

# Confronting failure: antecedents and consequences of shared beliefs about failure in organizational work groups

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## Summary

This paper contributes to a growing body of research on shared cognition by examining shared beliefs about failure in organizational work groups. We argue that the popular ideal of organizational learning from failure is likely to be impeded by powerful psychological and organizational barriers to engaging in behaviors through which this can occur. We hypothesize that people hold tacit beliefs about appropriate responses to mistakes, problems and conflict, and that these are shared within and vary between organizational work groups (H1). These shared beliefs vary in the extent to which they take a learning approach to failure – specifically in the extent to which they endorse identifying, discussing, and analysing mistakes, problems, and conflicts. We also hypothesize that effective coaching, clear direction and a supportive work context influence beliefs related to failure (H2), and that beliefs about failure influence group performance (H3). These hypotheses combine to suggest a theoretical model of antecedents and consequences of shared beliefs about failure in work groups. The paper presents empirical evidence from a recent field study to test the model and finds support for Hypotheses 1, 2, and 3. Hypothesis 4 – that shared beliefs about failure mediate between the antecedents and the outcome of group performance – was not supported. Copyright © 2001 John Wiley & Sons, Ltd.

## Introduction

The ability to learn from failure has been heralded as essential for organizational innovation, adaptation, and success in a changing environment (Starkey, 1998). For example, Sitkin (1992) argued that failure is more important than success for organizational learning; Nonaka and Takeuchi (1995) reported that Honda engineers understand that success is born of mistakes, and Leonard-Barton (1995) suggested that learning from intelligent failure is a hallmark of innovative companies. In a study of new products in the electronics industry, Maidique and Zirger (1984) documented the contribution of failures to subsequent commercial success. Despite the importance of learning from failure, however, it is more common in exhortation than in practice, and our understanding of the conditions under which it occurs is limited (Pralhad and Oosterveld, 1999; Tax and Brown, 1998; Arino and de la Torre, 1998). Much of the writing on learning from failure has come from the popular management literature, which relies mostly on anecdotal evidence (e.g., Peters, 1987). While this has given

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rise to a variety of interesting thoughts on the topic, it has not provided systematic empirical data to demonstrate a relationship between performance and learning-oriented beliefs or behaviors when confronting failure. Another limitation in the literature is that the process of learning from failure has not been clearly described. This paper seeks to address this gap by bringing together ideas about shared cognition with ideas about organizational learning from failure. We propose that work groups in organizations – defined as having clearly defined membership and joint responsibility for a product or service (Hackman, 1987) – share tacit beliefs about how to respond to mistakes, problems, and conflicts, and that these beliefs affect an organization's ability to learn from failure. We also present empirical research to support these ideas.

In recent years, organizational scholars have demonstrated a growing interest in understanding the role of cognition in organizations (Thompson *et al.*, 1999; Meindl *et al.*, 1996). Although this research has been characterized by diverse perspectives (Boles, 1999), a few themes have emerged as important to making progress in this area (Meindl *et al.*, 1996). Our contribution in this paper has particular relevance for two of those themes – the nature of cognition at distinct levels of analysis (Schneider and Angelmar, 1993) and the impact of shared cognition on performance. Understanding the nature and benefits of shared cognition at the group level of analysis recently has been of particular interest (Hinsz *et al.*, 1997), with several researchers arguing for the benefits of shared mental models (Cannon-Bowers *et al.*, 1993; Klimoski and Mohammed, 1994). Mental models are implicit beliefs that shape inferences, predictions, and decisions about what actions to take; shared mental models help people understand and react to the system in which they work in similar ways (Cannon-Bowers *et al.*, 1993).

In this paper, we argue that shared beliefs in work can influence the ability to respond constructively to failure. We first propose three behaviors through which learning from failure occurs. We then discuss barriers to engaging in these behaviors in organizations, and propose the existence of shared beliefs at the group level of analysis that can mitigate – or reinforce – the effects of these barriers. This proposition is consistent with recent interest in the special roles played by shared perceptions within groups (Thompson *et al.*, 1999). The specific contribution of this paper is to suggest that groups within organizations differ greatly in their beliefs about how to respond to failure, and to propose that this has an significant influence on work group performance. In sum, the paper proposes a theoretical model of antecedents and consequences of shared beliefs about failure in work groups and presents preliminary data to support the model.

## Learning from Failure in Organizations

### *Failure defined*

We conceptualize failure as deviation from expected and desired results. This includes both avoidable errors and unavoidable negative outcomes of experiments and risk taking. It also includes interpersonal failures such as misunderstanding and conflict. Our conceptualization is deliberately broad, encompassing failures of diverse types and magnitude, because we propose that opportunities for learning exist in both minor misunderstandings and major mishaps. We note also that the amount or significance of learning is not necessarily proportional to the size or scope of a failure. Clearly, learning can emerge from major failures such as launching a highly visible product only to have it rejected by the market, or implementing a new technology that cannot be made to work in the intended context. Additionally, however, significant learning can come from uncovering a small failure to communicate in a work relationship, and such seemingly small failures can lead, ultimately, to highly

preventable major failures. For example, a simple failure of communication between American and British scientists about the metrics each group was using to calculate weight and distance led to the loss of the Mars probe – a colossal failure of the entire venture (Pollack, 1999). We view misunderstandings and failures to inquire carefully into others' thinking as small failures, and argue that the inability to detect such failures in organizations often contributes to the occurrence of substantial, material failures. Along similar lines, another form of failure that presents an opportunity for learning in organizations is interpersonal conflict in which progress is blocked because individuals persist in holding different and incompatible views (Phills, 1999 – working paper, Yale School of Management). Constructive confrontation of such interpersonal breakdowns is necessary to generate learning to resolve the impasse.

In practice, major and minor failures are often highly related. As illustrated by the Mars probe example, the failure to uncover gaps in understanding can contribute to the likelihood of consequential failures in organizations. Similarly, failure to ask for help or challenge others' decisions or actions can lead to consequential drug errors in hospitals (Edmondson, 1996), and the inability to discuss errors, problems, and disagreements constructively across disciplines or functions can lead to poor product development and other failures (e.g. Dougherty, 1992).

More generally, we argue that two capabilities increase the chances of learning from failure in organizations. First, organization members must be able and willing to take risks, which necessarily implies that some portion of organizational activities will result in failure. Second, they must be able to confront failure directly rather than covering it up. In this paper, we focus on the latter issue of confronting failure directly rather than avoiding or covering it up, because we believe that the interpersonal and image risks that this requires are at the core of what makes learning from failure difficult in organizations.

### *The process of learning from failure in organizations*

The process of learning from failure involves identifying failures, discussing and analysing them, and dealing with conflict and disagreement productively. Identifying failure is an essential first step to learning from it: discussion and analysis are needed to understand and communicate the relevant lessons, and the ability to cope with conflict becomes necessary when discussion of failure involves controversy or disagreement about its causes.

#### **Seeking to identify failure**

Opportunities to learn from failure cannot materialize if mistakes are covered up. Identification of minor and major failure is thus an essential first step to learning from it. Failures can range in importance and include loss of life such as in the Challenger disaster or in a medication error in a hospital, to weak sales of a newly launched product, to something as seemingly unimportant as not understanding another person's ideas expressed in a meeting. Effective identification of failure entails exposing failures as early as possible, to allow learning in an efficient and cost effective way and minimize the unproductive investment of time and other resources. For example, a product development team<sup>1</sup> may conduct small-scale tests during the development process, and seek customer feedback in advance of product launch to learn from small, in-process failures and avoid large, outcome failures.

To illustrate, a new product development team in the present study frequently conducted small-scale experiments. As described by a team member, 'We [sometimes] put something down, even if it's not

<sup>1</sup>We use both team and work groups to describe groups in organization with defined membership and shared responsibility for a product or service (Hackman, 1987).

right, just to get a reaction.' Along the same lines, in a team meeting, we observed the team leader proposing a new feature and asking the group to 'tear it apart' – thus making it clear that failure was an acceptable option. A production team in the same organization engaged in feedback-seeking as a way of proactively identifying mistakes or failures. As one member described it, 'Sometimes, if we have a quality issue – we're not sure about something we've just done – we'll bring others in without telling them what the issue is to ask them if they see a problem with this part.'

A more subtle form of failure occurs in organizational conversations. For example, an individual listening to comments in a meeting may realize that he does not understand what was just said and yet fail to stop and inquire. A small failure occurs here – particularly if he has failed to understand important substantive content. This failure could be due to a lack of attentiveness by the listener, or to a lack of clarity on the part of the speaker, but in either case, learning cannot take place unless the listener takes the risk of asking the speaker to clarify in a timely manner. If he is unwilling to risk appearing ignorant or inattentive, he takes the more subtle (and less visible) risk that his failure to understand will lead to a more serious problem later. As this small example illustrates, early exposure of a potential failure, through verbal testing, enables learning about both content and process and may reduce the occurrence of more costly failures that could be caused by small failures of interpersonal communication. Thus, feedback seeking plays a role in identifying failures, both small and large. Feedback from a variety of sources can reveal failure to understand as well as failure to meet goals or satisfy customer requirements.

### Discussing and analysing errors

One of the revolutions in manufacturing, the drive to reduce inventory to the lowest possible levels, was stimulated as much by the desire to make mistakes quickly visible as by the desire to avoid other inventory-associated costs (e.g. Hayes *et al.*, 1988). Just as surfacing errors before they are compounded, incorporated into larger systems, or made irrevocable is an essential step in achieving high quality, one of the core themes of the total quality management movement is turning analysis of error and failure into a positive act that is recognized and valued for its contribution to overall performance. Implicit in this is the assumption that high quality arises from an organizational *system* that actively seeks out problems and determines how they may be avoided in the future. Although mistakes may be traced to individuals, the emphasis is on creating a system that eliminates the possibility of future repetition, rather than on personal blame (MacDuffie, 1997; Leape, 1994; Ryan and Oestreich, 1991). In a similar vein, project audits at the end of new product development projects (Clark and Fujimoto, 1991) serve as another vehicle through which learning from failure can productively occur. Such audits can be done in a half-hearted way in which boxes are checked but little soul-searching occurs, or they can be done thoroughly and with honest self-scrutiny by group members and others (Garvin, 2000).

To illustrate discussion and analysis of failure in the present study, a second product development team confronted the following failure. Members had been frustrated when customer focus groups repeatedly referred to a certain design element as a 'wall,' which conveyed impressions of solidity that the team had not intended. Finally, after resisting this feedback for several weeks, they realized they had to redesign the element. Although they had been slow to hear the message, we observed a meeting in which team members joked about their own unwillingness to listen to the customer for the earlier period of time. In contrast, interviews with members of a third new product development team reported that it was difficult to bring up failures, because of a consistently expressed belief that '[the team leader] doesn't want to hear it.' As a consequence, the team spent considerable time stuck 'in blind alleys,' working far too long perfecting the details of a design before seeking any external feedback, never achieving comfort with failure, only to find ultimately that the design was rejected by customers.

### **Handling conflict productively**

Poor handling of conflict can lead to a hostile environment in which trust and interpersonal relationships break down. Under these conditions, fear of being ridiculed or blamed, or fear that others will use knowledge of their failure against them may keep people from discussing their failures or disagreements (Argyris, 1982; Jehn, 1995). Alternatively, productive handling of conflict can serve constructive purposes, especially when people are brought together across disciplines to share different perspectives and to challenge others' ideas. When people with different backgrounds are engaged in a constructive thought process, these differences can lead to new, better ideas. Leonard-Barton (1995) describes Nissan Design Center's effective management of conflict to enhance the quality of ideas in the new car development process and calls this 'creative abrasion.' Discussion and analysis of failure in this kind of environment is more likely to result in deeper learning and more creative insights and solutions than it would in an environment in which people did not share differences of perspective and clash constructively on occasion. However, bringing people with different backgrounds together does not guarantee that they will unleash their creative potential. For example, in the present study, ability to handle conflict productively differed across groups. Interviews with members of the computer help desk group revealed that the group was fraught with personal conflicts that were never addressed directly. In contrast, members of the group developing the 'systems product' explained that the group's ability 'to handle and resolve conflict' was critical to their success. Several members of this group brought up the issue of conflict and explained that the group was 'not afraid to bring things up directly' and that people were 'willing to challenge each other.' In sum, conflict must be handled productively so that sharing differences of perspective does not produce bitter exchanges that lead people to conclude that it is safer to keep their different perspectives and information to themselves.

### *Barriers to learning from failure in organizations*

The notion that learning from failure is desirable is difficult to dispute; not learning from failure would seem foolish indeed. Agreement with this principle, however, does little to foster its enactment in the face of persistent psychological and organizational barriers. Learning from failure requires employees to adopt a learning orientation to mistakes and conflicts when their natural inclination may be otherwise. It also requires behaviors that can present interpersonal and career risk. For instance, admitting failure involves focusing on the potential benefits to be gained by this unpleasant process, while productive handling of conflict requires openness to being challenged and willingness to constructively challenge others. Both psychological – or individual-level – and organization-level barriers can make this difficult in organizational settings.

#### **Individual-level barriers**

Socialization processes that affect individuals throughout life present one barrier to engaging in behaviors through which learning from failure occurs. From early childhood, we are conditioned to avoid failure by our parents, often attempting to protect us from physical harm. Schools reinforce this by rewarding students who make the least mistakes. Argyris (1985) has argued that one of the main causes of control-oriented (rather than learning-oriented) behavior is how people are socialized to deal with potentially threatening situations. Similarly, focusing on one's own failures can strike a painful blow to self-esteem. Psychological research has established that people regularly, if largely unconsciously, engage in activities that enable them to maintain or enhance their positive self-concept and self-esteem (Baumeister, 1993). For example, people with high self-esteem tend to concentrate on their successes and positive qualities rather than their failures and negative qualities.

Finally, focusing on failure may undermine self-efficacy – an enabler of success in many challenging tasks (Bandura, 1990). Cannon (1998 – unpublished doctoral dissertation, Organizational Behavior Program, Department of Psychology, Harvard University) demonstrated that accurate perceptions of performance can lead to discouragement and poor performance. When participants engaged in a challenging task were given accurate performance feedback that revealed both successes and failures, they became discouraged and both their commitment and performance fell. In contrast, participants who received no feedback and were able to maintain an inaccurate positive self-perception remained motivated, persisted in the problem-solving task and performed better than those who received feedback. Facing failure, in order to learn from it, can be seen as an unpleasant form of accurate feedback; thus, intrapersonal psychological factors create a dilemma that individuals have to manage if they are to learn from failure.

### **Organization-level barriers**

Even though an organization may value learning from failure in the abstract, individuals associated with concrete instances of failure risk being stigmatized and cut off from valued organizational rewards. Just as self-perception is important to motivation, others' perceptions can be critical to career success in organizations. The fact that an organization commits to learning from failure does not guarantee that those involved in a failure will not be viewed negatively by colleagues. Fear of being perceived as incompetent is likely to be a significant disincentive for individuals to communicate their own failures. Such fears are not irrational. Promotions, bonuses and other organizational rewards may be negatively affected by the stigma of failure. If people believe that revealing failures will affect their compensation or future opportunities, they will be unlikely to do it. Further, people are likely to be unwilling to expose failures if they perceive that doing so could erode their credibility and consequently their ability to exert influence in the organization.

In sum, learning from failure requires overcoming significant barriers. In the next section, we propose that influences at the group-level of analysis can help to mitigate these well-established individual and organizational barriers to learning from failure.

## **Group Influences on Learning from Failure**

The central proposition in this paper is that barriers to productive discussion of mistakes and problems can be mitigated – or exacerbated – by shared beliefs about failure in work groups. Much of the literature on organizational learning focuses on the routines, culture, and shared mental models of the organization as a whole (e.g. Levitt and March, 1988; Senge, 1990). Top management is seen as setting the tone for an organization, and some organizations are portrayed as places in which people are comfortable sharing mistakes (e.g., Fast Company, 1998). We argue, however, that well-intentioned policies and vision statements can be undermined or enhanced by middle managers, supervisors, or team leaders whose face-to-face behavior indicates to subordinates that openness about mistakes would be unwise. Moreover, proximal managers evaluate performance. How such evaluation is carried out may vary from work group to work group, depending on the interpersonal skill of the manager (Argyris, 1982) and it has a profound influence on the way that employees experience their organization's response to failure (Ryan and Oestreich, 1991).

Proximal managers and work group peers are both in a position to exert significant influence on the perceptions of those with whom they work closely. As Levine and Moreland (1999) explain, groups tend to be more powerful in socializing individuals and shaping their beliefs than are broader

organizational forces, and thus the role of groups in such socialization processes may have been underemphasized by organizational researchers. In particular, beliefs and behaviors related to error suppression have been shown to be greatly discrepant within organizations. Within the same organizational context, work groups vary dramatically in the extent to which members perceive their groups as interpersonally threatening (MacDuffie, 1997), and behavioral norms related to admitting error vary across groups within the same organization (Edmondson, 1996).

Building on this work, we argue that beliefs about how to respond to failure should be understood (and assessed) at the group level of analysis. Because of the centrality of interpersonal perceptions and dynamics in responding constructively to mistakes or conflicts, it stands to reason that this construct resides at the group level – that is, it is characteristic of small social units in which people interact face-to-face (Edmondson, 1996, 1999). Although individuals or organizations may also differ in tolerance for failure, due to self-esteem or cultural factors, we argue that the social influences that take place in groups have a particularly acute influence on responses to failure. In sum, mistakes and failures are associated with salient interpersonal consequences, and work group members tacitly assess the nature of these consequences in their immediate work environment – an assessment that is likely to be deeply influenced by behaviors and conversations of those with whom they work closely (Edmondson, 1999). Thus, we argue that intact work groups develop shared beliefs about interpersonal consequences of failure, and that these beliefs constitute a central feature of shared beliefs in work groups. Shared beliefs about failure constitute an example of a shared mental model, encompassing an implicit causal hypothesis related to the organizational consequences of failure. When members of a team share beliefs about failure, they have similar predictions of how failure should be handled and what will happen as a result. This line of reasoning suggests a first research hypothesis, after which we examine antecedent conditions that might affect the ability of a work group to learn from failure.

*Hypothesis 1.* The degree to which beliefs about failure are learning-oriented is likely to be shared within and to vary across work groups within the same organizational context.

### *Antecedents and consequences of shared beliefs about failure in work group*

Under what conditions will members of work groups have learning-oriented beliefs about mistakes and problems, encouraging behaviors necessary for learning from failure? As a preliminary answer to the question of what factors enable these often counter-cultural beliefs and behaviors, we draw from research on work teams, in which a set of supportive conditions have been shown to promote team effectiveness (Hackman, 1990). We argue that three conditions identified by Hackman and colleagues are particularly relevant for promoting constructive beliefs about failure – effective coaching, clear direction, and a supportive work context.

### *Coaching by managers or team leaders*

To foster the unconventional set of attitudes and behaviors that individuals need to learn from failure, we argue that proximal managers need to act as effective coaches of the people with whom they work. Vision statements or corporate values articulated by senior management, although potentially inspiring, are likely to be insufficient for enabling behavior needed to learn from failure than the example and receptivity of an employee's proximal manager or team leader. The managers and group leaders who work as a face-to-face presence in the workplace are in a position to deliberately reframe failure as something that is essential to learning. For example, Katie Paine, a manager at the Delahaye Group instituted 'Mistake of the Month' as a way to encourage her group to share mistakes. It is not insignificant that, as the leader, Paine was the first presenter in these regular sessions (Fast

Company, 1998). The ritual not only allows vicarious learning but also has led to bonding among employees through sharing their stories. Edmondson (1996) found that coaching by nurse managers was a critical factor in enabling nurses to track down and discuss medication errors in hospitals. In sum, managers greatly influence the interpersonal climate in their immediate area. Their behavior is particularly salient; subordinates are likely to attend to each others' actions and responses but to be particularly aware of the behavior of the leader (Tyler and Lind, 1992). Therefore, if a team leader or proximal manager is supportive, coaching-oriented and has non-defensive responses to questions and challenges, those who work with him or her are likely to conclude that the environment is safe for identifying and discussing failure.

In addition to creating a constructive climate, proximal managers or team leaders may need to coach subordinates or group members in how to carry out potentially threatening dialogues about failure. To reduce the potential for defensiveness, they can facilitate productive conversation, in which people learn to inquire thoughtfully into each others' views and are coached in explaining their own thinking more thoroughly (Argyris, 1993). Moreover, by encouraging and displaying this kind of learning-oriented conversation, proximal managers are best positioned to enable employees to see the benefits of working through differences to resolve conflicts.

### *Clear direction*

A clear direction can facilitate work group performance (Cohen *et al.*, 1999). It also may enable identification and discussion of failure. It can clarify what is or is not a failure, such that deviations from the path toward the goal are more noticeable. In contrast, without a clear direction, the potential for confusion and ambiguity may create a kind of insecurity that discourages people from identifying and discussing failure. A clear direction can also help group members stay focused on the task and reduce the potential for them to come into conflict around issues that are not directly related to the immediate task, such as quarrelling over competing agendas for the team's direction. This is likely to reduce opportunities for unproductive personal conflict (Jehn, 1995) and to help to keep conflict within constructive bounds so that people feel less threatened about disclosing and discussing failure. A clear direction also can provide people with some assurance that the risks they are taking with failure are likely to be worthwhile because the results of these interpersonal risks can be assessed against a desired end-state.

### *Supportive work context*

The extent of group context support in the form of access to information, resources and rewards may reduce insecurity and defensiveness in a work group, making it somewhat easier to discuss mistakes and other failures. A supportive work environment may enable employees to believe that they will be fairly treated, such that admitting or calling attention to failure is less likely to be penalized.

*Hypothesis 2.* Effective coaching, a clear direction, and context support are associated with learning-oriented beliefs about failure in work groups.

### *Performance outcomes*

Next, we propose that shared beliefs about failure predict group performance outcomes. Beliefs about failure are likely to be associated with a broader set of attitudes and behaviors related to open



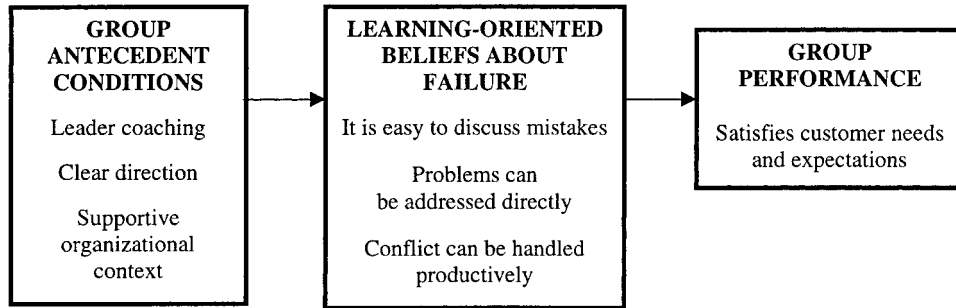


Figure 1. A model of shared beliefs about failure in work groups

communication, flexibility, and responses to unexpected events. If failure is confronted directly, and in a timely way, a group's ability to satisfy customers' desires and needs is likely to be enhanced. Thus, groups in which failure is tolerated and discussed are likely to perform better over time than those where failure is covered up. Similarly, willingness to seek and listen to feedback – one element of productive beliefs about failure – is likely to foster better relationships with the recipients of a group's work, who are in a position to evaluate the group's performance.

*Hypothesis 3:* Shared beliefs about failure are associated with performance in work groups.

Taken together, the above arguments combine to create a group-level model of shared beliefs that support the process of learning from failure. As depicted in Figure 1, we argue that these beliefs will foster effective group performance and that they mediate between antecedent conditions and performance outcomes. Thus, we conceptualize shared beliefs about failure as a partial mechanism through which supportive antecedent conditions enable high performance in a work group.

*Hypothesis 4:* Shared beliefs about failure mediate between antecedent conditions and group performance outcomes.

## Empirical Support for the Model of Shared Beliefs about Failure

To test our hypotheses about shared beliefs about failure, we draw upon data collected to study team learning in a mid-sized manufacturing company. The data collected, both qualitative and quantitative, allow us to investigate ways that beliefs about failure may take shape and manifest themselves in an organizational setting, as well as to conduct preliminary tests of our hypotheses about antecedents and consequences of these. We argued above that beliefs about failure reside primarily at the group level of analysis in organizations, and these data, gathered from 51 work groups in a single organization, allowed us to explore whether attitudes and behaviors related to failure differ across work groups embedded within a strong corporate culture.

With a history of investing heavily in research and design and of valuing human resources as key strategic assets, 'The Company' was a good setting to investigate group-level beliefs about failure. First, they utilized 'teams' to carry out organizational tasks. Second, they had a strong corporate culture, reinforced by explicit efforts to build common values and beliefs; the company's emphasis on research and development (R&D) suggests that experimentation was valued, and its people-oriented rhetoric and systems

were meant to create a safe environment for well-intentioned risk. Finally, the company adopted organization-wide gain sharing in 1950 and was a pioneer in promoting employee participation and cross-functional collaboration. Given this history, we reasoned that people at the company had a chance of being comfortable with failure in the service of learning. We also suspected that despite the company's espoused values and impressive history, many work groups would still struggle, given the potent psychological and organizational barriers to learning from failure, discussed above.

The study included four kinds of work groups. First, functional work groups, consisted of functional managers and their direct reports, including sales groups, production groups, and groups of middle and senior managers. These groups existed within and supported the work of a single functional department. Second, the company had a growing number of autonomous work groups in manufacturing and sales that lacked leaders in the hierarchical sense; these were referred to as self-managed teams. The third type was cross-functional teams that designed and developed new products, and worked together for the duration of a development project. The fourth type, also time-limited and cross-functional, were project teams convened to address specific organizational issues. The inclusion of four different types of work groups in this study allowed us to examine differences in beliefs about failure that may be attributable to group type or structure, as well as to explore the effects of other managerial factors. The sample consisted of 51 work groups: (1) 34 within-function teams (in sales, management, and manufacturing); (2) nine self-managed teams (in manufacturing and sales); (3) five product development teams; and (4) three project teams.

We conducted individual interviews with 20 members of 11 work groups of different types, and observed meetings of 10 work groups. These included product development teams, management teams, project teams, and both a self-managed team and a supervisor-led team in operations. This preliminary data suggested that learning-oriented beliefs varied greatly across groups, independently of differences in type of group, such that, for example, a work group in production was neither more nor less likely to exhibit evidence of productive beliefs about error than a group designing a new product. As noted above in several examples, we frequently observed evidence of discussing error and failure, of feedback seeking to identify failure, and of handling conflict productively. In these examples, we observed behaviors that members of some organizational work groups go to great lengths to avoid. Next, we analyse quantitative data to further explore the implications of shared beliefs about failure in work groups.

## Quantitative Data Sources

Members of 53 work groups at the company received a 90-item survey designed to assess a variety of group attributes. These items included measures of beliefs related to error and failure, as explained in detail below. four hundred and twenty-seven employees (86 per cent of the individuals sampled) from 51 work groups (96 per cent of the groups sampled) returned the surveys. At the same time, we asked individuals who received or assessed the work of each group to complete a 21-item survey rating work group performance and behavior; two or three raters were identified for each group, and 135 (91 per cent) of them returned the short surveys. The two surveys together provided data that measure the following antecedent, behavioral and outcome variables.

### **Antecedent factors**

The survey was coded to identify respondents by work group, rather than by individual, and to identify type of group (within function, self-managed, product development, or project), company department

(operations, sales, staff services, or cross-functional), and work group tenure (average number of months of each individual's membership in the group). Items assessing features of work group design and structure taken from Hackman (1990) were included in the work group survey, including *context support* (supportiveness of information, training and reward systems), *clear direction* (extent to which the group's goals were clear), *task* (degree to which the task design is motivating) and *coaching*, or the degree to which a group leader is readily available for help and consultation and initiates discussions of progress<sup>2</sup>.

### Shared beliefs about failure

Four items in the survey described shared beliefs about failure: 'In this group, people talk about mistakes and ways to prevent and learn from them;' 'This team tends to handle differences of opinion privately or off-line, rather than addressing them directly as a group' (reverse scored); 'Problems and errors in this team are always communicated to the appropriate people so that action can be taken;' and 'If you make a mistake on this team it is often held against you' (reverse scored). Although these items were not designed to form a single scale, when combined, they display marginal but adequate internal consistency reliability for four items (Cronbach's alpha of 0.68). To assess the discriminant validity between this new scale and other survey variables included in these analysis, we ran factor analysis on the 19 items that make up antecedent and process variables. This procedure yielded five factors for the antecedent variables, replicating planned scales for each construct with one exception. One of the items to assess context support (receiving adequate training on the job) loaded with task design. All four items related to beliefs about failure combined to make the fifth factor.

### Work group outcomes

The group members' survey includes a five-item scale measuring work group performance, and the raters' survey included a similar measure, using the same items where appropriate. Table 1 provides summary statistics and intercorrelations for key variables from both surveys, including internal consistency reliability.

Table 1. Group survey and raters' survey summary statistics and intercorrelations

Variable	M Year's	SD	Range Year's	1	2	3	4	5	6
1. Supportiveness of organizational context	4.78	0.97	5.40	0.65					
2. Clear direction	5.02	1.20	5.67	0.70	0.73				
3. Coaching	3.77	0.75	4.00	0.70	0.65	0.80			
4. Shared beliefs about failure	5.05	0.57	5.33	0.74	0.78	0.71	0.68		
5. Group performance (raters' survey)	4.95	1.29	0.87	0.37	0.35	0.38	0.40	0.87	
6. Group tenure	2.4	1.72	6.7	(-0.06)	(-0.13)	-0.32	(-0.21)	(0.05)	*

\*Signifies only one survey item. Correlations in parentheses not significant at  $p < 0.05$ ; all other correlations are significant at  $p < 0.05$ .

NB: cronbach's alpha coefficients are presented on the diagonal.

<sup>2</sup>Sample items include: 'the team leader initiates discussions with the team about ways to improve our work processes' and 'the team leader is an ongoing 'presence' in this team - someone who is readily available.'

## Results

To test Hypothesis 1, that beliefs about failure vary across groups within an organization, we used one-way analysis of variance to determine whether the survey measure varied significantly across these 51 groups, with group membership as the independent variable and learning-oriented beliefs as the dependent variable. The output from this ANOVA indicates significant variance at the group level of analysis ( $F = 5.02$ ;  $p < 0.0001$ ) for learning-oriented beliefs. The output of this ANOVA was used to calculate the intraclass correlation, which was positive and significant ( $r_{icc} = 0.30$ ). Intraclass correlations for variables that are conceptually meaningful at the individual (rather than group) level of analysis are typically close to zero (Kenny and LaVoie, 1985; see Edmondson, 1999, for an example). Intraclass correlations also were calculated for raters' performance assessments and were positive and significant ( $r_{icc} = 0.21$ ), supporting inter-rater reliability in this measure of group performance. These analyses allowed the creation of a group-level data set that combined group means for work group attributes and for rater performance ratings for each group. This data set ( $N = 51$ ) was used for regression analyses among group-level variables in addressing the other research hypotheses, as they pertain to group-level constructs.

The implication of this statistical finding is that beliefs about failure are shared within and vary between groups in the organization. The company's culture imposed a bias against supporting this hypothesis, in that all employees were subject to persistent messages about learning from mistakes and being a learning organization. These significant differences suggest that attention must be paid in organizations to work group beliefs and norms, as these can form independently of organization-level visions and values.

Next, we tested our assumption – reinforced by the qualitative data – that failure beliefs were independent of type of group, using GLM analysis; this allowed simultaneous testing of random effects of group membership and fixed effects of group type on failure beliefs, while controlling for the effects of the predicted antecedents. The results showed that the effects of type on failure beliefs were insignificant and the effects of group membership were highly significant, whether or not we controlled for other antecedent conditions (see Table 2). This result also provides further evidence that failure beliefs reside at the group level of analysis.

To address Hypothesis 2, we conducted regression analysis on the group-level data set, testing the effects of antecedent variables in encouraging productive attitudes and behaviors about failure. To do this, we regressed context support, direction, coaching, and tenure (as a control) on shared learning-oriented beliefs, and found that only coaching and direction were significant predictors, together

Table 2. Results of GLM analyses ( $N = 427$ )

Model	Independent variable	<i>F</i> -ratio	<i>p</i>
Y = Beliefs about failure	Team type	$F(3,51) = 2.33$	0.09
	Team membership*	$F(49,427) = 3.64$	<0.001
Y = Beliefs about failure	Team type	$F(3,51) = .25$	0.86
	Team membership	$F(46,427) = 1.42$	0.04
	Coaching	$F(1,427) = 21.89$	<0.001
	Direction	$F(1,427) = 22.87$	<0.001
	Context support	$F(1, 427) = 22.98$	<0.001

\*Team membership is the categorical variable identifying each team. The result that team membership accounts for significant variance in beliefs about failure indicates that this variance is attributable to unexplained effects of belonging to the same team.

accounting for 65 per cent of the variance in the dependent variable. These results provide support for the prediction that coaching on the part of the proximal manager is an important influence on helping a group overcome the interpersonal and organizational barriers to discussion of errors, problems and conflict. They also suggest that having a clear direction may support positive beliefs about failure, such as by making it easier to identify a potential failure. Supportive organizational context did not predict beliefs about failure in this model – despite a significant zero-order correlation – which may be in part due to correlation among predictor variables. In sum, this result suggests that organization context is less influential in shaping beliefs about failure than are leader behavior and clear direction.

To address Hypothesis 3, we examined the relationship between failure beliefs and group performance. First, the two variables – measured by independent survey instruments and different sets of respondents – were significantly correlated ( $r = 0.55$ ,  $p < 0.01$ ). A simple model regressing beliefs about failure on group performance showed a significant relationship ( $\beta = 0.72$ ,  $p = 0.002$ ), with beliefs about failure accounting for 18 per cent of the variance in group performance – a substantial amount given the use of independent data sources.

To address Hypothesis 4 that learning-oriented beliefs mediate the effects of coaching and clear direction on work group performance, we conducted a three-stage analysis to test each condition for mediation (Baron and Kenny, 1986): (1) Does the proposed mediator significantly predict the dependent variable? (2) Do the independent variables predict the mediator; and (3) Does the contribution of the independent variables drop substantially or become insignificant when entered into the model together with the mediator? As shown in Table 2, the first equation (discussed above) confirmed that beliefs about failure are significantly related to work group performance, supporting the first of the three relationships. The second equation showed that coaching and clear direction significantly predict learning-oriented beliefs; organization context is not included in this analysis, as its effect was previously shown to be insignificant. In the third equation, the antecedents do indeed become insignificant; however, the coefficient of learning-oriented beliefs is also insignificant ( $p = 0.16$ ). Although the coefficient for failure beliefs is closer to reaching significance than the other three regressors ( $p = 0.16$ , versus 0.28 and 0.85), the mediation hypothesis was not supported.

In summary, in these data, shared beliefs about failure, a group-level construct, appear to be associated with group performance. These beliefs also appear to be fostered by coaching and direction setting; however, beliefs about failure were not established as a mediator.

## Discussion and Conclusion

As discussed earlier, this paper addresses two major themes in organizational cognition research, by exploring the level of analysis of a certain set of beliefs and the impact of shared cognition on performance. We examined group-level beliefs about failure and demonstrated a relationship between these and group performance. Our data suggest that teams in the same organization, even those doing similar tasks, can vary substantially in beliefs about failure. The degree to which these shared beliefs about failure were learning-oriented varied significantly across work groups, independently of type of group. Further, shared beliefs about failure were associated with group performance. One implication of this result is that shared beliefs are not beneficial, in and of themselves; rather, the type or content of the belief is critical.

This study makes a contribution to the challenge identified by Meindl *et al.* (1996) of clarifying the nature and content of shared cognition in organizations. Although our study did not obtain data on

Table 3. Do shared beliefs about failure mediate between antecedents and performance?

Three steps to demonstrate mediation	Independent variables	Observer-assessed group performance			
		$\beta$	$t$	$p$	$R^2$
<i>Condition 1</i> : Do beliefs about failure predict <b>group performance</b> ?	Beliefs about failure	0.73	3.03	0.004	0.18
<i>Condition 2</i> : Do antecedents predict <b>beliefs about failure</b> ?	Group leader coaching	0.26	2.15	0.04	0.65
	Clear direction	0.44	5.88	<0.001	
<i>Condition 3</i> : Does the effect of the antecedents drop substantially or become insignificant? ( $Y =$ <b>group performance</b> )	Beliefs about failure	0.56	1.40	0.16	0.14
	Clear direction	0.35	1.09	0.28	
	Group leader coaching	0.04	0.20	0.85	

NB dependent variable is in **bold type**.

content of different kinds of shared beliefs, it does help develop specificity about the appropriate level of analysis for conceptualizing a specific set of shared beliefs, which is one aspect of developing further clarity about the nature and content of cognitive constructs. Thus, just as beliefs about self-esteem are most appropriately conceptualized as an individual-level construct and beliefs about the amount of opportunity in a given industry may be most appropriately conceptualized as an organizational-level belief, beliefs about failure appear to be shared in groups and to constitute a group-level construct. The level of analysis speaks directly to the nature of a belief. Self-esteem is private and individual, whereas perceptions of industry opportunity are typically widely shared within a company. Methodologists such as Kenny and LaVoie (1985) have developed statistical criteria for establishing the appropriate level of analysis for measuring a given construct. For instance, a group-level variable must satisfy two criteria. First, it must be conceptually meaningful at the group level; for example, team size is a meaningful group attribute, internal motivation is not. Second, data gathered from individual respondents to assess the group attribute must converge, such that the intraclass correlation is greater than zero. The variable we explore in this paper, beliefs about failure, satisfies both criteria, and we argue that this is because of the interpersonal salience of failure. Thus, this paper begins to address an important substantive issue in shared cognition research, by arguing and providing empirical support for the notion that beliefs about mistakes, problems, and conflicts are a group-level phenomenon.

The study also provides insight into antecedents of shared beliefs about failure. The ability of team leaders to provide effective coaching together with the presence of a clear direction appears to facilitate the development of these constructive beliefs. This leaves many open questions related to understanding what behaviors managers and team leaders must utilize to foster learning oriented beliefs, which cannot be answered with these data. It may be possible for leaders to directly engage their work groups in activities such as seeking to uncover failure, as well as analysing failure, positive experience with which may in turn may give rise to learning-oriented beliefs. Issues such as what kinds of training and development would help managers promote learning-oriented beliefs and behaviors related to failure are subjects to be addressed in future research. We did not find evidence that organizational context support, such as resources and information, influenced failure beliefs. This may be because context support is not as tightly related, conceptually, to the kinds of interpersonal risks implied by discussions of failure, such that our model should be changed to include only clear direction and team leader coaching. These results may also be particular to this organizational context, such that additional research should be conducted, in more than one organization, before drawing conclusions.

Another implication of these results is that organizational efforts to develop a learning-oriented culture through vision statements and top management actions are not sufficient in and of themselves. In these data, work groups varied widely in how effectively they were able to take on the learning values promoted by the company. A question for future research to address is the nature of the relationship between organizational culture and learning orientation in teams. What relationship, if any, did the organization-level initiatives play in the teams' ability to develop learning orientations? Is there an interaction between organizational initiatives and team beliefs, or are team beliefs affected primarily by local managerial behavior and other proximal factors? These data support the idea that groups are under-emphasized and under-utilized as shapers of organization member beliefs and suggest further investigation to better understand how group level interventions can be used to promote desired organizational outcomes. Finally, this study suggests the possibility that group-level beliefs can mitigate the unpleasant emotions that can arise in confronting failures. It may be worth investigating whether group-level shared beliefs are particularly important or beneficial for tasks that give rise to negative emotions.

In summary, this work provides a useful beginning for understanding the nature of shared beliefs in organizational work groups; however, many questions merit further investigation. We need a more exact understanding of these beliefs and whether they should be considered mental models. It is also worth investigating questions such as how resilient are these beliefs about failure, and to what extent it is possible for members of learning oriented teams to spread this orientation to other groups with which they take interact. And, how vulnerable are these cognitions to being disrupted when newcomers join a learning oriented group? Future research thus may profit from examining the dynamic issues involved in shared learning oriented beliefs in work groups. The aim of this paper is to provide a platform on which to build future studies of learning from failure and of shared cognition.

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