

# AN INDUCTIVE STUDY OF FEEDBACK INTERACTIONS OVER THE COURSE OF CREATIVE PROJECTS

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While there is a large amount of literature on feedback, it is unclear how well traditional prescriptions for feedback apply during creative projects, since creativity often relies on nonlinear and ambiguous work patterns. We conducted an inductive study of feedback meetings in creative projects in two contexts—modern dance and product design—to understand how feedback might influence the development of creative prototypes. Our emergent findings reframe current theorizing on feedback by revealing its interactive nature: feedback providers and creative workers co-construct a problem space that provides openings for changing prototypes. Our analysis revealed sets of moves that feedback providers (*personalizing*, *puzzling*, *measuring*, and *prescribing*) and creative workers (*backgrounding*, *forecasting*, and *opening*) use to interact. We also found evidence that patterns among these moves helped guide one of two responses: (1) *excavations*, when feedback spurs comprehensive changes by prompting creative workers to return to old ideas, and (2) *adjustments*, when feedback spurs incremental refinements to the prototype. We integrate these findings into a process model that describes how feedback influences creative projects over time.

[T]he group meets together and they give feedback on each other's work. This is counterintuitive for a lot of people because what it means is you're showing incomplete work early. And most people, if you think about it, are doing creative work, and you're going in front of, let's say the director, and you're gonna show something which is flawed, right? So that's kind of an embarrassing thing to do and so your natural thing is you want to make sure it's right before you show it. The trick is, don't think that way. You show the early first guess at it and then you talk about it.

Ed Catmull, CEO & Founder of Pixar (responding to the question: "Do you have some sort of formalized meetings where people can come together and give feedback?"; *Economist*, 2010)

The notion that linking creative work and feedback is "counterintuitive" and potentially "embar-

assing" has a great deal of merit. For example, the ubiquity of brainstorming and its associated rule to "defer judgment" (Sutton & Hargadon, 1996) or "withhold criticism" (Osborn, 1957) has likely spawned a disconnect between creative work and feedback. So too has research on evaluation expectation, evaluation apprehension, and supervisor monitoring, which generally shows a reduction in creativity when ideas are evaluated (Amabile, Goldfarb, & Brackfield, 1990; Shalley, 1995; Zhou, 2003). Perhaps more fundamentally, because creativity requires the generation of something novel, creative work almost inherently challenges feedback providers' ability to interpret a new idea and provide useful advice for its development. However, recent work is beginning to establish a connection between feedback and creativity, providing some evidence that feedback can positively influence individuals' creative performance, generally leading to the generation of more ideas (Yuan & Zhou, 2008) or better creative performance as rated by a manager (Zhou & George, 2001). This research is an important first step because feedback is an almost universal organizational practice, and, therefore, linking feedback and creativity provides a critical organizational mechanism to enhance creative work.

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The emerging conceptual bridge between creativity and feedback has opened up possibilities for asking new questions about the nature of feedback in creative work. One intriguing possibility relates to organizations' reliance on long-duration projects (Drazin, Glynn, & Kazanjian, 1999) as a mechanism for nurturing the development of creative ideas. Long-duration creative projects (which we refer to as "projects" for simplicity) are commonly used and have generated creative innovations in a diverse array of settings, from those that emphasize technical sophistication (Ekvall, 1993; Sundström & Zika-Viktorsson, 2009) to those highlighting artistic virtuosity (Lorenzen & Frederiksen, 2005; Simon, 2006). Importantly, as organizations have adopted project work as a method of fostering creativity, they have similarly adopted methodologies for managing them. These methodologies, often based on design thinking processes or engineering protocols (Brown, 2008; Howard, Culley, & Dekoninck, 2008), generally include formal feedback meetings in which experts provide their opinions on what Catmull labels "flawed" and "incomplete work" (*Economist*, 2010). Yet, current theorizing does not focus on feedback directed at "incomplete work," but, instead, focuses on that directed at the creative worker; it focuses on feedback as a factor that might motivate individuals' future creative behaviors. This ignores the situation common to creative projects, where the goal of feedback is to enhance the creative idea being reviewed. The result is that we have little theory to guide the accomplishment of the "trick" of combining feedback and creative work mentioned in the opening quote: we have practices like project work and design thinking that link creativity and feedback without sufficient theory to show how feedback changes the creative ideas being reviewed as a result of these practices.

In this study, we attempt to build a theory of feedback interactions in creative work by addressing two issues. First, both generic models of feedback (Smither, London, & Reilly, 2005) and models of feedback specific to creative work (Zhou, 2008) typically depict the "content of feedback" as the primary factor that needs to be considered in order to understand the effects of feedback. In other words, what feedback providers say may be a critical factor in understanding the consequences that can emerge from feedback. Nonetheless, even though extant research on feedback and creativity provides broad labels about "constructive" (Amabile & Gryskiewicz, 1987) or "informative"

(Zhou, 1998) feedback, it remains unclear what feedback providers actually say, what verbal "moves"—actions and words used to compose a performance or interaction between workers (Pentland, 1992)—they make, and how their feedback influences prototypes. Further, in focusing on feedback provider content, prior research fails to fully appreciate the interactive nature of feedback meetings. In other words, we do not have adequate theory to explain how feedback providers and creative workers mutually shape the feedback experience, and how this interaction relates to the changes to a prototype that might occur. Hence, our first goal was to explore the content of feedback and to understand the moves feedback providers and creative workers use and how these moves catalyze changes to the prototype under review.

Second, the creative process, as it occurs over time, is nonlinear and fraught with ambiguity. There are often multiple paths that might lead to success (George, 2007; Lubart, 2001; Mokyr, 1992). The complex nature of the creative process can leave creative workers feeling "blind" (Campbell, 1960), or unsure how to proceed. The complexity and ambiguity of the creative process provides an additional opportunity for building theory, since feedback might serve as an important guide for helping creative workers move a project along. Yet, while we know little about what feedback providers might say to creative workers, we know even less about how feedback might evolve as a prototype develops over the course of a creative project, or how creative workers guide and influence this process. As a result, our second goal in this study was to better understand how feedback interactions evolve during the creative process.

To explore these questions, we conducted an inductive study of feedback meetings in two settings: (1) we appraised feedback given to modern dance groups by a panel of dance experts and (2) feedback given to two design teams in an award-winning research and design (R&D) department. In this study, we adopt a broad definition of "feedback" as *information that is communicated with the intent of improving the prototype under review*. To reduce complexity in discussing the two contexts, when discussing the target of the feedback, we use the word "prototype"—a commonly used label for drafts of creative work and one used in our settings.

Our emergent model emphasizes an often-overlooked aspect of feedback and creativity: feedback providers and creative workers are both struggling to arrive at an end point that, by definition, neither party fully understands, and yet they need to interact at points along this journey and help each other to have success. In highlighting this problem, our study makes several contributions. First, we reorient extant research by revealing that the moves feedback providers use to give advice to creative workers are enabled by and work with a set of moves that creative workers use to help shape the feedback. Put simply, our findings suggest that feedback is the result of the *interaction* between feedback providers and creative workers, and not a one-sided passing of information. This insight is practically important because, by recognizing this interaction, we reveal how creative workers help feedback providers understand the nature of the prototype and thereby enable prescriptive advice. Hence, an interactive perspective helps describe how feedback providers overcome the fundamental difficulty of providing advice on something that has never been created before. Second, in revealing the moves that are used in feedback interactions, our findings suggest that previous categories of feedback that have been described as somewhat antithetical can be complimentary. For example, our findings imply that “informative” and “controlling” feedback might work together to motivate changes to prototypes. Finally, we contribute to theory by highlighting how the *problem space* of a prototype—the set of possible solutions considered for a given problem (Newell & Simon, 1972)—is explored and, ultimately, co-constructed throughout feedback interactions. The exploration and co-construction of problem spaces emerged as a key mechanism that helps explain why, over time, some feedback interactions help creative workers return and retry previous ideas, and why some feedback interactions allow feedback providers to add new ideas to a prototype.

Since this is an inductive, theory-building study relying on methods that prescribe iterating between theory and data, much of the literature we review in the section that follows became apparent during data analysis “rather than being derived from prior theory” (Nag, Corley, & Gioia, 2007: 823). That is, the review below provides an overview of theoretical concepts and conceptual gaps that sensitized us to emergent themes in our analysis (see also Pratt, Rockmann, & Kaufmann, 2006).

## FEEDBACK AND CREATIVITY: SHIFTING THE FOCUS TO FEEDBACK INTERACTIONS AND ADVANCING PROTOTYPES

Creativity and feedback are both mainstays of organizational life, but, until recently, they appeared together infrequently in research. “Creativity” is typically defined as the generation of something that is both novel and useful or appropriate (Amabile, Conti, Coon, Lazenby, & Herron, 1996). Long-duration projects represent a common organizational tactic for developing creative products. These projects typically include formal reviews and feedback meetings (Howard et al., 2008). Current theories of feedback provide little guidance for what might occur in these feedback meetings. Henderson’s description of a cross-disciplinary team designing a medical device provides a grounding for surfacing gaps in our understanding of feedback in creative work:

The design was truly a team effort that included input from the technician, the product engineer, the manufacturing consultant, the drafter, and the physicians . . . the team designed them through sketching and discussion sessions of initial ideas, followed by sketches, often-altered drafts, and clean drawings . . . More sketching and talking among designers and between designers and the manufacturing consultant preceded the quick-and-dirty prototypes. These prototypes, in turn, facilitated tinkering and feedback, more tinkering and more sketching in the messy, nonlinear process moving toward a final, well-designed product.

(1995: 287–288)

Three important aspects of feedback are readily apparent from this description. First, the content of the feedback—the “discussion sessions of initial ideas”—is focused on the prototypes. Second, the feedback meetings were a “team effort” where “input” seems to emerge from both feedback providers and creative workers. Third, as the creative process unfolded, feedback evolved from an “input” that influenced “sketching,” “clean drawings,” and “quick-and-dirty prototypes” to a “discussion” and “talking” that “facilitated tinkering,” and, ultimately, formed a “well-designed product.” These transitions intimate that feedback might work differently at different stages in the creative process promoting distinct outcomes. As our review unfolds, we will illustrate how these three aspects of feedback are largely ignored in the extant literature. Although previous work has made great strides to link creativity and feedback, the existing literature

tends to: (1) look at the information in feedback as person focused with the goal of influencing the creative worker (rather than focusing on a prototype), (2) describe feedback meetings as one-way prescriptions (rather than two-way interactions), and (3) depict feedback meetings as one-time opportunities (rather than acknowledging that the nature of feedback likely evolves along with the evolution of a creative idea).

### **Content: Moving from a Person Focus to a Prototype Focus**

The *content* of feedback—the information that is actually communicated—is a primary antecedent in many models of feedback (Smither et al., 2005). Traditional dimensions of the content of feedback suggest that positive sign (e.g., “is the feedback affirming or disconfirming a behavior?”), task focus (e.g., “is the feedback directed to a task or to a person?”), and specificity (e.g., “is the feedback concrete and detailed?”) are more apt to generate positive changes in individual performance (Ilgen, Fisher, & Taylor, 1979; Ilgen & Moore, 1987; Smither & Walker, 2004). However, findings suggest that the non-algorithmic nature of creativity might require different ways of conceptualizing feedback content since traditional forms of feedback are generally less effective in complex tasks, such as creativity (Brehmer, 1980; Campbell, 1988; Hammond, Stewart, Brehmer, & Steinmann, 1975; Hoffman, Earle, & Slovic, 1981). For example, Fodor and Carver (2000) found that, for individuals with a high achievement personality, negative feedback (negative sign) improved creative performance on a common laboratory problem used to assess creativity. Similarly, some research hints that creativity can be aided by breaks in work; hence, feedback that leads to off-task tangents (e.g., non-task focused, nonspecific) might allow individuals to return to their creative work with new ideas (Goodman, Wood, & Hendrickx, 2004; Segal, 2004).

Not surprisingly, additional dimensions of the content of feedback have been theorized for creative work. In concert with traditional models, Zhou's (2008) review of the creative feedback literature also suggests that the content of feedback is the first predictor of the effects of feedback, but she proposes that “feedback style” is a critical component of feedback. Feedback style is the “manner in which feedback is delivered” (Zhou, 2008: 130) and is classified as either informative or controlling.

Informative feedback improves individuals' creative performance by maintaining their sense of intrinsic motivation, whereas controlling feedback might introduce extrinsic motivation and thereby reduce individuals' willingness to explore and be playful (Zhou, 1998). As with traditional models, this conceptualization of feedback content focuses on the creative performance of individuals. That is, both streams of literature view the content of feedback as an important first step in understanding how feedback might influence work, and both view the individual as the target of feedback.

While the focus on individual motivation is undoubtedly important, feedback for creative work is often directed at prototypes, not people. As an example, Hargadon and Bechky (2006: 491) described an interaction in which a creative worker seeks feedback from a colleague:

Katherine walked down the hall and asked, “Bob, I'm working on this thing and I'm kind of stumped. Can I borrow your brain?” Bob put down his work and the two of them found a nearby conference room where they then spent an hour working on Katherine's project . . . [This] led to recognizing that a section of software Bob had previously written could be adapted to help solve Katherine's problem.

In this instance, the feedback Katherine receives is not about her creative performance, but about a product she is trying to develop. The feedback that Bob provides is ultimately about implementing a solution that Bob has already invented. Because the solution comes from Bob, it is unclear if he is being informative or controlling—is he motivating Katherine or just solving her problem? This reveals the limitations about the existing distinction between informative and controlling feedback. The result is that, although the focus on individual motivation has been helpful, new theory needs to be built to better address how feedback influences prototypes, rather than people. Moreover, examples such as these indicate that the content of feedback is not unidirectional. That is, Katherine approached Bob and the two spent an hour together “working” on the problem. Hence, feedback content is likely influenced by the interaction of the creative worker and the feedback provider, as we discuss next.

### **Interactions: Moving from One-Way Prescriptions to Two-Way Interactions**

To date, the feedback literature has primarily focused on either feedback giving or feedback seek-



ing, rather than on considering how feedback givers and seekers interact with one another. When a review of the literature is constrained to focus specifically on feedback giving and creative work, the results are somewhat equivocal. For example, Zhou (2003) found that developmental feedback from a supervisor could enhance creative work, but only when creative coworkers were present. Indeed, in many field studies, the variables measuring creativity and feedback themselves are not correlated (George & Zhou, 2001, 2007; Zhou, 2003; cf. Zhou & George, 2001), and even the type of feedback giving studied is generally very narrowly defined (e.g., “supervisor developmental feedback” (George & Zhou, 2007; Zhou, 2003) or “positive feedback valence” (George & Zhou, 2001)). Overall, this suggests gaps about how feedback giving actually influences creative work. Similarly, in the feedback seeking literature—studies that focus on feedback seeking as an antecedent to performance—there is some mixed evidence. For example, De Stobbeleir, Ashford, and Buyens (2011) found that feedback seeking increased creative behavior as rated by a supervisor. However, Amabile, Barsade, Mueller, and Staw (2005) found that creative workers generally felt deflated after seeking feedback.

The equivocal results from each body of research suggest the need for attention to the assumptions underlying each, and for eliminating a somewhat artificial separation between the feedback giving and feedback seeking literatures. For example, the feedback giving literature assumes feedback providers are active purveyors of information and feedback seekers (creative workers) are either neutral or passive receivers (see reviews by Kluger & DeNisi, 1996; Smith et al., 2005). This arrangement is largely inverted in the feedback seeking literature: those seeking feedback (creative workers) are active, and those providing feedback are neutral or passive until a request is made (see reviews by Ashford, Blatt, & Walle, 2003; Morrison, 2002). In other words, the feedback giving and seeking literatures both portray one party in the interaction as relatively passive. But, what happens when we consider feedback providers and feedback seekers as both being active participants in the shaping of feedback? Might we better understand how feedback influences the development of ideas? Assuming active participation in feedback is particularly important for creative work since creative workers are often assumed to have a strong sense of ownership over their projects (Pierce, Kostova, & Dirks, 2001) and because evidence suggests that

they are often curious and like to engage in exchanging ideas with each other (Sutton & Hargadon, 1996). Indeed, Elsbach and Kramer’s (2003) study of Hollywood pitch meetings found that writers often shaped a meeting in such a way as to engage the creativity of the executives evaluating their pitch. This implies theorizing about feedback in creative work needs to address mutual influence between feedback providers and creative workers.

### **Process: Evolving Ideas Require Evolving Feedback Interactions**

Incorporating creative workers as active shapers of feedback becomes more important when considering how feedback might change over time. Because much creative work in organizations is accomplished via projects, and because creative work likely requires different inputs and different thinking at different stages of a project (Howard et al., 2008; Lubart, 2001), feedback interactions likely change as prototypes evolve. Unfortunately, most studies of creativity and feedback take place at one point in time. As a result, Amabile, Schatzel, Moneta, and Kramer (2004: 28) concluded that “[f]eedback mechanisms and changes in effects over time are largely absent from . . . current theories of organizational creativity.” The few studies that include some description of the dynamics of the creative process suggest that feedback during earlier phases of the creative process is different than feedback at later phases. For example, Baird, Moore and Jagodzinski’s case study of Rolls Royce found that “early design consultation supports tentative solutions and the growth of knowledge” (2000: 350). However, the content of feedback, as well as nature of feedback interactions, likely changes as a project progresses. As evidence, Yuan and Zhou (2008) conducted an experiment and found that the expectation of evaluation influenced creativity differently at different phases of creative work. Specifically, they found that the expectation of evaluation led to a reduction in the number of ideas during early stage creative work, but helped participants improve the appropriateness of their ideas during later stages of creative work.

The existing evidence on feedback and the creative process seems to support the conclusion that feedback interactions need to maintain a subtle balance: avoiding generating pressure early that might reduce the number of ideas that are considered but also maintaining contact throughout the creative process to help tailor ideas as they mature. Evi-

dence from Long Lingo and O'Mahoney's (2010) ethnographic study of the country music industry resonates with the precarious nature of maintaining this balance over the duration of creative work:

Producers needed to provide feedback on performances in ways that enabled artists and musicians to adjust their performances, save face, and remain open to new creative ideas . . . Affirming direction helped cultivate creative performances and gently guided performances toward a quality aesthetic that everyone could understand. By doing so, producers reduced ambiguity over quality while avoiding overt criticism, fearful that it might create a chilling effect on individuals' willingness to experiment and work toward their individual limits.

(2010: 70)

The upshot is that what little research there is that addresses how feedback shifts as ideas and projects develop suggests that feedback may need to change over time to not only accommodate prototype development, but also feedback providers' and creative workers' changing understanding of the prototype. To build theory then, research needs to explain how this happens, to show how feedback interactions change over time and how these changes influence the development of prototypes.

### Emergent Research Questions

Given our goal of understanding how feedback interactions enable prototype development in creative work, our review of the literatures suggests several questions that beg for additional theory building: How does the content of feedback precipitate changes in prototypes? How do feedback providers and creative workers interact to mutually shape feedback? How and why do feedback interactions evolve over the course of a creative project?

## METHODS

Because of gaps in existing theory, we used an inductive grounded theory approach (Corbin & Strauss, 2008; Edmondson & McManus, 2007; Locke, 2001). Moreover, because inductive, qualitative research is well suited for studying process or "how" questions (Creswell, 1998; Langley, 1999), this method aligned with our interest in understanding how feedback changed throughout the creative process. As Langley articulates, "Generally, it [process theory] demands a fairly large number of comparable incidents that are all richly" described (1999: 700). The meetings we captured

between feedback providers and creative workers—our "comparable incidents"—served as our primary data, which we supplemented with interviews and focus groups.

### Sampling

Sampling for theory building often relies on a logic of purposeful sampling on revelatory contexts where the dynamics of interest are more transparent (Patton, 2002; Yin, 2009). Our overriding sampling logic was to find contexts that had shown a history of successfully using feedback in creative work, enabling us to see feedback in action frequently and transparently. We began this study by observing feedback meetings with modern dance groups (this context and our data are described more fully below). Specifically, we observed experienced mentors providing choreographers in modern dance feedback on new choreography. Although originally intending to study the creative process more generally, we were struck by the feedback we observed and quickly realized that it seemed theoretically novel in many ways (for another example of adapting grounded methods to emergent patterns, see Hargadon & Sutton, 1997, and Sutton & Hargadon, 1996, who began studying the design firm IDEO to understand the creative process and then adapted their sampling to focus on brainstorming and technology brokering, respectively). To broaden our understanding, we negotiated access to an additional setting that relied on feedback to foster creativity: an award-winning R&D department of a company that designs and manufactures technical equipment (e.g., climbing harnesses, tents, backpacks, etc.) for outdoor enthusiasts. Both contexts relied on: feedback meetings as a part of the creative process, group creative work with groups guided by a leader, and a panel of feedback providers that offered a level of diverse knowledge within the area being judged (e.g., dance panels had critics, directors, and choreographers, and design panels often had supply chain managers, engineers, and executives). We discuss each context and the type of data gathered next.

**Modern dance.** Modern dance sets a high bar for creativity, emphasizing "avant-garde" or "bold, shocking statements" in dance (Friesen, 1975: 105). We worked with a long-standing program for choreographers designed to help them develop original pieces of choreography in modern dance. Choreographers apply to the program by providing a proposal for the dance they are developing. They are

then invited to perform prototypes of their work twice at roughly 4 and 8 weeks into the process. The entire process, from proposal to final performance, takes about 3 months.

During the prototype performances, the choreographers show their works in progress to a panel of mentors who provide feedback on the development of the work. Typically, the panel consists of the program director, who has taught dance extensively and received numerous fellowships and awards for her choreography, and a mix of two other choreographers, teachers, or critics. Since 1992, the program has taken place three times a year, and entrance to the program is competitive. We observed four cycles of the program, observing a total of 53 feedback interactions over the course of 2 years. Audio recordings of these interactions were all transcribed. We were also able to observe meetings among the panel in which they selected dances that would continue in the program and those that would be removed, and had access to 7 of the dance groups' rehearsals following the feedback meeting so that we could hear their reactions and see how the feedback influenced the choreography. In 17 interviews, we also asked choreographers and dancers their reactions to the feedback they received.

**Product design.** We gained access to the R&D department of a company that designs and manufactures technical products for outdoor enthusiasts. OutDesign (a pseudonym) makes a variety of products, including tents, trekking poles, skis and boots, climbing harnesses, and carabiners among others. Annually, the organization wins more than 50 design awards, both from within the outdoor sports industry as well as awards from design organizations that compare products across industries. We provided OutDesign's R&D department with two video cameras, one for each of two projects: Boot Group, a redesign of a ski boot, and Helmet Group, a redesign of a climbing helmet. We instructed each group to film as many of their prototype review meetings as possible over the course of 8 months. These meetings were an opportunity for the team to present prototypes to other team members and, most importantly, to other stakeholders within the organization. Ultimately, this produced 33 useable meetings for analysis: 17 for Boot Group and 16 for Helmet group. Boot Group was a longer project (18 months), so the 17 videos capture the second half of the creative process. In contrast, Helmet Group was a relatively fast project (7 months) and the videos, while they do not capture every meeting

or design decision, catalog the major meetings throughout the entirety of the creative process. After gathering this data and initial analysis, the first author conducted 5 informal interviews with leaders from the R&D department and a 3-hour focus group with 20 members of the R&D department. Since this focus group occurred during a later, more mature phase of our analysis, we used it as an opportunity to ask questions about creative workers' experience of feedback and to do some preliminary member checks (Lincoln & Guba, 1985) regarding emergent themes in our data across the two settings.

Our data are summarized in Table 1. In sum, we were able to gather data that captured 88 feedback interactions. These interactions serve as our primary data. Our observations of modern dance group reactions, formal interviews with choreographers and dancers, and a focus group and informal interviews with product designers provide additional data for triangulation. Finally, it is worth noting that the two designs we observed (helmet and boot) have been launched as retail products and the dances were performed for paying audiences, so there is some evidence that the final outcomes in our study were not only creative but also economically viable.

## Data Analysis

We used a grounded theory approach (Strauss & Corbin, 1990) to explore the processes of feedback during creative work. During the data collection process, we met weekly to discuss emerging patterns in the data and kept memos to record insights (Charmaz, 2006). These early discussions helped sensitize us prior to a full-fledged analysis of the data we collected. Once we had collected our observations of feedback meetings, we followed a three-stage process of coding the data to build theory (Pratt et al., 2006).

**Stage 1: Developing first-order concepts.** In the first step, we began with open coding. As Bechky and Okhuysen (2011) observed, there is little methodological guidance for how to pool qualitative data across contexts. Therefore, we decided to code both contexts together (e.g., each coding session would include data from both contexts), rather than code all of the data from one context and then move to the other. This decision was informed by consultation with colleagues with considerable experience publishing qualitative research, and based on the logic behind open coding. As Corbin and

TABLE 1  
Summary of Data Collection and Analysis

	Type of Data and Site		Use in Analysis and Theory Development
	Dance	Product Design	
Context Prototype discussed Participants involved in feedback interaction	Part of developmental program Choreographic work in progress Panel of mentors, choreographers, dancers	Part of internal R&D process Product in development Designers, engineers, supply chain managers, project managers, executives	
Number of groups of creative workers	29	2	
Longitudinal nature of data	2 feedback meetings over 3 months: 28 groups at 1st meeting 25 groups at 2nd meeting	Multiple feedback meetings over 7 months: 16 meetings for Helmet Group 17 meetings for Boot Group	Transcripts and video coded to provide primary evidence for understanding feedback provider, creative worker, and response moves.
Total number of feedback meetings in data	53 observed in person and transcribed	33 video recorded and transcribed as necessary	Provided foundation for data structure. Engaged in memo-writing and co-author discussions to assist in developing theory.
Interviews/Focus Groups	17 interviews	5 interviews; 3-hour focus group with 20 members of R&D	Provided supplemental evidence to understand the motivation behind particular moves and to understand what ideas creative workers considered outside of the feedback interactions.



Strauss described, open coding “is designed to break open the data to consider all possible meanings” (2008: 59). We felt we could best access a variety of meanings by examining data across contexts at the beginning.

Using an open coding logic, we relied heavily on in vivo codes or verbatim statements to categorize dynamics that seemed related to feedback in a given context. We decided to have each author code the same data separately, and then we met to discuss our coding. For the dance data, we worked from transcripts and video to code, whereas, for the design data, we primarily worked from the raw video data of OutDesign to code. For OutDesign, we would watch the video, starting and stopping, to summarize interactions (including the gist of the conversations, the interactions among the speakers, and any notable physical expressions, such as the handling of particular items). Then, we would code those interaction summaries. Finally, we would return to the video to transcribe selections of dialogue that illustrated the nature of particular types of interactions.

We began by looking at feedback interactions broadly, and then circled back to find interactions that we could link concretely to changes in prototypes at subsequent feedback meetings. For this purpose, our video data proved invaluable in allowing us to track changes to prototypes and the responses from the creative workers themselves since it allowed us to see visual evidence of changes in prototypes over time. Data from our interviews with creative workers also helped inform our understanding of how and why creative workers responded to particular feedback moves. Once we reached a point of theoretical saturation (Corbin & Strauss, 2008), where additional cycles of open coding revealed no new codes, we moved to the next stage of our analysis.

**Stage 2: Discovering second-order themes.** During this stage, our analytical strategy shifted to axial coding: understanding how our first-order categories fit together to suggest more abstract, theoretical categories. Part of the logic of axial coding is the notion of connecting concepts that emerged through open coding through the process of comparing and contrasting. In order to facilitate this process, we compared codes from feedback interactions that resulted in a visible change in a prototype to those that did not, from early- to late-stage project work, and across contexts in order to further our understanding of feedback moves and how they were used over time. Using comparison groups in analysis provides “con-

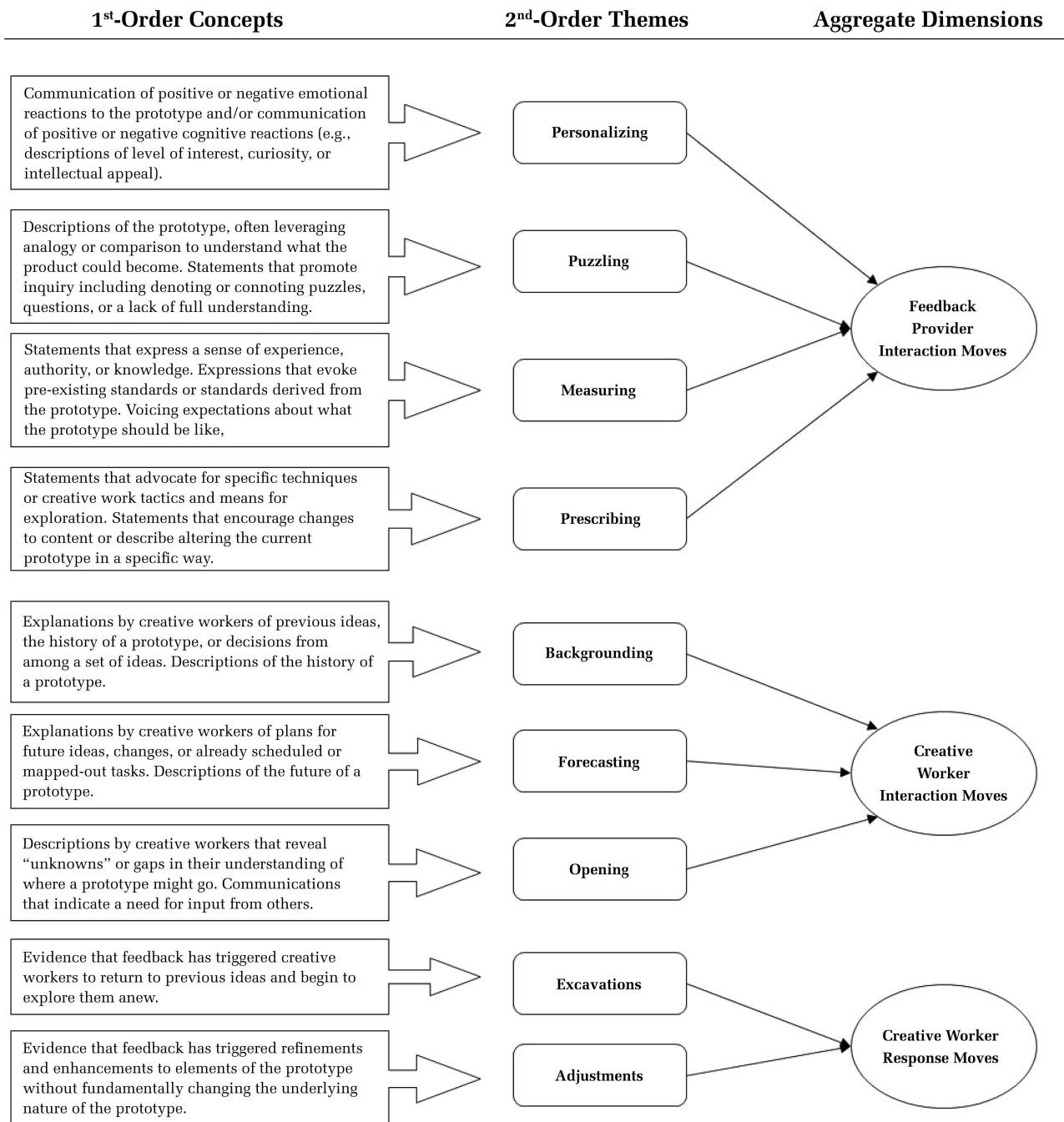
trol over the two scales of generality: first, conceptual level, and, second, population scope” and provides “simultaneous maximization and minimization of both the differences and the similarities of data that bear on the categories being studied” (Glaser & Strauss, 1967: 55). For example, within this stage, we began to notice and unpack differences in how creative workers revised their prototypes in response to feedback, and differences in the pattern of interaction moves that preceded these different responses. Although we selected our contexts in part because of their similarities (thereby controlling for some dynamics), some differences remained; most notably, the smaller number of feedback meetings for the dancers, and the opportunity for internal members of the design teams to provide feedback to one another. We discuss these differences more fully in our limitations section, below.

**Stage 3: Aggregating theoretical dimensions.**

At this stage, we began iterating between data and theory more frequently to inform the patterns we were beginning to see in the data and to better differentiate in our own minds the feedback we witnessed with what was described in the extant literature. As we became secure with our theoretical categories, we began to examine underlying dimensions to discover how these categories fit together to best capture the dynamics we witnessed. For example, we found that some categories were directed at emotional and cognitive reactions to the prototype, whereas as other categories centered on understanding the prototype in relation to existing standards. We summarize the emergent structure of our data in Figure 1 (Corley & Gioia, 2004). Table 1 describes the data sources we used to understand feedback providers’ moves, creative workers’ moves, and prototype changes.

As our framework began to coalesce, we became aware that different kinds of prototype changes occurred at different stages of the projects, and that these changes seemed to be preceded by different patterns of moves. This gave us the wherewithal to begin to build a process theory of feedback interactions. In focusing on process, we followed Langley’s (1999) advice and identified the “activities” that make up the process—or, as we label them here, the “moves.” By “detecting the patterns” among these moves, we tried to understand “how things evolve over time and why they evolve that way” (Langley, 1999: 692). We noticed that certain moves served as anchors—or moves that drove the content of the interaction—with other moves sup-

**FIGURE 1**  
**Data Structure**



porting these anchors, and that particular anchors seemed to lead to particular response moves. We tested these patterns against our data and used additional interviews and a focus group as participant checks to further sharpen and refine our theorizing. These steps allowed us to increase the

dependability of our data, helping us ensure that "that the resulting interpretations authentically and plausibly, though not with absolute certainty or accuracy (Golden-Biddle & Locke, 1993), explain the studied phenomenon" (Reay, Golden-Biddle, & Germann, 2006: 983).

The patterns among feedback moves that best explained the outcomes in our data are similar to Pentland and Rueter's (1994) observation about routines. They observed that:

[A] routine is not a single pattern but, rather, a set of *possible patterns*—enabled and constrained by a variety of organizational, social, physical, and cognitive structures—from which organizational members enact particular performances. There are many different variations . . . [but each] instance is also, to a greater or lesser extent, the effortful accomplishment of the participants and the *emergent product* of their interactions.

1994: 491, emphasis added)

Similarly, we did not find a definite order of moves per se, but patterns that showed a reliance on subsets of moves (anchor and omitted moves), and that these particular subsets were related to particular outcomes. This is consistent with a process theorizing lens: focusing on necessary conditions for outcomes rather than necessary *and* sufficient conditions. The resultant theory offers a “recipe” for the necessary conditions that “strings them together in such a way as to tell the story of how [the outcome] occurs whenever it does occur (Mohr, 1982: 37)” (as quoted in Markus & Robey, 1988: 590).

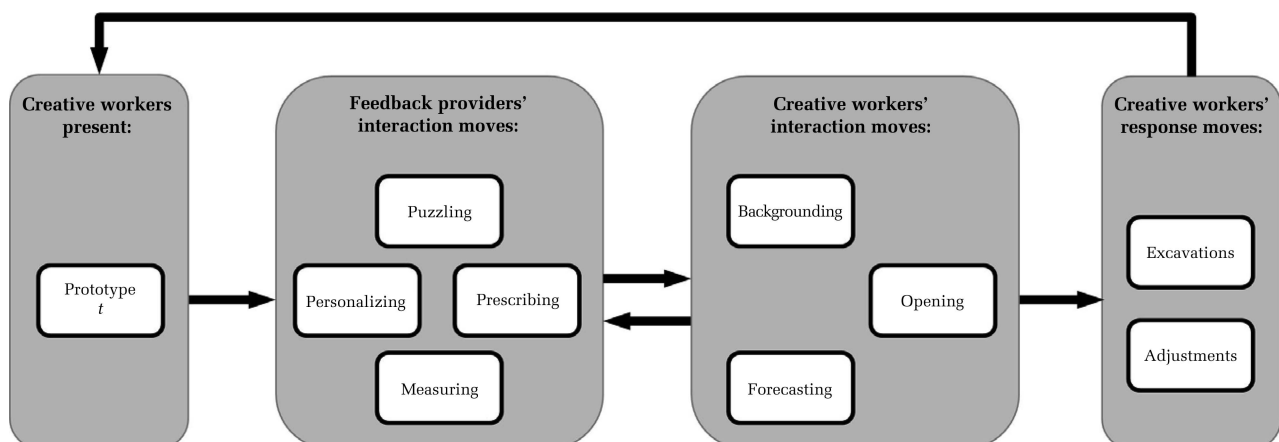
### FINDINGS: FEEDBACK INTERACTIONS AND PROTOTYPE CHANGES

Creative projects are inherently complex. Meetings between feedback providers and creative workers provide one point of influence where new

information and ideas can arise and shape a creative prototype. In building a process theory of feedback interactions, we begin by defining the moves that the participants relied on. Moves are inherently interactive (Goffman, 1981), requiring the deployment of knowledge (Levinson, 1983). Workers' skillful patterning of these moves determines the effects of their performance (Pentland, 1992). We define the individual *interaction moves* that feedback providers and creative workers make during feedback interactions separately. We also describe how, after feedback meetings have ended, creative workers use *response moves* to produce an updated, changed prototype. After explaining these moves in isolation from one another, we spend the remainder of our findings illustrating how these moves work together in an interaction, focusing on the different patterns of interaction moves that seem to give rise to different response moves and describing how these patterns evolve over the course of a creative project.

By way of preview, feedback providers relied on four interaction moves in their efforts to influence prototypes: (1) *personalizing*, (2) *puzzling*, (3) *measuring*, and (4) *prescribing*. During feedback interactions, creative workers relied on three interaction moves to help provide more information about the state of their prototypes: (1) *backgrounding*, (2) *forecasting*, and (3) *opening*. Finally, creative workers also used two response moves to change their prototypes after feedback interactions: (1) *excavations* and (2) *adjustments*. That is, response moves occurred during creative meetings after a feedback interaction as a way of addressing the feedback. As

FIGURE 2  
Feedback Provider and Creative Worker Moves within Feedback Interactions



shown in Figure 2, these moves can be depicted as a cycle in which creative workers present a prototype that can spur a feedback interaction—an amalgam of feedback provider and creative worker moves—which can facilitate creative worker response moves, which, in turn, can generate new prototypes that are presented at the next feedback interaction. Table 2 has additional evidence for these moves.

### Feedback Provider Interaction Moves

**Personalizing.** Initially, we were surprised by the explicitly subjective, emotional content embedded within the feedback provided to creative workers, particularly since objectivity is often described as a desirable feature of feedback (Kinicki, 2008; Kopelman, 1986). Personalizing was a way for feedback providers to express their subjective, visceral reactions to prototypes. Feedback providers used phrases like “I love this!”, “I’m really excited about this!”, or, conversely, “I hated this!”, or “what bothered me most was . . .” These emotional expressions often felt interchangeable with a set of more cognitively oriented expressions that reflected a feedback provider’s sense of being “interested” or, conversely, “confused” by a prototype. For instance, while narrowing down the set of materials that would be used to build the final product, we saw design team members bend and feel the materials in their hands and utter, “Wow! This is cool.” Feedback providers would also talk about being curious. For example, a feedback provider expressed to a choreographer, “I was curious about your costuming . . .” Overall, personalizing provided an emotional/cognitive cue about how a feedback provider reacted to the prototype.

**Puzzling.** Feedback providers used puzzling to describe back to creative workers what they observed in the prototype. Puzzling often made it clear that feedback providers were wrestling with what they had seen or heard, resulting in questions that expressed gaps in their understanding or metaphors that helped them establish their sense of what the prototype could be. As an example from the design context, a feedback provider puzzled:

The real goal and vision is that it’s got to be a helmet that isn’t a helmet. I want trade guys to look at it and say, “You should be thrown in jail.” I want it to be that provocative, and then we’ll know we’re on the right track. Optimizing what we’ve got is a good option, but if we could get it sub-200 (grams) and more durable? [Pause]. What if it’s 150 “g” and

extremely provocative? What if it is extremely safe, light, expensive, and beautiful?

Puzzling also included the use of metaphor and analogy. For example, after seeing a prototype that used balloons in the dance setting, a feedback provider commented:

It reminded me of a Hallmark card that came alive. So, at first I was thinking, “Oh that’s sweet,” as the balloons would come up. But then it was sort of like you were making a dance that seemed to be sort of a pseudo-ballet, which is a very hard thing to do, by the way, because everybody knows what ballet looks like. So, it’s sort of a pseudo-ballet with a gimmick, and a gimmick that was sort of like the jimmies on top of the icing.

The feedback providers’ layered analogies—a Hallmark card, a ballet, a cake with icing and sprinkles (jimmies)—helped establish what the prototype might be. These strategies allowed feedback providers to vocalize their questions or tentative understandings of the prototype.

**Measuring.** Feedback providers used measuring to introduce their prior experience or expertise, highlight an external standard or measure, or emphasize an internal standard emerging from the prototype itself. Feedback providers raised standards as a point of concern or opportunity to push a prototype further. For example, in designing a new ski boot, designers had to consider the existing standardized attachment mechanisms that locked the boot to the ski. Feedback providers also invoked standards in dance. For example, a dance feedback provider noted, when observing a prototype that she felt melded modern dance and theater, “I’m letting my other backgrounds come into this because this is obviously theater, . . . [so] let it be theater and then let it be dance and don’t try to minimize the two.” In another example, a modern dance group attempted a ballet technique, evoking this response:

You know, so if you’re going to do a bourrée, you know exactly what a bourrée is supposed to look like. So if you’re going to do that, it has to really be perfect. If you’re going to vary it, you have to be very clear what the variation is and you have to do that . . . You have to be very clear in terms of the technical approach and how it’s varied. If not, it just looks like, “Oh, they are trying to do something that they really can’t do.”

The standards in this context, then, related to standards in movements and choreographic form, such as the balance of repetition and variation.



TABLE 2  
Dimensions, Themes, and Quotations

Aggregate Dimension	Second-Order Theme	Context Examples
Feedback Provider Interaction Moves	Personalizing	DANCE: It was <i>great</i> . I mean, I'm really <i>excited</i> to see where it goes. DANCE: I was <i>very engaged</i> at the very beginning and the script and the voices; I would say that really be aware of there was sort of balance when there was like speaking to each other really genuinely and also engaging and addressing your lines to the audience. And then, somehow, I did become less engaged as it went on. I was thinking, "Am I distracted by the movement like voice? Here we go, talking about something and then we go to this new movement." But, then again, I like some of the theatrical choices that were decided upon. Then, toward the end, I sort of <i>became re-engaged</i> . DESIGN: I <i>love</i> this! DESIGN: A feedback provider is holding the helmet prototype, rolling it around in his hands, and utters " <i>very cool</i> [pause] really really cool."
		DANCE: I <i>didn't know</i> where to focus, what to listen to, and what I was watching. <i>Am I supposed</i> to listen or watch the movement? Do you know what I mean? DANCE: Where you guys have done this circle of fast, fast, fast, and, you know, I <i>think you're saying something there</i> because the energy in the beginning is this fast, fast, fast, fast in place separate. So, here we are, fast, fast, fast; <i>somehow we're in here together again, so there is something there that's going on about individual manic</i> . You're saying something and we get all this on a sub-cortical level and we're not going to think it but it's like, afterwards, when we're feeling all intellectual with a glass of wine, it will just come to us, but the audience in the moment, though, if you're aware that you've just done that, taking energy kind of similar when you're taking it from separate and isolated to brew. DESIGNERS: <i>My question is</i> , from the perspective of workload, <i>this looks</i> like three to four more times than the previous spring, <i>is that right?</i> DESIGN: I'm <i>always amazed</i> at how effective nylon screens are at stopping a cat. [laughs] They just pluck them like a harp—they don't really damage them, I'm amazed at how resilient they are.
		DANCE: <i>I've been there</i> , you know what I mean? DANCE: That kind of thing needs the piece of theater behind it, the physicality. That's what I'm saying. It's like were this not to be funny, <i>it has to be so clearly because you're using bodies in ways that are inherently not the way bodies are used</i> and that context with which that's evolving has to be mirrored. DESIGN: <i>In the past, we have had problems with this sort of solution</i> . . . all the elastic had just let go with age. DESIGN: So I'm sorry, and maybe I missed this earlier, but we're shooting for <i>CE and UIAA certification</i> .
		DANCE: <i>Work on</i> the ending. The ending has far more priority. DANCE: The solo, <i>it needs</i> a little bit more eye contact, a real connection. DESIGN: <i>We need</i> to try to rule out or rule in the Kevlar. DESIGN: The more [the boot] is getting relatively intricate and seemingly delicate design in that area, the more that shelf isn't supported as much as maybe it could be . . . I think <i>we need</i> a design where there is shelf material and then secondary material that supports it.
Creative Worker Interaction Moves	Backgrounding	FP: I know what I want to ask you about, what you're planning on wearing. And, if it's going to be all black, the answer is "no." CHOREOGRAPHER: No, <i>we're not, we're not. I'm actually thinking gray, but not white</i> . FP: Where are your musical ideas from? CHOREOGRAPHER: It's a Spanish tango and a waltz. And Chopin's— <i>those are just two that we are looking at</i> but that's also a waltz. I'm kind of going for the Spanish. DESIGNER: <i>We've been looking</i> at a semi-flexible shell and we've got a few different ways that we're trying to mock that up [the designer hands out a Kevlar prototype, an EPS-Kevlar bonded prototype, and a thin PC example]. DESIGNER: <i>We have done some testing</i> of the boots and most testers felt pressure on the instep. We adjusted the last and liner and we think this has improved the fit overall.

TABLE 2  
(continued)

Aggregate Dimension	Second-Order Theme	Context Examples
Creative Worker Response Moves	Forecasting	<p>CHOREOGRAPHER: We wanted to show you something that gave you <i>a little bit of sense of what we're going to be doing</i> but we will be continuing after the music.</p> <p>CHOREOGRAPHER: <i>The costuming is going to be whiter but we're also going to have gloves that have very long fingers</i> . . . One of my goals with the costumes was to try to break apart what's the normal-looking human form into something that looks a little less human.</p> <p>DESIGN: <i>We're planning on</i> adding a heel shock absorber. So that's something we'll have in the future prototypes.</p> <p>DESIGN: <i>We want to try</i> different colors and graphics [beyond the ones shown] to get a really provocative look to this.</p>
	Opening	<p>FP: Do you have sense of costuming? Is there anything?</p> <p>CHOREOGRAPHER: <i>The costume is still up for discussion among us.</i></p> <p>CHOREOGRAPHER: I'd like it if we could start out with everybody on there, but we're choosing where the piece is going that needs to be. <i>It's something that we need to do.</i></p> <p>DESIGNER: I want to show the Kevlar . . . and <i>that's where I'm not sure</i> if we want the graphic to mimic the Kevlar.</p> <p>FEEDBACK PROVIDER: So are you going with this blue prototype?</p> <p>DESIGNER: <i>I'm not sure.</i> I'd like to hear what others think.</p>
	Excavations	<p>CHOREOGRAPHER TO FP: I took your feedback on, really using the movement to find the story, and it took me somewhere completely different, much more fulfilling.</p> <p>FP: And I think, you know, it works, it's kind of quirky, it's funny. I think more and there was something very rhythmically even for a long time in there. You were kind of moving and moving and so I think playing around also with a certain tension of different rhythms, even silence, playing a little bit.</p> <p>RESPONSE: The feedback reminded the choreographer of the goals of the piece—to be funny. In response, she continued to work with and explore humor as she continued to choreograph. She commented, “I think it's looking really good. I think it's hilarious.”</p> <p>FP: There is a mountain bike helmet that uses Kevlar stringers somehow through the EPS to hold it together in a big crash.</p> <p>DESIGNER: I have a picture of one of those that is sectioned on a wall. It's a really cool concept.</p> <p>FP: Yeah, they are just nylon strings.</p> <p>DESIGNERS: We decided to use our previous design. So it's very similar to the cuffs on our old boots.</p>
	Adjustments	<p>FP: I feel that you have to make a choice, is it a dancey piece which has to do with manipulating [a] theme variation of movement, or does it also have a dramatic element?</p> <p>CHOREOGRAPHER [in interview]: We talked about the poem. [A dancer] had just brought up questions that she had about the poem, and I kind of related it to themes that I know they could just understand like in their lives.</p> <p>FP [in 1st meeting]: When he is doing his wonderful little soliloquy about giving me space and all this kind of stuff and you have the women come in and dance around him, I think it would be my sense it would be stronger if you just had the women behind him the whole time and just hover over him.</p> <p>FP [in response to choreographer's change in 2nd meeting]: You give him sort of a personhood and almost a backstory that nobody else knows, because he is the only guy. It's a very tender moment.</p> <p>FP: You have some protruding plastic where these overlap, is that a matter of machining?</p> <p>DESIGNERS: That was not intentional. We'll get that fixed.</p>

**Prescribing.** Prescribing allowed feedback providers to offer guidance about how creative workers might pursue changes to a prototype (a focus on tactics), or guidance about what could change in a prototype (a focus on content). For example, in the Boot Group, a manager recommended, “You might try making models with 6, 4, 3, 2, and 1 millimeter foams and see which provides the best fit and that will give you opportunities to choose from.” Prescribing could also focus on the actual content of the prototype, as feedback providers offered specific changes to the content. These comments often took the form of things that “should” or “needed” to be done. For example, in the dance context, one feedback provider claimed, “When you have that little transition where you’re going from a quartet to a trio, be real clear about how it goes from one to the other. It should be seamless and I think that’s what you’re going for, so just work on the transition how people get together and how they leave.”

### Creative Worker Interaction Moves

**Backgrounding.** Creative workers used backgrounding to explain the history of the prototype. This was rarely a generic overview of the history of the creative project, but generally a response to a specific piece of feedback. For example, a feedback provider asked a choreographer about how she was using balloons in her piece. The following exchange resulted:

CHOREOGRAPHER: Well, we were going to use like air blown balloons so they are on the floor, not on strings. They are like moving with us. We just felt, like, originally we had left the balloons on stage but we didn’t want it to look messy and cluttered on the stage, and that’s why we had them take them off, and then I ended up just actually focusing on the dance before we let out the balloons.

FEEDBACK PROVIDER: When you started this piece, did you say, “Okay. What do we want to do? I know, let’s make a piece with balloons.” Were the balloons just sort of the initial impetus for doing this?

CHOREOGRAPHER: Yes.

During review meetings for the Boot Team, the designers often presented prototypes or images of designs with additional background; for example, “One of our thoughts was that for one model we could add rubber lugs to provide more traction” and “This is the latest artwork of the liner and these

are our samples [and they show] a few different concepts that we’re trying.” Statements such as these allow creative workers to open up the black box on their creative process and reveal ideas they had explored prior to presenting their prototype, giving feedback providers a broader perspective on the options that creative workers have already considered and the rationale behind their current decisions.

**Forecasting.** Sometimes, instead of explaining the background behind a set of creative decisions, creative workers simply found themselves acknowledging the limits of a current prototype but describing changes they had already planned on making. Prototypes are, by nature, unfinished approximations, so it seemed natural for creative workers to provide descriptions that helped fill in some of the missing pieces of a prototype. We labeled this move “forecasting” because it allowed creative workers to explain how an undeveloped feature of the prototype might be handled in the future. For example, a feedback provider asked the creative workers on the Helmet Team about the prototype’s structural rigidity:

FEEDBACK PROVIDER: Do you envision this being, because the dart penetration is only a small area, so do we envision just a section of fabric underneath a super thin shell?

DESIGNER: So that’s what we’re doing next week is to think what is the best way to make a structurally sound helmet all the way around.

As another example, in one dance prototype, a choreographer noted that, in the future, there would be a specific set of “isolated solos and duets that are sort of expressing feelings like the continuum between being in control and executing things.” In both cases, the creative workers are hinting that they have already begun to think through the issues within the prototype and are explaining their future plans for the prototype and its development.

**Opening.** Whereas backgrounding and forecasting reveal what creative workers have already explored or have already planned to explore, “openings” allowed creative workers to reveal aspects of a prototype that they had not fully thought through or issues they had not considered before the feedback meeting. For example, with the Boot Team, a feedback provider asked about the design for the buckles, and the designer responded, “We haven’t gotten that far yet.” Similarly, in a feedback interaction within the dance context, a feedback provider commented on what they were enjoying about the piece:

FEEDBACK PROVIDER: I support this counting act, it was really, really cool and I like all this sort of varying theme and I think it really defines diagonal and it's all on a diagonal and you sort of like shifted into a slight, direct climb upstage in turns. It's very clean.

CHOREOGRAPHER: I mean we just called these decisions. Some if it is just kind of what's happened. We just recently started rehearsing this piece.

FEEDBACK PROVIDER: This morning? What time?

CHOREOGRAPHER: It's fresh.

Statements like "we haven't gotten that far" or "it's fresh" or even the more common "I don't know" put the creative workers and the feedback providers on the same level in terms of their familiarity with a prototype. Because, in these situations, the creative workers did not have additional background knowledge or forecasted plans, these moments seemed to provide opening events for feedback providers to provide more direct advice.

### Creative Worker Response Moves

**Excavations.** Response moves were moves indicating creative workers' "response" to feedback providers vis-à-vis making changes after the feedback meeting to the next iteration of a prototype. Excavations were a one of two response moves we observed, and were evident because they involved changing a significant portion of the prototype, generating a thorough reformulation from one prototype to the next. For example, after feedback about the rigidity of a prototype using a "pod" structure, the designers of the Helmet team generated a new prototype that returned to a "honeycomb" structure they had brainstormed earlier. As an example from dance, a group had presented a prototype in which they surrounded themselves with shoes and clothing. The feedback providers questioned the intention behind the props. In their next presentation, the group had replaced these objects with fairly generic pieces of fabric that they had rehearsed with earlier. We labeled these response moves as "excavations" since, surprisingly, these changes related to moments where feedback providers' input aligned with ideas the creative workers had previously explored, but had "buried" and not included in their current prototype. As such, excavations allowed the creative workers to "dig up" old ideas to address feedback providers' concerns or questions.

**Adjustments.** In contrast, some feedback was linked to incremental refinements. We labeled these response moves "adjustments." In contrast to excavations, adjustments were often proposed by and originated from ideas of the feedback provider, but they tended to have a smaller impact on the overall design or concept of a prototype. These adjustments generally required small additions or subtractions to the existing prototype, refining the prototype but not changing a critical feature of the prototype. For example, in the Helmet team, creative workers used adjustments in determining colors and graphical elements for the helmet, refining the prototype without dramatically changing the composition of the design. Similarly, choreographers used adjustments to respond to suggestions about music, costuming, or precise movements.

### Patterns of Interaction Moves and Response Moves

By providing longer portions of interaction data coupled with evidence of changes in future meetings as well as interviews with creative workers, we illustrate how some patterns of interaction moves seem to serve as necessary conditions for certain response moves. Our data revealed that feedback provider interaction moves served as necessary conditions to elicit certain creative worker interaction moves, and that the patterning of these moves could serve as a necessary condition for creative worker response moves. We found that certain moves seemed to "anchor" or drive interactions toward particular response moves. By "anchored," we mean that a particular move set the tone for the interaction and conveyed the central meaning or goal of the interaction, with other moves serving to support exploration of the content contained within the anchoring move. To be clear, the moves were not used in linear patterns; instead, feedback interactions produced what might be termed a "mandala" pattern, or a circular series of moves notable for the interaction moves that served as the content anchor(s) (as well as the interaction moves that are omitted). Specifically, we found interactions that anchored on puzzling (for feedback providers) and/or backgrounding (for creative workers) moves, but omitted measuring and forecasting, helped the emergence of an excavation response move, whereas interactions that anchored on measuring (for feedback providers) and/or forecasting (for creative workers) moves, but omitted puzzling and backgrounding, helped the emergence of an adjustment response move. Importantly, we found



that opening moves by creative workers served as a sort of critical turnkey that enabled feedback providers to engage in prescribing moves. We detail these patterns next.

### **Interaction patterns that lead to excavations.**

By way of illustration, in the first feedback meeting for a group of modern dancers, the following interaction emerged:

In this interaction, the choreographer uses a series of opening moves (lines 2 and 4) to reveal that she had not thought through the issues the feedback provider was assessing via puzzling (lines 1 and 3). The choreographer's use of opening moves in this back and forth allows the feedback provider to be more directive and use prescribing to ask for changes in the next prototype (line 5). When the choreographer presented a revised prototype in the next feedback meeting, the new prototype incorporated the sense of unison the feedback provider had requested. This change was evidence of an excavation since, although the group originally presented a prototype that did not feature unison, it had been a feature they had explored in earlier rehearsals.

A purely linear schematic of this interaction could be diagrammed like this:

Puzzling → Opening → Puzzling → Opening → Prescribing → Personalizing → Prescribing → Excavation

However, the move that anchors the content of the interaction, that drives the information being exchanged, is the puzzling move (line 1), and the participants move back and forth between puzzling and opening. Hence, the interaction has a more circular nature:

Puzzling ↺ Opening → Prescribing ↺ Personalizing → Excavation

The circling back helps reveal the anchor move that is driving the content of the interaction and helps determine the outcome. Note that there is also circling back between prescribing and personalizing; however, in this case, these moves are informed by the puzzling move—"was it supposed to be the same?"—that happened earlier in the interaction. Taken together, this interaction shows how *puzzling* moves can lead to *opening* moves, which allow for *prescribing* moves that suggest changes that creative workers incorporate through an *excavation* response move.

Whereas the prior example focuses on how puzzling, a feedback provider move, can (in conjunction with other interaction moves) precipitate an excavation response, the next example from the design context reveals how backgrounding, a creative worker move, can precipitate excavation. In this example, prior to the interaction presented below, the designers had spent several minutes passing out different prototypes of helmets and outlining two different design directions the team could follow. This served as an extensive series of backgrounding moves, the anchor, to help the feedback providers understand the state of the project. The following conversation served as a sort of culmination to the meeting:

The prototypes presented in the next feedback meeting featured changes that followed the prescriptions from lines 2 and 3. The changes resulting from these prescriptions were evidence of excavations since they roughly matched an idea the group of designers had discussed in one of their first brainstorming meetings: "One direction we can go is clearly optimizing what we've already made. Just optimizing what we've got is a good option. My personal

(1) FEEDBACK PROVIDER: I can only comment on what I saw, and some of it, I don't know if it's performance or choreographic, so that's why I'm asking questions—Was it supposed to be different, was it supposed to be the same? I'm asking you a really specific question.	Puzzling (anchor)
(2) CHOREOGRAPHER: I don't know yet.	Opening
(3) FEEDBACK PROVIDER: So you didn't direct them?	Puzzling
(4) CHOREOGRAPHER: No, I wasn't sure of that.	Opening
(5) FEEDBACK PROVIDER: Everyone is different. So I would say that's extremely, extremely important because it's either unison or it isn't. So we either have these isolated individuals, so, in terms of setting it up, that was the first thing we saw. So, that's fine. You were confused so we were confused. I mean you have to make a decision.	Prescribing Personalizing Prescribing

(1) DESIGNER 1: I advocate we go with this bluish prototype. That's my gut feeling. I'm curious to hear others' thoughts.	Opening
(2) FEEDBACK PROVIDER 1: I agree that the left one is easier [pointing to an optimized version of an existing helmet]. Perhaps this is a first-generation product and the other is second-generation product in 3 or 4 years.	Prescribing
(3) FEEDBACK PROVIDER 2: I agree that's a really good direction to go in the future, with the flip side being we can reach our goals with this prototype here.	Prescribing
(4) DESIGNER 2: Is something like this [holding up a prototype of the optimized version] with a Kevlar patch enough of a move? Is it enough of a move for this helmet?	Opening
(5) FEEDBACK PROVIDER 3: If you make the aesthetics kick ass, then yeah.	Personalizing

feeling is that if we can get it to be sub 200 and durable it would be nice.” In this interaction, then, *backgrounding* moves eventually led to an *opening* move, which enabled *prescribing* moves that ultimately led to an *excavation* response move. What these examples reveal is that puzzling (for feedback providers) and backgrounding (for creative workers) help to anchor the interaction such that the content that emerges from these moves is subsequently supported by the opening and prescribing moves. It is also worth highlighting that, in both the example above and in the one that preceded it, the feedback providers eschewed measuring and the creative workers eschewed forecasting.

### **Interaction patterns that lead to adjustments.**

Important similarities and differences emerge when examining the interactions that led to adjustments rather than excavations. In the next example, a choreographer was presenting her prototype for the second time. Part of the feedback focused on costuming:

In contrast to the previous examples, in this case, the choreographer is not describing things that she has previously attempted or considered, but, instead, she is describing what she was planning on doing (forecasting; lines 2, 4, and 6). However, similar to the previous examples, there is a moment where the choreographer admits she has not fully thought through the costuming issue and openly requests advice (opening, line 6). The opening move by the choreographer allows the feedback provider to reiterate her

prescribing move (note the similar content in line 5 preceding the opening and in line 7 following the opening), and then they mutually build on this with the choreographer to provide additional advice (prescribing, line 9). The final version of the dance provided evidence of an adjustment as a response move by the choreographer: the costumes matched the prescription of the feedback provider. In sum, this example shows how *forecasting* enables an *opening*, which enables *prescribing* that results in an *adjustment* response move.

While forecasting, a creative worker move (in conjunction with other interaction moves) precipitated adjustment responses; so too did measuring, a feedback provider move. The next interaction from design highlights measuring in addition to forecasting:

Like the example above, this interaction includes forecasting moves, but also shows the influences of measuring, leading to an opening move by the designer. The subsequent versions of the prototype featured an adjustment response where the designers incorporated the advice of the feedback provider—relying on the existing fit system (albeit with thinner webbing, as the designer suggested). Overall, this example illustrates how *forecasting* and *measuring* can lead to *openings* through which *prescribing* enables *adjustments*.

(1) FEEDBACK PROVIDER: What are you guys going to be wearing, do you know yet? Have you thought about that?	Puzzling
(2) CHOREOGRAPHER: Yeah. I've had two sort of ideas. One, I wanted to pay attention to legs a lot, but not have like very—so I wanted micro shorts, but not like really short ones. Like, it would cut around somewhere right along there.	Forecasting (anchor)
(3) DANCER: It's kind of like what I'm wearing.	
(4) CHOREOGRAPHER: Like about an inch shorter than those. And then a very simple tight-fitting shirt and micro shorts.	Forecasting
(5) FEEDBACK PROVIDER: Okay, I would love to see arms. I would love to see bare arms. I think that would be very good.	Prescribing
(6) CHOREOGRAPHER: Then I thought of, like, I don't know. I don't think very much or do too much costumes, so, you know, if you have ideas, I'm interested in knowing more about it, but I'm interested in very very simple.	Forecasting Opening
(7) FEEDBACK PROVIDER: No I think you're on the right track with bare arms and legs, or at least partly bare legs, because I think you want to see the legs.	Prescribing
(8) CHOREOGRAPHER: Maybe not black, but it would be, like, red.	
(9) FEEDBACK PROVIDER: Yeah, you need a little bit of contrast.	Prescribing

(1) DESIGNER: We were planning on pursuing this fit system [lifts up prototype].	Forecasting (anchor)
(2) FEEDBACK PROVIDER: For the saving of two grams?	Forecasting
(3) DESIGNER: More just because we like the fit better and it seems to fit this product. But, I mean, on the list of things to do, for two grams, if that falls off the table and we end up with the existing system, weight wise we're fine. Perception wise, you pick this up, it feels better. I'd love to use this if we could pull it off.	Puzzling
(4) FEEDBACK PROVIDER: My only thought is that we already have two helmets and two fit systems so we're going to have three helmets and three fit systems . . . And, if that's what we should do, that's what we should do. But my thought is if you could spend more time getting the shell of the helmet dialed, my thought is that the fit system is already pretty good, so, rather than spending time on the fit system, you could spend more time on the shell.	Measuring (anchor) Prescribing
(5) DESIGNER: Yeah, if we could maybe use thinner webbing on [our existing] system. But that's a good point. Maybe we should just do that.	Opening
(6) FEEDBACK PROVIDER: Yeah, at the end of the day, they're going to judge the entire product and not just the fit system.	Measuring

What emerges from these examples is the active role of the creative workers, and how their interaction moves provide openings that signal opportunities for feedback providers to offer guidance through prescribing moves. And, while opening moves are critical signals, the interplay of interaction moves also seems to act as a necessary condition that can cause creative workers' response moves. Specifically, as the first two examples show, interaction moves in which creative workers respond to feedback providers' puzzling by relying on backgrounding seem to generate excavation response moves. In contrast, interaction moves in which creative workers rely on forecasting and feedback providers rely on measuring seem to catalyze adjustment response moves. These patterns did not occur in every feedback interaction (just as every feedback interaction did not lead to prototype changes), but they do provide the best explanation of how changes emerged in our data. That is, in general, the interplay of interaction moves seems to act as a necessary condition that can determine creative workers' response moves. Table 3 provides additional examples of feedback provider interaction moves and evidence of creative worker response moves. To better explain why these patterns emerge, in the next section, we explore how the co-construction of problem space serves as a mechanism that undergirds and connects interaction moves and response moves over time.

### Feedback Interactions over Time: Co-Construction of Problem Space

In addition to providing additional interaction examples, Table 3 also indicates the stage of the creative project at which different response moves occurred. In other words, in addition to the configuring of particular sets of moves, we also noticed a pattern in how these configurations of moves unfolded during the project development. The pattern that emerged by looking at response moves across our data was that excavations happened in the early stages of creative projects and adjustments happened in the later stages. To better understand what mechanisms might be driving differences in the timing of these response moves, to understand *why* creative workers respond in different ways throughout the prototype development process, we interviewed creative workers to understand their interpretations of feedback interactions. One de-

signer observed: "When you are creating products, few things are left unconsidered, so I would suggest that most of the logical ideas are already in the bank. Anything that a [feedback provider] suggests has likely had some consideration already, and the new prototype highlights some detail that could be solved with an earlier idea." A "bank" of ideas is similar to Newell and Simon's (1972) notion of a *problem space*, or the field of knowledge and possible solutions available for creative combinations and solutions. A problem space is similar to other notions used in creativity research, such as Hogarth's (1987) notion of a "causal field," Csikszentmihalyi's (1990) notion of a "domain," or Amado's (2009) discussion of "potential space." All of these concepts share the view that problem space serves as a crucial context, a set of possible problems and solutions that inform each prototype.

Our follow-up interviews with creative workers suggest that the co-construction of problem space in the course of feedback interaction serves as an important mechanism that explains how patterns of interaction moves might cause response moves. In particular, as feedback providers gain an understanding of the problem space and creative workers reach the limits of their problem space during feedback interactions, particular interaction moves shape the responses that unfold. We introduce the concept of *retrospective* problem space to capture the notion of a "bank" of ideas that have been considered in service of developing the prototype, and the concept of *prospective* problem space to capture the notion of a "bank" of ideas to be explored in the future. The focus on retrospective versus prospective problem space shifts as the prototype progresses through feedback interactions, as we detail next.

***Understanding and re-exploring retrospective problem space.*** Feedback providers are usually blind to creative workers' retrospective problem space; they do not know what ideas might have been considered but left aside. Because feedback providers have not helped shape the problem space prior to a feedback meeting, it is only through interaction that they learn about the problem space. Therefore, feedback providers have limited knowledge of the ideas that creative workers have already considered. A choreographer intuited this problem for feedback providers, noting that they are only able to "really wrap [their] mind around" the prototype after they have seen it a few times, allowing them to "provide more direction" rather than general "observations." During early feedback interactions,

TABLE 3  
Evidence of Move Patterns and Feedback Outcomes

Timing of Feedback/Context	Representative Data of Feedback Interactions and Responses to Feedback
Early/Dance	<p>During interaction (first of two interactions):  FP: There is a lot, you have a lot. For me, it was too much. [personalizing] <i>I wasn't quite sure where, tons of material, and I think what puzzled me most is the going back and forth with the partner.</i> [anchor: puzzling] It's kind of interesting itself, but it came out of something which is very separate, so I'm going to go sort of right from the beginning and ask you some questions . . . Were they supposed to have the same focus or different? . . .</p> <p>CHOREOGRAPHER: I don't know yet. [opening]  During follow-up interview:  CHOREOGRAPHER: So, I was going to bring back elements [excavation] from the first combination into the second half of the piece which I am doing and that's how I have kind of completed . . . so it should hopefully like use elements that I put together and then tie it together. Because what they think, yeah I would have probably added more movements, because I am just like oh, more ideas, it is not like, it wouldn't have come full circle, it would have just kind of been like open ended.  Puzzling → Personalizing → Opening → Excavation</p> <p>During interaction (third of 16 meetings):  DESIGNER: So that's the data there. So here's something I'm putting together now to look at ways of making this helmet. I'm seeing four main ways. I'll give you the quick run-down . . . [backgrounding]  FP: The thing is . . . I'm less enthusiastic [personalizing] about the flexible one because <i>there's this perception, even though it's provocative, that it won't work</i> [anchor: puzzling] . . . we just have to be careful, we just have to be really careful . . . I don't want to give up on it, for sure, but let's just not take something like this too far. [puzzling]  During follow-up interview:  DESIGNER: When [the feedback provider] said, "This helmet is too soft/flexible, we need to do something," the feedback was helpful because it just set the tone (vaguely) of what was acceptable for our project. [opening]  During subsequent meeting:  FIELD NOTES OF VIDEO: Based on the feedback, the designers returned to previous discussions about increasing the rigidity of the helmet and improvised on earlier ideas to create a new design solution using carbon rods. As one designer had suggested in the first brainstorm meeting, "What if you had a spider web concept on the inside of the helmet?" Metaphorically, this is what the final solution was. [excavation]  Backgrounding → Personalizing → Puzzling → Opening → Excavation</p> <p>During interaction (second of two interactions):  FP 1: <i>I did have a sense that the volume of the music could be a little bit lower to meet your voice, so a sense of background of the music to meet the foreground of your music.</i> [anchor: measuring]  CHOREOGRAPHER: Yeah. Our intention was definitely for it to be lower. [forecasting]  FP 1: Right, because I thought you were, like, in competition with the music, in a way, with your counting, which I really, really like. [personalizing] I didn't really see, this time around, the comedic timing that I think needs to really be there. It's the comedy, it's all about the timing [measuring], and I thought a way of addressing it was usage of pause. [prescribing]  FP 2: . . . So here are some thoughts: counting needs, first of all, to be even louder in the beginning, because we could hardly hear you. [prescribing] I think it's too distracting as a performer and you haven't had much time for it to work. It felt, though, like you were having trouble with the performance of it, both of you, and I'm wondering if the counting is just too distracting. [personalizing] I'm not sure we need you to count constantly. [prescribing] It loses its impact if you just keep counting and counting and counting. [measuring]  FP 1: What I would suggest is maybe counting sort of to the first time you have a little trouble at the beginning to count and then count when you're holding her upside down. [prescribing]  CHOREOGRAPHER: What do you mean if I have a little trouble to in there? [opening]  FP 2: When it starts to get more obviously manipulative so the counting sort of means something as opposed to just what the phrases are doing. [prescribing]</p>
Early/Design	
Late/Dance	



TABLE 3  
(continued)

Timing of Feedback/Context	Representative Data of Feedback Interactions and Responses to Feedback
Late/Design	<p>During subsequent performance: The final performance used louder counting and split up the counting across the dance. [adjustment] Measuring → Forecasting ⇄ Personalizing ⇄ Prescribing ⇄ Measuring → Opening → Adjustment</p> <p>During interaction (13th of 15 meetings): (FIELD NOTES: The designers are displaying a digital mockup of the new directions for the underside of the boot) [forecasting] FP 1: That's still not really our criteria. <i>I think it's a matter of getting the motion right</i> [anchor: measuring] . . . Why don't we try to just make that shape a little more ergonomic. [prescribing] FP 2: I just think it's a matter of making it a little more ergonomic. That shape will work well. [prescribing] During follow-up interviews: DESIGNER: [This] feedback was helpful because it was at an appropriate time during the project, it was clear why he didn't like it, and he showed confidence that our team would be able to come up with a better solution, and we did. [opening] DESIGNER: Feedback is what keeps you thinking and engaged on creative projects. The most recent example of critical feedback that stands out in my mind was during a design review of the boot. I was presenting the ski/walk mechanism concept we had designed for this new boot and [the feedback provider] said, "It's too big and bulky." He wasn't willing to accept the design we had come up with, and he wanted our team to go back and make it more integrated and trim. [adjustment] Forecasting → Measuring ⇄ Prescribing → Opening → Adjustment</p>

Note: FP = feedback provider.

feedback providers “wrap their mind” around prototypes through puzzling moves, supported by personalizing moves. Creative workers respond with backgrounding moves to help feedback providers understand the decisions that produced the prototype. In doing so, these moves help expose the retrospective problem space to the feedback providers, but it also allows creative workers to explore the problem space anew. During these interactions, creative workers’ opening moves are critical because they are moments in which creative workers reveal the limits of the problem space and provide a signal to feedback providers that there is an opportunity to explore new ideas. However, in early feedback meetings, when feedback providers respond to openings with prescribing moves, their prescriptions have often been explored previously by the creative workers. In other words, the suggestion is likely already part of the retrospective problem space. As a designer reflected:

INTERVIEWER: It seems you often return to old ideas as a result of feedback. . .

DESIGNER: Yes. Often, after the brainstorming process is done, it’s difficult to pick the “best” idea to “run” with. Usually, a few strong directions emerge and picking a direction is a bit arbitrary. However, if, in feedback, it is shown that other people favor an idea that we were unaware was one of the top “other” directions that could have been taken, [this] provides validation and emphasis, so that it may also resonate with other people if the creative team were to pursue this other direction instead.

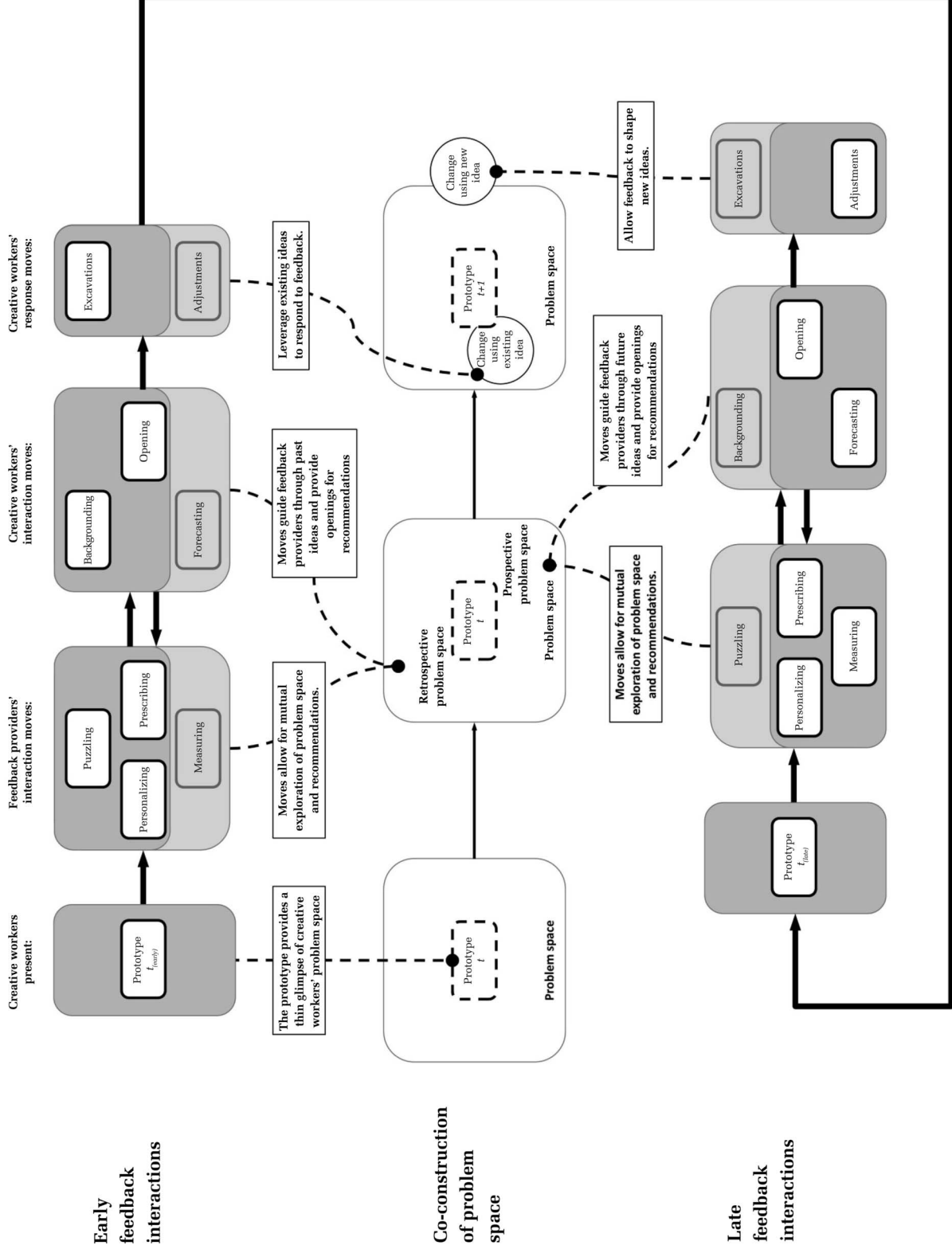
Understanding the “arbitrary” nonlinear nature of creative projects made excavations, as response moves made early in the creative process, seem fairly natural to creative workers. It also helped creative workers feel they were beginning to somewhat share problem space with feedback providers, as another designer noted: “If it was a concept that was thought of earlier, and someone else brings it up, it’s at least grounded in a mutual understanding of a good idea and not coming out of left field.” Hence, the feedback providers’ attempts to understand the retrospective problem space through puzzling and creative workers’ use of backgrounding as a way to explain the problem space allow creative workers to revisit old ideas and see them anew, providing the wherewithal to make excavations. For example, in early feedback meetings with the Helmet Group, most of the feedback was focused on materials that could be used and different shapes

that the design could take. Generally speaking, this feedback allowed the group to return to ideas that had been left latent as they explored other options, until the feedback provided a push to return to them, as these ideas remained part of the retrospective problem space.

***Mutually exploring and broadening prospective problem space.*** In the later stages of creative projects, feedback providers could rely on measuring instead of puzzling moves because they better understood what the prototypes were the ideas that had been explored (i.e., the retrospective problem space) and what standards the prototypes could be compared against. One designer described this process as follows: “Later, with more refined prototypes, everything is on the table for review, etc.” “Everything is on the table” in latter feedback interactions because the feedback providers now better understand the problem space, since prior feedback interactions provided a fuller picture of the retrospective problem space. At the same time, later in the creative projects, creative workers’ used forecasting to describe a sort of prospective or future problem space, a sense of what they were planning to do next with a prototype. Because forecasting helped illuminate the prospective boundaries of problem space, it allowed feedback providers to better suggest opportunities that creative workers had not already explored, though these suggestions tended to be more incremental. Put succinctly by one dancer: “Once the concepts have been seen for a while, people tend to dive deeper and provide feedback on smaller issues or features.” Our data still reveal that these later interactions require creative workers to provide openings, but these openings tend to occur after forecasting has reached a limit, after creative workers admit they have not fully thought out all the implications of a future prototype. For example, in a later feedback interaction within the dance context, a feedback provider offered a new idea for a movement: “I almost wonder if you took [your arm] out from the body just a little bit more . . . it is a very mysterious gesture, but it doesn’t look to me like holding.” This prescribing move extended the problem space, but ever so slightly. The basic move already existed, but the feedback changed the trajectory of the move in a subtle, precise way.

***A process model of feedback interactions and problem space over time.*** Figure 3 presents a model that summarizes how the co-construction of problem space between creative workers and feedback providers serves as a mechanism that allows

**FIGURE 3**  
Theoretical Mechanisms Underlying Feedback Interactions over Time



both to develop and shape creative prototypes over time. In early stages of the project, the presentation of the prototype allows feedback providers a glimpse of the problem space, and the retrospective problem space is further revealed through the interaction of puzzling and backgrounding moves. While feedback providers offer suggestions through prescribing following creative worker openings, these early suggestions have often already been considered by creative workers and are part of the retrospective problem space. Nonetheless, these suggestions allow creative workers to revisit old ideas and incorporate them into the next prototype (an excavation response). This return to old ideas, rather than jumping to new ideas, might be a result of the fact that remembering ideas from earlier brainstorming sessions has been shown to improve subsequent brainstorming (Dugosh & Paulus, 2005), so experienced creative workers might intuitively return to old ideas first before exploring new ones. In subsequent feedback interactions, feedback providers have a better understanding of the retrospective problem space; therefore, when a prototype is presented, they are better able to engage in measuring, rather than puzzling, as they better know the history of the prototype. Through forecasting and measuring, feedback providers and creative workers mutually explore the limits of the current and prospective problem space, and, following opening moves, feedback providers can offer suggestions that lie outside of the problem space to further develop the prospective problem space. Creative workers, then, incorporate these suggestions into the prototype (an adjustment response). Taken together, these findings suggest that the back and forth between feedback providers and creative workers allow each party to better understand the problem space, both retrospective and prospective, thereby enabling feedback to influence creativity.

## DISCUSSION

Research shows that nurturing creativity at work often occurs in fleeting, unplanned interactions (Hargadon & Bechky, 2006; Zhou, 2008). Given the fleeting nature of creativity, organizations need to take advantage of planned interactions, such as feedback meetings during creative projects, that offer the chance of enhancing creative ideas. Our review of the feedback literature suggested links between feedback and creativity while highlighting conceptual openings; specifically, the need to understand how both feedback providers and creative

workers interact to shape the feedback that is offered. This study builds a process theory of these feedback interactions, explaining what feedback providers and creative workers say during these interactions, how these interactions influence the development of prototypes, and how patterns of feedback interactions evolve over the course of a creative project.

Our process model (Figure 3) of feedback moves provides an “initial grounding” (Corley & Gioia, 2004: 201) for understanding feedback interactions in creative work that revealed counterintuitive dynamics that offer several important theoretical contributions. First, we provide a process perspective on feedback interactions that takes seriously the notion that creative workers are active participants in shaping the feedback they receive. Second, our model of feedback interactions reveals how categorizing feedback as either informational or controlling might limit the repertoire of tactics feedback providers use to help creative workers. Finally, our work revealed that the co-construction of problem space by creative workers and feedback providers serves as an important mechanism to understand how feedback influences creative work. We elaborate on the implications of these findings below.

### Feedback Interactions: Acknowledging the Role of the Creative Worker

Researchers have argued that individuals that receive feedback play an important role in whether the feedback has a positive effect. Specifically, extant research on feedback, often focused on performance generally rather than creativity specifically, indicates that whether the person receiving feedback is motivated to change helps determine the efficacy of the feedback. However, this line of research tends to paint feedback receivers as generally passive participants *during* feedback interactions—they receive feedback and then determine whether or not to change. By taking a process perspective, our results revealed that, for creative workers involved in long-duration projects, feedback interactions are not one-way flows of information. Instead, creative workers are active participants in shaping the content of the feedback they receive, and the interactions of creative workers and feedback providers determines what feedback is offered and how it will impact the next iteration of a prototype. These insights provide important new implications for theory regarding creativity and feedback.



The notion that creative workers play an active role in shaping the feedback they receive provides an important conceptual bridge between the feedback giving and feedback seeking literatures. Our review of the literature revealed that previous work has generally assumed either the feedback provider or the creative worker takes a passive role during a feedback interaction. Instead, our findings suggest that they both actively shape the information that emerges from feedback. Most of the moves feedback providers use—personalizing, puzzling, and measuring—are about actively trying to understand the nature of a prototype. These moves help feedback providers tailor their feedback to fit the needs of the creative workers. We also show how creative workers can be “feedback seekers” in these settings by engaging with feedback providers to help them understand what they have already done (backgrounding), what they plan to do (forecasting), as well as being clear about issues that they have not considered (opening). The upshot is that feedback is not the result of one party’s view of the prototype, but a co-constructed evaluation of what has been achieved and what can be achieved. This suggests that understanding how prototypes change as a result of feedback cannot be based solely on what feedback providers say (or even how creative workers seek feedback), but, rather, on the interaction: feedback providers and creative workers learn from each other to mutually understand the possibilities for their prototype. Future feedback research needs to better attend to the actions of both participants in a feedback interaction as a process that unfolds over time. To date, relying on methods and measures that provide a one-sided assessment of these interactions has provided inconsistent results. Our emergent model provides a foundation for exploring feedback providers and creative workers in tandem as they engage in feedback giving and receiving.

### **Informative and Controlling Feedback as Compliments**

Conceptualizing feedback as an interaction also provides new insights on the content of feedback. In the creativity literature, “good feedback”—that is, feedback that leads to increases in creative performance—has been typified by labels like “informative” (Zhou, 1998, 2008), “positive” (Fodor & Carver, 2000), or “useful” (Zhou & George, 2001). In contrast, “bad feedback”—feedback that decreases creative performance—has been typified by labels such as “controlling” (Zhou, 1998, 2008) or “nega-

tive” (Fodor & Carver, 2000). However, the descriptions of these apparently divergent types of feedback are underdeveloped. For example, informative feedback, the most frequently used label, is described as feedback that does not “impose the feedback giver’s will or wishes on the feedback recipient” (Zhou, 2008: 131), and has been operationalized with primes like, “You did really well” (Zhou, 2008: 267). In other words, when offering controlling feedback, feedback providers express their preferences for changes to the prototype, whereas, in informational feedback, they do not. Our findings provide important insights into this line of research by suggesting that, rather than viewing feedback as a dichotomy of styles (e.g., informative vs. controlling), instead, feedback is more often composed of both informative and controlling content. For example, puzzling and personalizing often allowed feedback providers to take ownership of their reactions and to ask questions. This might be seen as informative feedback. However, feedback providers used these more informative moves in concert with moves that might be seen as more controlling: measuring and prescribing. These latter moves allowed feedback providers to acknowledge external standards and expertise and to advise creative workers about specific elements they could improve on in their prototypes. Yet, our findings reveal that feedback interactions that generated changes to a prototype generally used a mix of moves such that the interaction could be classified as both informational and controlling in nature. Hence, our findings provide new insights by suggesting that types of feedback once thought of as opposites may be complements.

The role of creative workers serves as an important lynchpin in understanding how informative and controlling feedback work together. Specifically, creative workers’ use of opening moves serve as key pivot events that help link feedback providers’ moves that could be viewed as informative with those that are more controlling. Within a feedback meeting, feedback providers’ early moves were generally aimed at attempting to understand the prototype and the work that went into it (informational), and they tended to use prescribing moves (controlling) after creative workers showed they were open to it. Therefore, in inviting more controlling feedback through the use of opening moves, creative workers may perceive the suggestions as more informational and be more willing to embrace the suggestions. The role of creative workers’ opening moves seems critical when understood in light of existing research, which suggests that individuals have a

bias for receiving information that affirms their beliefs rather than information that challenges their beliefs (Hart, Albarracín, Eagly, Brechan, Lindberg, & Merrill, 2009). However, this bias is attenuated when individuals are exposed to affirming information first and then receive disconfirming information. While informative feedback need not be affirming (and controlling feedback need not be disconfirming), at the very least, the process that unfolded in our data showed that moves that were more informational led to creative worker openings, after which more controlling feedback was introduced. The responses that occurred following this pattern of moves suggest that creative workers did embrace more directive prescriptions, and this “controlling” feedback led to changes in the prototypes. The notion that informative and controlling feedback may work synergistically, rather than antagonistically, once again highlights the importance of creative workers as active participants in feedback interactions. That is, looking at the feedback interaction as a process reveals the dynamic way that informational and controlling feedback may be interwoven to produce future changes.

### Feedback as Co-Construction of Problem Space

Feedback, at its core, is meant to generate change. Creativity is also, at some level, about change. Both connote a prospective focus: “This is what can be improved for the future.” Hence, we were surprised to find that, when feedback had the most sweeping effects on prototypes, it was a result of feedback providers touching on ideas that creative workers had already explored but had left behind. This seemed extremely odd, given that many studies of creativity focus on manipulations that enabled individuals to produce more new ideas, not return to old ideas (Madjar & Oldham, 2006). A key theoretical implication here is that feedback is not just about motivating individuals toward the future, but also prompting reflection on the past. In doing so, it seems to empower individuals to return to old ideas and see them with in new ways. Our data show that problem space serves a critical function in this regard, as both feedback providers and creative workers began to mutually understand the problem space the prototypes emerged from.

Research on problem space has typically focused on the assumption that expanding problem space increases creativity. For example, one of the fundamental arguments for augmenting the diversity of

teams is that additional diversity expands the pool of ideas available to the team and thereby increases creativity (Woodman, Sawyer, & Griffin, 1993). Our finding that feedback providers can help catalyze refinements resonates with this logic, in the sense that feedback providers were able to add new ideas to the problem space that ultimately became incorporated in the prototypes—to co-construct the problem space with creative workers. Our analysis suggests that, once creative workers have shepherded a prototype through early rounds of feedback, the shape of the prototype—what it means, how it works, who it serves—becomes more solid. As a result, feedback providers are better able to use measuring—to evoke appropriate standards and expectations—and then prescribing to suggest changes that incrementally broaden the prospective problem space. The idea that the creative process moves from more radical changes to more narrow ones is not new. What is new and surprising is the notion that this is the moment when creative workers seem most apt to adopt new content suggested by feedback providers, rather than earlier when the prototype is more fluid.

However, research shows that creative workers often struggle selecting creative ideas from the set of possibilities that compose their problem space (Rietzschel, Nijstad, & Stroebe, 2010). In early stages, creative workers pick particular ideas and abandon others. When feedback providers use personalizing and puzzling moves to make sense of the creative prototype, and when creative workers respond with backgrounding, it allows old abandoned ideas to be legitimized as viable. In other words, by being forced to construct and articulate the problem space for feedback providers, creative workers revisit and re-explore the newly co-constructed space. In doing so, feedback interactions enable creative workers to reconsider old ideas and incorporate them into the prototype (excavations). This suggests that the memory of successful ideas (Hargadon & Sutton, 1997) alone is not sufficient for creativity; creative workers need mechanisms that can trigger the reconsideration of ideas that might have been prematurely discarded. Taken together, our findings suggest that, not only do feedback interactions help expand problem space, but they also facilitate revisiting and re-exploring problem space. That said, none of our feedback interactions produced a “go back to the drawing board” response. Future research might reveal when wholesale rejection of a prototype is necessary and what the consequences of such a decision are.

## Contributions to Practice

Given the opportunity that planned feedback meetings afford for helping creative ideas evolve, this study offers several significant practical implications. One key contribution of our findings is that they might help feedback providers and creative workers better understand the creative process and their joint roles within it. Creative work (Amabile et al., 2005) and feedback (Gaddis, Connelly, & Mumford, 2004) are affectively laden processes, and feedback about creative work often evokes strong negative reactions. Amabile et al.'s (2005) study of daily emotions associated with creativity found that negative emotions occurred in 16 of 20 examples where creative ideas were assessed by others. Although this is a small sample, it aligns with anecdotal evidence—such as the opening quotation in this article—that creative workers dislike the process of having their work reviewed. While our findings do not speak to the emotional reactions of creative workers, they do help illustrate how difficult it is for feedback providers to make sense of early creative work. At their core, feedback interactions are about two separate parties trying to “unpack newness.”<sup>1</sup> If feedback providers and creative workers approach feedback as a two-way search for the emergence of novelty, rather than a one-way prescription, and if feedback providers openly acknowledged the importance of the information creative workers provide during feedback interactions, then both parties might view feedback as a more generative, enjoyable interaction. It might be possible to enact norms around feedback, much the same way IDEO has built norms around brainstorming (Sutton & Hargadon, 1996), to help reconfigure how feedback providers and creative workers experience feedback interactions.

A second key practical contribution is that our findings might help managers better understand and support the creative process. A common finding is that managers need to be supportive of creative work (e.g., Amabile et al., 1996; George & Zhou, 2001; Madjar, Oldham, & Pratt, 2002). Our results, by examining feedback giving in real work settings, add needed specificity to this notion by outlining appropriate managerial expectations for the types of changes that might occur as ideas evolve throughout the feedback process. For exam-

ple, managers might grow weary of the creative process if they see creative workers returning to early ideas, or they might grow tired when, late in the process, creative workers are still tinkering and making small changes to prototypes. Intervening in these moments might undercut the feelings of support. Understanding what changes are likely to happen can help managers set better expectations for themselves about the evolution of the creative projects that they support.

## Limitations and Opportunities for Future Research

Prior work has largely negated the ability to observe the complexity of feedback dynamics by relying on the precision of laboratory manipulations that likely do not reflect the realities of a field setting, and by using surveys that captured variance about *if* feedback is being provided rather than exploring *how* it is provided. Although our work helps overcome these limitations, all studies have weaknesses that offset their strengths. We see the use of multiple contexts as a strength of the study, yet it also introduced additional complexity into our findings for which we cannot fully account. For example, our contexts differed in the number of feedback meetings and the length of the projects. In dance, the feedback was delivered at two meetings separated by about four weeks of work. In the design context, feedback occurred at weekly project meetings and at more formal project reviews. This raises the opportunity for future research to look more closely at the optimal amount of time that should occur between feedback meetings and creative work. Also, in dance, the feedback was provided by external observers, whereas, in design, some of the feedback providers were external people brought in for specific meetings, but others were imbedded within the creative team. One implication is that individuals more closely linked to a project have a deeper understanding of problem space during a feedback meeting. Future research might explore whether having feedback providers inside the group enhances feedback or not, since, while insiders might be better at tailoring their feedback to the personalities of the creative workers, they might be less able to see new potential directions for a prototype because of their attachment to the outcomes.

<sup>1</sup> We thank an anonymous reviewer for coining this phrase and highlighting this dynamic.

## CONCLUSION

The social interactions that foster creative work are often ephemeral. Because of the importance of creativity, organizations need to take full advantage of the review meetings that are often built into creative projects. The results of the present study shed new light on these interactions and the impact they have on developing creative ideas. "The crucial element in creativity," Abelson argues, "is not dramatic illumination; it is judgment" (1965: 604–605). Our findings help reveal how feedback interactions might provide that judgment.

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