**							
13. Oscillation orientation	3.76	1.31	.09	−.12	.09	.01	.12	.01	−.11	−.02	.04	.20**	.47**	.51**						
14. Perceived normalization	4.59	1.50	.22**	−.05	.10	−.02	−.04	.07	.09	.04	.03	−.33**	.02	−.11	−.01					
15. Learning from failure	4.66	0.90	.20**	.07	.08	.05	.32**	.11	−.05	−.02	.15*	−.01	.41**	.34**	.37**	.60				
16. Affective commitment	4.29	1.03	.37**	−.07	.15*	−.13*	.10	.24**	.12	.20**	.21**	−.22**	.13*	.04	.11	.25*	.15*			
17. Time since project failure[a]	47.67	59.18	.07	.06	.01	−.08	−.01	.30**	−.03	.21**	.28**	−.03	−.01	−.05	−.01	.08	.21**	.10		
18. Material values	2.49	0.51	−.14*	−.09	−.01	.01	−.01	−.27**	−.14*	−.02	−.26**	.09	.05	.07	.10	−.12	−.03	−.06	−.02	
19. Social desirability	4.41	0.67	.12	−.01	.05	.02	.14*	.16**	−.10	.14*	.15*	−.06	.02	−.02	.00	.07	.02	.08	.09	−.26**

[a] In weeks.
[b] In years.
* $p < .05$
** $p < .01$

TABLE 5
Results of Hypothesis Testing Using Hierarchical Regression Analysis[a]

	Learning from Project Failure		Affective Commitment		Negative Emotions from Project Failure		
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**
Control							
Firm 1	−0.04	−0.01	0.05	0.06	−0.02	−0.003	0.004
Firm 2	0.15	0.17	0.003	0.02	0.07	0.05	0.04
Firm 3	−0.02	0.06	0.006	0.01	0.03	−0.004	0.01
Firm 4	−0.05	−0.002	−0.03	−0.04	−0.05	−0.06	−0.06
Firm 5	−0.01	−0.01	−0.04	−0.04	0.03	−0.03	−0.02
Firm 6	−0.05	−0.04	−0.01	−0.02	−0.15	−0.17	−0.16
Firm 7	−0.01	0.002	0.19	0.18	−0.08	−0.10	−0.11
Firm 8	−0.09	−0.06	0.07	0.05	−0.01	−0.02	−0.01
Firm 9	−0.09	−0.11	0.12	0.11	−0.02	−0.11	−0.11
Firm 10	−0.17	−0.16	0.01	0.01	−0.02	−0.01	0.003
Firm 11	−0.01	0.04	0.07	0.08	0.05	0.08	0.07
Firm 12	−0.18	−0.05	0.09	0.09	−0.11	−0.05	−0.05
Project importance	0.18*	0.10	0.37**	0.34**	−0.27**	−0.17*	−0.16*
	−0.004	0.07	−0.12	−0.12	0.002	0.02	0.03
Number of projects	−0.002	0.004	−0.03	−0.03	−0.05	−0.05	−0.05
Percentage of project failures	0.07	0.05	−0.12	−0.13	0.007	0.06	0.05
Emotional intelligence	0.25**	0.19**	0.03	0.04	0.09	−0.001	0.001
Age[b]	0.02	0.02	0.11	0.09	−0.09	−0.12	−0.16
Gender	0.02	0.04	0.07	0.04	−0.11	−0.11	−0.12
Ph.D.	−0.03	−0.05	0.14*	0.14*	−0.04	−0.04	−0.03
Organization tenure[b]	0.13	0.03	0.13	0.13	−0.03	−0.01	0.001
Predictor							
Loss orientation		0.14*				−0.04	−0.02
Restoration orientation		0.15				0.28**	0.34**
Oscillation orientation		0.18*				0.07	0.03
Time since project failure[c]		0.19**				0.02	0.04
Perceived normalization		0.04				−0.25**	−0.26**
Negative emotions				−0.09**			
Time × loss orientation							0.14*
Time × restoration orientation							0.11
Time × oscillation orientation							−0.18*
R^2	0.19**	0.32**	0.28**	0.30**	0.14**	0.29**	0.32**
Adjusted R^2	0.11**	0.24**	0.22**	0.23**	0.06**	0.20**	0.21**
ΔR^2	0.19**	0.13**	0.28**	0.02**	0.14**	0.15**	0.03**

[a] Standardized regression coefficients are displayed; $n = 257$.
[b] In years.
[c] In weeks.
* $p < .05$
** $p < .01$

RESULTS

Table 4 presents the means, standard deviations, and bivariate correlations among all 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 Hypotheses 1, 3, 6, and 9), affective commitment to the organization (testing Hypothesis 2a), and negative emotions (Hypotheses 2b, 4, 5, 7, 8), respectively. The hierarchical ap-

[7] In line with several recent studies (e.g., Datta, Guthrie, & Wright, 2005; Guthrie, 2001; Krishnan, Martin, & Noorderhaven, 2006), we tested for nonresponse bias by comparing early and late respondents. Armstrong and Overton (1977) argued that late respondents resemble nonrespondents and, therefore, can be used as representatives for the nonresponse group. We ran a multivariate analysis of variance and found no significant differences (Wilks lambda = 0.65) 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.

proach is particularly appropriate when analyzing potentially correlated independent variables or when investigating multiplicative terms (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 ($R^2 = .19$, $p < .01$). 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 ($R^2 = .32$, $p < .01$), the addition of these five variables accounted for 13.0 percent of the variance in learning from failure over and above the base model. Hypothesis 1 proposes that organization members for whom the time since their project failed is greater learn more from the failure experience than organization members for whom that time is shorter. The results indicate a significant, positive relationship between time since project failure and learning from failure ($\beta = 0.19$; $p < .01$), thereby supporting Hypothesis 1. Hypothesis 3 states that organization members with a stronger loss orientation learn more from a project failure than those with a weaker loss orientation. The results indicate a significant, positive relationship between a loss orientation and learning from project failure ($\beta = 0.14$, $p < .05$), supporting Hypothesis 3. Hypothesis 6 specifies that organization members with a stronger oscillation orientation learn more from project failure than those with a weaker oscillation orientation. A significant, positive relationship between an oscillation orientation and learning from project failure ($\beta = 0.18$, $p < .05$) supports Hypothesis 6. Hypothesis 9 states that organization members who perceive failure as highly normalized in their organizational environment learn more from project failure than those who perceive failure as less normalized in their organizational environment. However, the relationship between perceived normalization and learning from failure was shown to be nonsignificant ($\beta = 0.04$, $p > .05$); thus, Hypothesis 9 is not supported. Although not hypothesized, a significant, positive relationship was found between a control variable, emotional intelligence, and the amount of learning from project failure ($\beta = 0.19$, $p < .01$).

In models 3 and 4 of Table 5, the dependent variable is affective commitment to organization. Model 3 demonstrates that the base model (control variables only) explains a significant amount of the variance in affective commitment ($R^2 = .28$; $p < .01$), and the addition of the negative emotions variable (model 4) also explains a significant amount of variance ($R^2 = .30$; $p < .01$). This addition represents a significant increase in variance explained over and above the base model ($\Delta R^2 = .02$, $p < .01$). Hypothesis 2a proposes that organization members with more negative emotions over a project's failure have less affective commitment to their organization than those with less negative emotions over a project's failure. The results indicate that the negative emotions resulting from project failure are negatively and significantly related to affective commitment to organization ($\beta = -0.09$, $p < .01$), supporting Hypothesis 2a.

In models 5, 6, and 7 of Table 5, the dependent variable is negative emotions over project failure. The base model (model 5) explains a significant amount of variance in negative emotions ($R^2 = .14$, $p < .01$). The main effects model (model 6) also explains a significant amount of variance in negative emotions ($R^2 = .29$, $p < .01$), and the added variance explained is over and above that explained by the base model ($\Delta R^2 = .15$, $p < .01$). Additionally, the full model (model 7) explains a significant amount of the variance in negative emotions ($R^2 = .32$, $p < .01$) and significant additional variance over and above the main-effects-only model ($\Delta R^2 = .03$, $p < .01$). Hypothesis 8 states that organization members who perceive failure as highly normalized in their organizational environment will have lower negative emotions over project failure than those who perceive failure as less normalized in their organizational environment. The results reveal a significant, negative relationship between the perception of normalization and the level of negative emotions ($\beta = -0.26$, $p < .01$), supporting Hypothesis 8. Hypothesis 2b proposes that organization members for whom more time has passed since a project's failure have fewer negative emotions related to that experience than those for whom the time since project failure is less. The results shown in model 6 indicate a nonsignificant relationship between the time since project failure and the level of negative emotions ($\beta = 0.02$, $p > .05$); therefore, Hypothesis 2b 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 coefficient for the effect of the interaction term for time since project failure and loss orientation on the level of negative emotion from project failure ($\beta = 0.14$, $p < .05$), and they demonstrate a significant, negative interactive effect of time since project failure and oscillation orientation on the level of negative emotions

($\beta = -0.18$, $p < .05$). In terms of Hypothesis 5, which states that organization members with a strong restoration orientation have fewer negative emotions in response to project failure than those with a weaker restoration orientation when the period after the failure is short but have more negative emotions about the failure when the period after the failure is long, the interactive term was nonsignificant ($\beta = 0.11$, $p > .05$); thus, Hypothesis 5 was not supported.

To determine the nature of the significant interactive effects, using the regression coefficients, we plotted the effect of the time elapsed since project failure on negative emotions for the given values of both loss orientation and oscillation orientation. Figures 2 and 3, respectively, provide these graphs. The values for loss and oscillation orientation were set at one standard deviation above and below their means, and we entered a range of values for time since project failure, as suggested by Cohen and Cohen (1983). Hypothesis 4 proposes that organization members with a strong loss orientation have fewer negative emotions in response to project failure than those with a weaker loss orientation when the period after a failure is short but have more negative emotions about the project failure when the period after the 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 failure; however, individuals with a weak loss orientation experience comparatively lower levels of negative emotions associated with it (and vice versa for short time periods). This pattern of results supports Hypothesis 4. Hypothesis 7 proposes that organization members' negative emotions stemming from a 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 organization 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 supports Hypothesis 7.

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, applying a partial correlation procedure (Podsakoff & Organ, 1986). In this approach, we examined whether 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 is not present, they do suggest that it is unlikely to have had a significant impact on the results.

DISCUSSION

Although knowledge-based research at the organizational level has deepened understanding of strategic management and entrepreneurship, few empirical studies have helped researchers understand how organization members create new knowledge from their experiences and commit these new knowledge resources to their organization. Prior

FIGURE 2
Time, Loss Orientation, and Negative Emotions

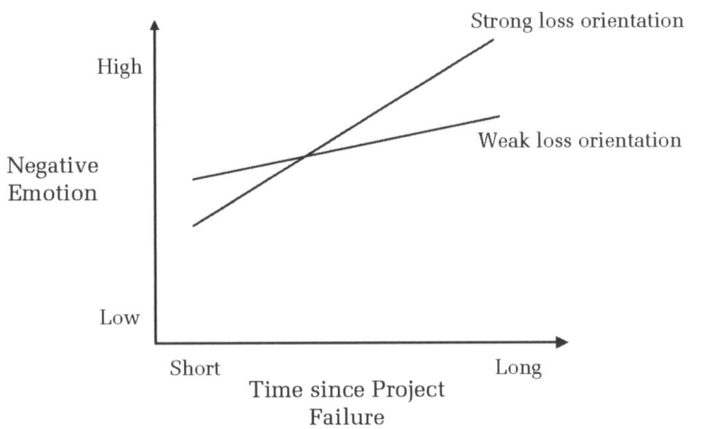
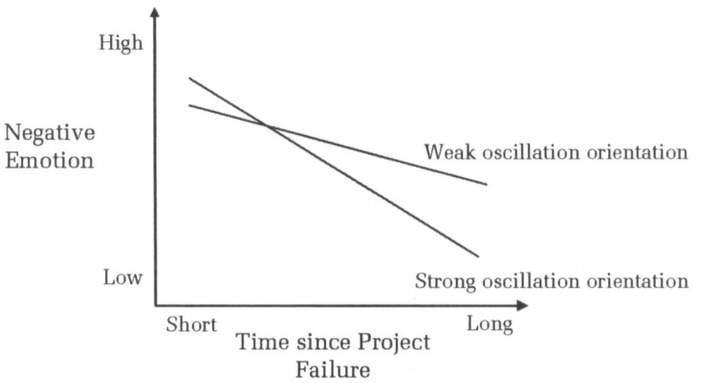


FIGURE 3
Time, Oscillation Orientation, and Negative Emotions



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 created knowledge needs to be acted on to benefit an organization (Bettis & Prahalad, 1995), and the pervasive belief that people can learn most from their 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 after a project failure. Taking a sensemaking perspective, we argued that moving forward involves organization members' learning from a failure 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 experienced over failure undermine organization members' commitment to their organization, and coping with loss—whether in preparation (measured by perceived organizational culture of normalizing failure) or over time (measured by time since project failure, coping orientation, and their interaction)—affects these negative emotions. Second, coping with loss (measured by the same three variables) affects learning from the experience of failure. 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 project failure (Hypothesis 1), but also that negative emotions reduced more quickly for those with a stronger oscillation orientation (Hypothesis 7). The level of negative emotions over project failure was lower for those who perceived their organization as normalizing failure (Hypothesis 8), and it was lower for those with a stronger loss orientation when the period after failure was short but higher for such individuals when the period after failure was long (Hypothesis 4). Jointly considering learning from failure and affective commitment to organization to determine individuals' progress in moving forward from project failure, we found that such learning increased with the time since a project failed (Hypothesis 1) and for those with a stronger loss orientation (Hypothesis 3) and a stronger oscillation orientation (Hypothesis 6). Our results indicate lower affective commitment to their organization for those who experience more negative emotions from failure (Hypothesis 2a).

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 and empirically supporting 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 a 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 organization members do appear to search for and process information about failure events. Specifically, project failure likely stimu-

lates individuals to search for what went wrong so that they can revise beliefs 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 organization members vary in their ability to learn from failure, which can be explained by the strengths of their various coping orientations and their perceptions of the extent to which their organizations normalize failure. Those with a stronger loss orientation tend to learn more from failure, which is consistent with the notion that grief work is necessary for individuals to build an account of why it occurred. We also found that a stronger oscillation orientation is associated with learning from failure. Therefore, learning from failure does not appear to be instantaneous or automatic. It takes time to learn from an experience, and depending on the strength of their coping orientations, 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, they can learn to have an oscillation orientation (Shepherd, 2004). The findings here suggest that individuals may be well advised to develop such a skill/ability, especially those more frequently facing project failure.

We did not find a significant relationship between the perception of the extent to which an organization normalizes failure and members' learning from project failure. Therefore, we did not find evidence supporting the notion of "intelligent failure," according to which learning from failure is maximized when failure is not considered an extraordinary event (Sitkin, 1992). It could be that the notion of accepting failure with alacrity warrants the same criticism as learning from small wins—in both situations, the event generates so little emotion that it does not capture sufficient amounts of individuals' attention for them to scan, process, and learn from it. It could also be that our measure does not sufficiently capture the environments in which failure is normalized or that organization members' perceptions of that environment do not influence their thoughts and feelings about failure. However, this is an unlikely explanation, given the significant relationship between perceived normalization and negative emotions that we observed. Future research can offer a finer-grained investigation of the nature of the relationship between perceived normalization and reduced emotional stimulation for information scanning and thus learning from failure, on the one hand, and between perceived normalization and increased interference with information processing obstructing such learning on the other hand. 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 arises from examining affective commitment to an organization with an emotions-based logic. We found empirical support of three sets of theoretical arguments. First, members' affective commitment to their organization has long been recognized as important for organizational success (e.g., Gong, et al., 2009). Project failure generates negative emotions, and these negative emotions are associated with lower levels of individuals' affective commitment to their organization. It appears that emotions as outcomes may influence emotions as inputs for subsequent projects, at least in terms of the negative emotions related to project failure (output) and affective commitment to organization (input).

Second, we take an important step toward explaining the levels of negative emotions organization members experience over a project failure. At first, it appears that time does heal wounds (the negative emotions). However, we theorized and found that the relationship between time and negative emotions from project failure is more complex; it depends on the strengths of individuals' different coping orientations. Time heals wounds differently depending on how that time is used. When the time passed since project failure was short, individuals with a strong loss orientation had lower levels of negative emotions from the experience. However, as the time since project failure grew, those with a stronger loss orientation did less well. This has important implications for research on coping with the negative emotions generated by project failure. Depending on the research design used to capture these emotions, results on the effectiveness of a stronger loss orientation will vary considerably and will perhaps even be opposite in direction. Indeed, the literature on coping with loss shows mixed results (Stroebe & Schut, 2001). The varying time periods of this study are sufficient to highlight this important implication, but our cross-sectional design does not permit exploring this temporal issue further. Perhaps new methods are needed to tackle the very real challenges of tracking emotions over time (e.g., Foo, Uy, & Baron, 2009; Uy, Foo, & Aguinis, 2010;).

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 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 one. It is only as time since project failure increases that a stronger oscillation orientation provides superior benefits. This finding has implications for scholars of loss, coping, and emotional recovery. Although an oscillation orientation may overcome the costs of holding a loss orientation or a restoration orientation for too long, it may not be a panacea for reducing negative emotions, as it may have short-run costs. Feeling a need to switch into and out of different orientations may create anxiety until an 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 organization members' levels of negative emotions over project failure were lower when they perceived their organization's culture as one in which failure was considered ordinary. Given the negative relationship seen here between negative emotions and affective organizational commitment, future research could further investigate the nuances of the relationship between a culture of normalization and affective commitment. It could be more complicated than our results appear to suggest. An organization runs the risk that by taking emotion out of the outcome, it may also remove emotion as a project input. Indeed, more research is needed on the experiences of failure (absolute number relative to successes, and frequency) to better explain 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 included various control variables in our analyses, a number of other promising variables exist for empirically testing future theorizing on project failure. These include individual variables (e.g., self-esteem and self-identity, self-efficacy as a scientist, and personality aspects such as openness to experience, conscientiousness, and neuroticism); firm variables (e.g., entrepreneurial orientation, slack resources, and a real options reasoning approach to projects); and environmental variables (e.g., hostility, dynamism, and complexity). Additionally, perhaps members of any project hold different perceptions as to whether it has failed or not. Future research on such differences could help explain within-group dynamics, including conflict, which may impact the ability of an 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 was appropriate for testing the theoretical model, but care must be taken in generalizing the results to other groups in which project failure is less frequent and occurs when projects are older; feedback is more ambiguous, less directed to individuals, and delayed; and the determination of project failure is more ambiguous.

A number of managerial implications can also be drawn. First, managers need to recognize that organization members feel bad when their projects fail, and it takes time for these emotions to subside. Second, some members possess coping orientations that can more quickly reduce these emotions—helping them to maintain commitment to the organization—and learn from the experience. Managers could try to select members who have these orientations for highly uncertain projects 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 scholars research these topics further, managerial implications will become finer-grained.

Conclusions

Project failure is a way of life in many organizations. Organization members' ability to learn from those failures and their willingness to continue to support their organization are important for the latter to move forward. We theorized and found that learning from failure is not instantaneous (but requires time) and not automatic (organization members differ in the strengths of their coping orientations, and these differences matter). We also theorized and found that although time heals wounds (reduces the negative emotions stemming from project failure), it heals differently depending on coping orientations, and the wounds are shallower for those who perceive their organizations as normalizing failure. Our theorizing and findings—based on joint consideration of learning from failure and affective commitment to organization as determining individuals' ability to move beyond project failure—suggest that studies that address such moving forward solely in terms of learning from failure will 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 have 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.

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This article continues on the next pages with appendixes.

APPENDIX A
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 and 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 multitarget 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	Specific 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
	Anesthesiology	Targeting PI3K in neuroblastoma
	Neurology	Age-dependent effects of decreases in cerebral perfusion pressure
	Nuclear medicine	Cytomegalovirus infection and PML nuclear bodies
	Urology and oncology	Antiviral compounds from Euphorbiaceae plants
Biochemistry	Biochemistry	Inhibitors of HDACs—effective drugs against cancer
	Biophysics	TSA down-regulates 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 B
Comments by Research Scientists about Their Project Failures

Scientist	Failed Project	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 counterreactive 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 redirected 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."