

# Distributed Creativity: How Collective Creations Emerge From Collaboration

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Creativity is often considered to be a mental process that occurs within a person's head. In this article, we analyze a group creative process: One that generates a creative product, but one in which no single participant's contribution determines the result. We analyze a series of 5 theater performances that were improvisationally developed in rehearsal by a theater group; over the course of these 5 performances, a collaborative creation emerged from the improvised dialogues of the group. We argue that in cases of creativity such as this one, it is inaccurate to describe creativity as a purely mental process; rather, this case represents a nonindividualistic creative process that we refer to as *distributed creativity*. We chose this term by analogy with studies of distributed cognition, which are well established in cognitive science, but have not yet had a substantial impact on creativity research. Our study demonstrates a methodology that can be used to study distributed creative processes, provides a theoretical framework to explain these processes, and contributes to our understanding of how collaboration contributes to creativity.

*Keywords:* group creativity, collaboration, improvisation, distributed cognition, performance

After Guilford's legendary American Psychological Association Presidential address (Guilford, 1950), a first wave of creativity research began that focused on the personality of the creator. Many important insights resulted from this first wave of research, but by the 1980s scholars had begun to realize that a narrow focus on the solitary individual could provide only a partial explanation of creativity. In the 1980s, several researchers began to explore the social and cultural dimensions of creativity (Amabile, 1983; Csikszentmihalyi, 1988). This research gained inspiration from a similar shift in cognitive science that occurred during the 1980s and 1990s—a shift away from focusing on internal mental states and processes, to an analysis of how cognition is distributed across people, tools, and environments (Hutchins, 1995; Salomon, 1993). For example, in the late 1980s, Csikszentmihalyi formulated his influential systems approach, which argued that creativity emerged from a system containing the creative individual, the surrounding field of others working in the area, and the domain, or body of knowledge and prior works (Csikszentmihalyi, 1988, 1990; also, see Gardner, 1993). Through the 1990s, a second wave of creativity research pursued the idea that creativity is found in collaboration and group dynamics. In the last few years, this research has resulted in several books that explore collaborative creativity (Farrell, 2001; John-Steiner, 2000; Paulus & Nijstad, 2003; Sawyer, 2003a, 2006).

This second wave of research has provided a new perspective on creativity. It shows how creativity is embedded in social groups, and how creative products emerge from collaborative networks. However, even though we now realize the importance of group

collaboration, we still have very little understanding of the exact mechanisms whereby creative products emerge from groups. And we have very little understanding of the relationship between the emergent creativity of the group, and the individual creative actions of each member of the group.

The most substantial studies of group creativity have been social psychological studies of brainstorming groups (e.g., Paulus & Nijstad, 2003), but these studies have not analyzed the interactional processes that occur within the groups. This failure to analyze collaborative processes is a significant lacuna in creativity research because a wide range of empirical studies has revealed that significant creations are almost always the result of complex collaborations. These include studies of innovative businesses by organizational behavior researchers (Hargadon, 2003) and historical studies of the origins of successful innovations (Basalla, 1988). Even studies of individual creators, when researchers focus on the social and cultural origins of their ideas, have revealed a high degree of collaboration behind their ideas (Csikszentmihalyi, 1996; Farrell, 2001; John-Steiner, 2000).

One potential path forward is for creativity researchers to borrow methodologies and frameworks from those cognitive scientists who have contributed to our understanding of distributed cognition. In the years since the field of cognitive science shifted to a distributed perspective in the 1980s, cognitive scientists have developed a sophisticated set of methodologies and have conducted a broad range of empirical studies of how various cognitive processes are distributed across groups. The distributed processes of problem solving and of learning have been of particular interest (e.g., Greeno, 2006).

When cognitive processes are distributed across groups, they become visible, and scientists can observe them by analyzing the verbal and gestural interactions among the participants. Thus rather than controlled experimental methods, studies of distributed cognition typically use qualitative and observational methods that

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enable researchers to capture the real-time processes of distributed cognition. Perhaps the dominant methodology is *interaction analysis*—videotaping collaborations over time, and documenting the step-by-step emergence of cognition from the contributions of each group member (Jordan & Henderson, 1995). Even though creativity scholars and cognitive scientists both shifted to a group focus during the same time period—roughly the middle 1980s through the 1990s—creativity researchers have rarely used methodologies that allow a real-time analysis of distributed creativity in action.

In this article, our goal is to contribute to our understanding of the interactional mechanisms that occur when creativity is distributed throughout a group. A secondary goal is to demonstrate the potential power of interaction analysis as a tool that could contribute to our understanding of group creativity. We begin by presenting a theoretical framework of *distributed creativity* that allows us to compare and contrast a range of collaborative creative phenomena. We then describe the methodology of interaction analysis as used by cognitive scientists studying distributed cognition. We apply the theoretical framework and the methodology to analyze a series of five theater performances that were improvisationally developed in rehearsal by a teenage theater group. Novel narrative elements emerge across the five successive encounters; our analysis reveals that this novelty is a collective social creation, rather than an individual cognitive construction. We conclude by exploring some implications for collaborative creativity more generally.

### Distributed Creativity

We use the term *distributed creativity* to refer to situations where collaborating groups of individuals collectively generate a shared creative product. Distributed creativity ranges from relatively predictable and constrained, to relatively unpredictable and unconstrained. Some groups engage in creative activities that are relatively predictable—for example, a symphony orchestra performs from a score and is guided by a conductor. In contrast, we are specifically interested in collaborating groups that are relatively unconstrained, such that unexpected creativity could result. We use the term *collaborative emergence* to refer to these group processes (Sawyer, 2003a). Collaborative emergence is more likely to be found as a group becomes more aligned with the following four characteristics:

- The activity has an unpredictable outcome, rather than a scripted, known endpoint;
- There is moment-to-moment contingency: each person's action depends on the one just before;
- The interactional effect of any given action can be changed by the subsequent actions of other participants; and
- The process is collaborative, with each participant contributing equally.

Collaborative emergence is a defining characteristic of social encounters that are improvisational because only when the outcome is not scripted can there be unpredictability and contingency. Social encounters that are more ritualized—like formalized greetings between customers and store clerks—or that are controlled by a single individual, like a business meeting—are less likely to manifest collaborative emergence.

The collaboratively emergent nature of the group enables something novel and appropriate to occur. In contrast, the examples of distributed cognition studied by cognitive scientists are not always collaboratively emergent. Many task-oriented groups develop routines and procedures that facilitate the group's task, and the outcomes of these encounters, although collaborative, are predictable and scripted (see Jordan & Henderson, 1995, for multiple examples). However, several influential studies of distributed cognition have demonstrated that groups sometimes diverge from routine and engage in distributed cognitive behavior that is emergent. A now classic example is Hutchins' (1995) study of Navy navigation teams; he found that in most cases, the teams followed well-established group routines, but that when emergencies occur, the team was often capable of collaboratively creating a novel, improvised response.

To demonstrate the above four characteristics of collaborative emergence, we begin with an example of improvised dialogue taken from a 1993 performance by Off-Off-Campus, a Chicago theater group (Example 1). This is the first few seconds of dialogue from a scene that the actors knew would last about 5 min. The audience was asked to suggest a proverb, and the suggestion given was "Don't look a gift horse in the mouth."

#### Example 1: *Lights Up*

Dave is at stage right, Ellen at stage left. Dave begins gesturing to his right, talking to himself (from Sawyer, 2003b).<sup>1</sup>

(1) Dave: All the little glass figurines in my menagerie,  
The store of my dreams.

Hundreds of thousands everywhere!

(Turns around to admire.)

(2) Ellen: (Slowly walks toward Dave.)

(3) Dave: (Turns and notices Ellen.)

Yes, can I Help you?

(4) Ellen: Um, I'm looking for uh, uh, a present?

(Ellen is looking down like a child, with her fingers in her mouth.)

(5) Dave: A gift?

(6) Ellen: Yeah.

(7) Dave: I have a little donkey?

(Dave mimes the action of handing Ellen a donkey from the shelf.)

(8) Ellen: Ah, that's =

I was looking for something a little bit bigger,

(9) Dave: Oh.

(Returns item to shelf.)

(10) Ellen: It's for my Dad.

By Turn 10, elements of the dramatic narrative are starting to emerge. We know that Dave is a storekeeper, and Ellen is a young

<sup>1</sup> Transcript notation follows the conventions generally used by conversation analysts and elaborated in (Atkinson & Heritage, 1999). An equals sign (=) indicates a break in speech, with either the same speaker or another speaker continuing; a double slash (//) in two successive lines of dialogue indicates the onset of overlapping speech.

girl. We know that Ellen is buying a present for her Dad, and because she is so young, probably needs help from the storekeeper. These narrative elements have emerged from the creative contributions of both actors. Although each turn's incremental contributions to the unfolding story can be identified, none of these turns fully determines the subsequent dialogue, and the emergent dramatic narrative is not chosen, intended, or imposed by either of the actors.

This example demonstrates the moment to moment contingency of collaborative emergence. A wide range of actions is possible at each moment; the actors do not know what is going to follow an action, and they do not know how their actions will be interpreted and elaborated. The emergence of the narrative cannot be reduced to actors' intentions in individual turns because in many cases an actor cannot know the meaning of her own turn until the other actors have responded. In Turn 2, when Ellen walks toward Dave, her action has many potential meanings; for example, she could be a coworker, arriving late to work. Her action does not carry the meaning "A customer entering the store" until after Dave's query in Turn 3. In improvisation, many actions do not receive their full meaning until after the act has occurred; the complete meaning of a turn is dependent on the flow of the subsequent dialogue. This sort of retrospective interpretation is common in collaborative emergence, as we show below.

The concept of emergence has received increasing attention in psychology and in other social sciences in the last 10 years (see Guastello, 2002; Sawyer, 2005, for overviews). A property of a system is said to emerge from the system's parts in interaction when (a) the system property is not held by any of the parts (a commonly used example is water; water is a liquid, but hydrogen and oxygen are not); (b) the system property could not be predicted even if one held a full and complete knowledge of the parts. In Example 1, neither of the actors began the performance with a mental representation of this particular sequence of 10 turns; and these 10 turns could not have been predicted even with a full and complete knowledge of the mental states of Dave and Ellen.

Emergence and complexity are generally contrasted with reductionism—the traditional analytic approach of explaining a system by decomposing it, explaining the components, and then putting the components back together to work upward to an explanation of the entire system's behavior. Although reductionism is quite successful at explaining many systems in nature, beyond a certain level of complexity it becomes difficult to execute successfully. A reductive analysis of Example 1 would involve first conducting a detailed study of the relevant mental representations held by Dave and Ellen, and their personality traits and predispositions that are relevant to theater performance, and then using these individual findings to explain the performance. With collaborating groups that display collaborative emergence, this approach has limited usefulness—due to the radical contingency of the unfolding dialogue, and due to the prevalence of retrospective interpretation, which means that the intentions behind an utterance are not necessarily explanatorily relevant.

Emergence is commonly observed in *complex dynamical systems*—systems with many elements, organized into multiple levels of subcomponents, with multiple interactions among elements and subcomponents. For example, emergence is commonly attributed to the brain-mind relationship—subjective mental states like "pain" are often said to emerge from the brain's neurons in synaptic interaction, but yet to be irreducible to the brain. Emer-

gence is also often attributed to the social-individual relationship, to argue that properties of social institutions often emerge from individual interactions but yet are not reducible to properties of individuals.

Because collaborative emergence results from interactions among participants, it must be analyzed as a discursive, distributed process. Researchers who study distributed cognition argue that knowledge and intelligence reside not only in people's heads, but are distributed across situated social practices that involve multiple participants in complex social systems. "Knowing" is reconceived as the ability to participate appropriately in these shared cultural practices. In the distributed cognition perspective, mind is considered to be "social, cultural, and embedded in the world" (Gee, 2000, p. 195). Likewise, the distributed creativity perspective locates creativity in the symbolic social interactions among members of a group.

Improvised narratives are good examples of collaborative emergence because they are so obviously created by the collaborative efforts of the entire group. No single speaker creates the narrative; it emerges from the give and take of conversation. The narrative is constructed turn by turn; one actor proposes a new development for the play, and others respond by modifying or embellishing that proposal. Each new proposal for a development in the narrative is the creative inspiration of one person, but that proposal does not become a part of the play until the other members of the group respond to it, and potentially redefine it retrospectively. In the subsequent flow of dialogue, the group collaborates to determine whether to accept the proposal, how to weave that proposal into the drama that has already been established, and then how to further elaborate on it.

When groups of individuals work together to generate a collective creative product, the interactions among group members often become a more substantial source of creativity than the inner mental processes of any one participating individual. This becomes increasingly likely as the degree of contingency increases—as the dependency of each participant's action on the preceding sequence of actions increases, and as it becomes increasingly difficult to predict an individual's actions using individual factors such as personality traits or cognitive models. These characteristics—increased contingency and decreased explanatory power of individual variables—hold true for a wide range of groups, from business teams engaged in brainstorming (Paulus & Nijstad, 2003; Sawyer, 2003a), to musical ensembles (Berliner, 1994), to friends engaged in small talk (Sawyer, 2001). These characteristics are found in the most extreme form in improvisational groups—jazz, improv theater, and improvised dance.

Distributed creativity can occur in single encounters and across multiple encounters. In a business context, a cross-functional team is often brought together for an hour or two to brainstorm potential solutions to a specific problem; the conversation that ensues represents distributed creativity, and if successful, a creative solution emerges by the end of the encounter. Interaction analyses of single encounters have been conducted with jazz performances (Monson, 1996) and with improvised theater performances (Sawyer, 2003b). However, equally common are situations in which the same group comes together multiple times, with the intention of generating a creative product across repeated encounters. This latter situation is the norm in the performing arts, in which musical or theater ensembles rehearse many times over weeks or months to generate

a collectively created performance. In this paper, we extend the scope of the methodology by applying interaction analysis to repeated rehearsals of an improvised performance.

Studying collaborative emergence requires a focus on the distributed nature of creativity. To reveal the mechanisms by which groups are collaboratively creative, group creativity research could incorporate the methods of interaction analysis to closely analyze the processual, turn-by-turn dynamics of collaborative dialogue. The next section describes the interaction analysis methodology, and how we applied the methodology to gather and analyze our data. The remainder of this paper demonstrates the application of interaction-analytic techniques to study a specific case of distributed creativity.

### Methodology and Research Site

Interaction analysis is a method for studying the interaction of people with each other and with objects in their environment. Its focus is on people's observable actions—including talk, nonverbal gestures and movements, and the use of objects. The goal is to identify recurring patterns in collective behavior, and processes that result in the emergence of these recurring patterns. Its roots lie in ethnography, sociolinguistics, developmental psychology, and conversation analysis. The central focus of an interaction analysis is the collective behaviors of a group of interacting individuals. It is a deeply empirical methodology; its practitioners believe that all theories of knowledge and action must be grounded in a particular sort of empirical evidence: video records of naturally occurring activities.

Interaction analysis is particularly valuable when each individual's behaviors display a moment-to-moment dependency on the behaviors of other individuals—a characteristic that we referred to above as "contingency." In situations of contingency, one person's action at a given moment is highly influenced by the actions of their partners immediately before—such that prediction of a person's action cannot be made successfully independent of the sequence of preceding actions of others. In such encounters, knowledge and action are often better viewed as social, rather than as located in the heads of individuals. In situations in which the creative process is distributed across people and objects, understanding those distributed creative processes requires a methodology that details the social interactions of the participants, in addition to the internal cognitive structures and mental models of those participants. In collaborating creative groups, creativity is an ongoing social process, and a full explanation of processes of distributed creativity requires an empirical study of the moment-to-moment processes whereby individual creative actions result in the emergence of a collective creative product.

Perhaps the first scientific studies of interaction were conducted by Bales (1950). Researchers watched people interacting, and, using a specially prepared coding sheet, checked off behaviors of interest as they occurred. However, this method was limited because even a trained observer cannot keep track of the overlapping activities of several different people; and the interpretations of the observer can never be subjected to later disconfirmation in any rigorous way. (For similar reasons, interviewing participants after the fact to discern what they remember about an encounter does not provide sufficient data to understand an encounter.) In the 1960s, researchers first gained access to audio recording equip-

ment, which allowed them to listen repeatedly to the same sequence of interactions and to produce accurate and detailed transcripts of verbal utterances. This resulted in a methodology known as *conversation analysis*, a precursor to interaction analysis largely associated with sociologists (Psathas, 1995). In the 1970s and 1980s, video equipment became increasingly available to researchers, for the first time allowing true interaction analyses to be performed. Multiple viewings of recorded video reveal the richness of both verbal and nonverbal actions, allowing researchers for the first time to study the rich multimodal nature of human interaction. During this period, two research laboratories emerged that were dedicated to interaction analysis: Michigan State University's Interaction Analysis Laboratory (1975–1988), which focused on medical settings, and Xerox Palo Alto Research Center and the Institute for Research on Learning, which studied a broader range of settings including mealtime conversation, mother–infant communication, children at play, human–machine interaction, and various forms of technology-mediated communication in the workplace (Jordan & Henderson, 1995). Interaction analysis has spread widely with the increasing affordability of digital video technology; today, any desktop computer is capable of storing hours of video data, and inexpensive video analysis software (such as Transana, developed at the University of Wisconsin) is widely available and easy to use.

Standard interaction analysis procedures generally involve six steps (Jordan & Henderson, 1995). In the following, we describe each of the six steps, and then describe how we applied the step in this study.

1. Videotape naturally occurring encounters as part of a broader ethnographic study, using participant observation—when the researcher is an active participant in the interactions.

Our data emerged from an extended study of a student improvisational theater group, TheaterWorks, which was directed by the second author during the time of the study. TheaterWorks is a nonprofit theater troupe for teens aged 11 to 17, who meet weekly for about 90 min. Weekly meetings are spent on a variety of activities, including improvisation training, rehearsal of existing shows, development of new shows, and business matters such as planning and scheduling. New members may join the troupe at any time, and frequently begin performing a few small roles very soon after joining, usually after watching one or more performances and/or attending one or more rehearsals. Teens enter with varying degrees of previous theater and improvisation training, and their level of performance skill varies widely. Of the 13 young people who were performing with the troupe during this study, only 3 had more than rudimentary improvisation and performance skills when they entered the group.

Our analyses focus on 12 rehearsals and five performances of a show, *Squids Will Be Squids*, which the group prepared from December of 2001 through May of 2002. Performances of *Squids* occurred from April through August of 2002. This was a stage version of the book by the same title (Scieszka & Smith, 1998). The show contained a series of 5-min scenes, each of them based on a one-page story from the book. The stories are slightly bizarre parodies of Aesop's fables; they involve animals and inanimate



objects, and they conclude with a moral that is, by author intention, humorous and not very edifying. The scenes were not scripted, memorized, and rehearsed, as in traditional theater. Instead, the director guided the group through an improvisational, collaborative writing technique that is often used to develop sketch comedy and other ensemble-based performances (Sawyer, 2003b); each of the scenes was improvisationally and collaboratively developed by the actors over many rehearsals.

Although each scene was loosely based on a story from the book, the performance scene often diverged significantly from the book version, due to processes of collaborative emergence. Each scene was semi-improvised in that even though the overall plot was predetermined by the book, the actors did not attempt to follow a set script when they performed, and were free to improvise dialogue and actions within the larger plot structure. Because the troupe operates on a rotating cast system, in which the actors share all the roles and rotate parts for successive performances, subsequent attempts at improvising a scene would often be done by a different set of actors. The actors continued to improvise through the course of the five live performances; the group never considered any scene to be permanently fixed, and the performances continued to vary up to the last performance.

2. Once videotapes are made, the first analytic step is to watch through the videos and prepare a content log—each identifiably distinct episode is given a heading and a rough summary of events.

Content logs enable a quick overview of the data set, allowing quick identification of episodes related to specific research questions, and guiding the decision about which portions of the data to transcript in detail. We watched the collected videotapes of the 12 rehearsals and five performances, and prepared a content log in which each episode was one scene. A rough summary of what was observed in each scene was prepared.

3. Perhaps the most critical stage is the identification of general patterns—sequences of interaction that occur repeatedly and that provide insight into the nature of distributed creativity.

In practice, interaction analysts often index digital video data so that instances of similar events can be observed together. (Video analysis software like Transana supports such indexing.) The process proceeds inductively—attempting to develop statements about general patterns from multiple sets of empirical data. Repeated observation of our videotapes revealed that each of the performed scenes varied from one performance to the next, and yet, for each scene, relatively stable elements emerged and remained through subsequent performances. We chose to analyze the collaborative emergence of two somewhat distinct elements of dramatic structure. First, we observed that many of the key narrative elements of the performance emerged from the collective improvisations of the ensemble. These included such foundational elements of narrative as character, relationship, and plot. Second, we observed that within the emergent narrative structure, short segments of dialogue and action emerged collectively and were retained through subsequent performances. Actors commonly refer to such sequences as *bits*.

4. Depending on the researcher's interest, some portion of the video dataset is selected for transcription.

Transcription methods vary in detail depending on the researcher's interest; in some cases, only talk is transcribed; in other cases, nonverbal details such as eye gaze and body position may also be important and recorded along with talk. The scenes in *Squids Will Be Squids* varied along a continuum in the extent to which the scene varied from performance to performance, and they also varied in how much the cast changed from performance to performance. Of all of the scenes performed during the show, we chose "Rocks, Paper, Scissors" for transcription and extended analysis because it fell in the midpoint of this spectrum.

5. For many research questions, it can be valuable to quantify video data by coding the data.

Coding involves several steps (following Chi, 1997; Lampert & Ervin-Tripp, 1993): (a) delimit the stream of data into distinct episodes (these could be as large as "conversational encounters" or as small as "utterances," depending on the research question); (b) develop categories, or codes, within which the episodes can be grouped; (c) use two or more researchers to assign codes to each episode, and then calculate intercoder reliability of the coding scheme. The coding process is typically iterative because often the initial coding scheme makes it impossible to attain reliability across coders and must be revised repeatedly. Once a reliable coding scheme is developed, and the many episodes found in the video data have been coded, then quantitative methods can be used to identify generalizable patterns.

All interaction analyses have to make a decision about how to balance the more in-depth understanding that results from a qualitative analysis, versus sacrificing some depth of understanding in exchange for the more generalizable and quantifiable data that results from coding. Because we chose to analyze the emergence over time of a single scene, we determined that coding was not appropriate. If we eventually choose to conduct similar analyses over a large number of scenes, then application of a coding scheme would allow for quantitative analyses of similarities and differences in processes of collaborative emergence across scenes, actors, or even ensembles.

6. Many interaction analysts ask the original participants to watch the videotapes with the research team, with the goal of eliciting the participants' perspectives on what was happening.

In addition to the videotapes of the performances, our data included six interviews with cast members. During the interviews, the second author and the cast member watched all five versions of *Squids Will Be Squids*. The videotape was paused frequently, and the cast member was asked where the ideas for the previous dialogue emerged, and how the dialogue had emerged over the course of the rehearsals. Each interview lasted approximately 90 min.

Interaction analysis is difficult and time consuming; the study we report here took six months of participant observation followed by long hours of transcription and analysis, extending over another six months. However, this sort of analysis has the potential to

expand our understandings of the step-by-step processes whereby creativity emerges from groups, and of the relationship between the distributed creativity of the group, and the individual creative actions of each member of the group.

### Findings

After conducting Steps 1, 2, and 3 of our interaction analysis, we had identified two types of dramatic structure that collaboratively emerged. First, we observed that foundational elements of narrative—character, relationship, and plot—emerged from the collective improvisations of the ensemble. Second, we observed that short segments of dialogue and action, known as bits, emerged collectively and were retained through subsequent performances.

#### *The Collaborative Emergence of Narrative Elements*

Although the group attempted to generally follow the story that appeared in the children's book, each scene that the group dramatized was embellished considerably from the simple one-page stories in the book. No single person scripted a scene, or was assigned to dramatize a story; the final scenes collaboratively emerged from the collective actions of the ensemble in successive group rehearsals.

The following example illustrates the degree to which the group elaborated on the stories in the book. The story titled "Rock, Paper, Scissors" appears in the book like this:

Rock, Paper, and Scissors were assigned to be partners for the big end-of-the year Science project.

Rock thought up the idea for the project.

Paper drew all of the charts and graphs and illustrations.

Scissors did the research and the presentation.

It wasn't a very good project, and they didn't work very hard on it, so they got a "c."

"You should have done more research," said Rock, hitting Scissors.

"You should have drawn more illustrations," said Scissors, cutting Paper.

"You should have thought of a better idea," said Paper, covering Rock.

Moral: RockPaperScissors say, "Shoot, It wasn't my Fault." (Scieszka & Smith, 1998)

An elaborated version of the story emerged over 12 rehearsal sessions during which the group practiced improvising their way through the scene; it went something like this, although there was always improvised variation and embellishment:

The group enters holding signs stating the scene title, which they read to the audience: "Rock, Paper, Scissors." A cast member comes forward, as the teacher, while three other actors sit nearby, as students. These three actors play characters named "Rock," "Paper," and "Scissors," and are wearing baseball caps onto which have been glued the items appropriate to their names: a large rock, a piece of notebook paper, and pair of scissors. The Teacher addresses the audience as his class, and announces that the class must work on their science projects today. He assigns Rock, Paper, and Scissors to work together. Paper and Scissors are very happy to learn they are together, but disappointed to learn that they must work with Rock. The Teacher tells

them to select their topics, and exits. Rock suggests they do their project on rocks, while Paper and Scissors propose butterflies. The three argue over this until the teacher reenters and asks for their topic. Rock says "rocks" at the same time that the other two say "butterflies." The Teacher clearly favors the topic of rocks, which leads to a discussion on the relative merits of rocks versus butterflies. The Teacher asks the audience which they would choose, and suggests that the group is likely to receive a higher grade for doing rocks. He then tells the entire "class" (the audience) to get to work, and exits. The students now divide up the work: Paper reluctantly agrees to draw the charts and graphs and illustrations, Scissors concedes that she will do the research. Rock tries to get off without any additional work since he "thought up the topic," but at the grimaces of the other two, agrees to contribute by putting the project in a nice folder. The group then sits idly for several moments, Scissors noting that she has books on butterflies but not rocks. The Teacher announces that he is coming to grade the projects, and the group quickly assembles a "project" by tossing anything they can find lying about the stage into the folder, including one of the books on butterflies and Rock's rock hat. The Teacher negatively reacts to the ramshackle project, while the group tries to justify it as being "interactive" and noting that the butterfly book contains a picture of a butterfly on a rock. The Teacher gives the students their grade, a C. The students each in turn blame one another, and the skit is brought to an end as the emcee of the show walks on stage and states the moral.

The overall story structure remains the same as that written by Scieszka and Smith (1998), but there is quite a bit in the performance version that is the group's own creation, including the character of the Teacher, the opposition between Rock and the other two students, and the teacher's preference of project theme. The collaborative emergence of these narrative elements is described below. As will become apparent, because the group worked collaboratively, using improvisation, the narrative that resulted is best understood as a collective social product that cannot be simply attributed to the contributions of individual members.

The troupe began creating their dramatization of *Squids* by breaking into small groups of three to five students. For the Rock Paper Scissors scene, the initial group was composed of four actors: Josh, Ryan, Elena, and Zoey (pseudonyms are used throughout). The group began by assigning which role each of them would initially play (although the roles would later rotate among the actors). Because there were three characters in the story and four actors in the group, they would either have to add an additional character or one actor would have to sit out of the scene. The group decided that the addition of a teacher would be useful because this character could help drive the action by assigning and grading the project. Josh was cast as the first teacher; Ryan was cast as Rock; and Elena and Zoey were cast as Paper and Scissors.

Instead of planning and scripting the performance, the group immediately began improvising. Josh, as the Teacher, began by telling Rock, Paper, and Scissors to think of topics for their science projects. Ryan, as Rock, adopted a self-promoting attitude, and proposed to the group that they do their project on rocks. Elena (as Paper) rejected Ryan's project idea and proposed that the topic be butterflies. Zoey, as Scissors, agreed with this proposal.

Elena's counterproposal created a conflict in the scene. As part of their general training, the troupe had been taught to introduce conflict to "make the skit longer and more entertaining" (interview with Miranda). In addition to creating a conflict among the char-

actors, Elena's response to Ryan's topic proposal also created a problem for the actors, because the book dictated that Rock, rather than Paper, was the one to select the topic. Somehow, Elena's and Zoey's characters would have to be convinced to go along with Rock's idea. This problem was solved by Josh, who reentered the scene as the Teacher, and suggested that they would get a better grade if they selected rocks. In subsequent rehearsals, the Teacher's preference for rocks was elaborated on further. When Sandra took on the teacher's role, she commented at length on a previous year's project about rocks that was the "best project in the whole school district." When Josh later reprised the teacher role, he developed this idea even further by saying that the previous year's rock project was a "life changing experience" for him. By the time the skit was performed for an audience, the Teacher had developed a fanatical obsession with rocks. This character trait collaboratively emerged across many rehearsals, due to creative contributions of all of the actors, performing in different configurations.

The development of the Teacher character is an example of a two-layered collaborative emergence process that characterizes much of the group's rehearsal work. Narrative ideas, such as the idea that the Teacher is obsessed with rocks, emerged initially within a single rehearsal. Such ideas are then further developed across successive rehearsals, as new actors portrayed the character. Each time a different actor took on a role, she drew from the previous rehearsal performances that she had observed, selecting certain ideas performed by other actors, recreating those ideas, and often elaborating on them. Of course, each new enactment of the character was situated within a newly unfolding improvisation of the entire scene, and so was influenced as well by moment-to-moment interactions with other actors. In this way, narrative elements emerged as a process of both within-scene interactions during a single rehearsal and the collaboration among actors across successive rehearsals.

The Teacher's final character is but one example of this two-layered process. Many other narrative elements were the result of the same process. For example, when Rachel played Scissors in the second rehearsal, she continued the character conflict that the previous actors had established by also proclaiming "let's do butterflies." However, in Rachel's performance, the conflict with Rock was heightened by an action she did earlier in the skit: When the Teacher assigned Rock, Paper, and Scissors to work together, Rachel scooted herself and also pulled Miranda (as Paper) away from Rock, making a face she later described as the "he has cooties" look. In the next rehearsal, Rachel and Miranda (again in the same roles) further elaborated the "disgust with Rock" idea by clutching each other, inching further away from Rock, and gesturing to the Teacher to let them be in the same group. Josh, as the Teacher, responded to these actions by scooting Ryan, as Rock, toward the girls, and emphasizing that they would all have to work together. The girls' proposal of the butterfly topic then became retrospectively defined as part of an emerging theme about gender conflict and the group's unwillingness to work together.

Although Elena first proposed the idea of a conflict in topic between rocks and butterflies, Elena's "let's do butterflies" statement did not take on its full meaning (as signifying a personality conflict between the characters which contributes to their poor performance on their science project) until several rehearsals later, with a different group of actors. The meaning this line eventually assumed was retrospectively determined through a collective so-

cial process; it was the result of many interactions among the actors, including Rachel's "cooties" bit, and Josh's and Sandra's insistence on the superiority of rocks. Further, although Elena was deliberately trying to create conflict, she did not know how this conflict would play out in the rest of the scene, or how it would be embellished later by other members of the troupe.

This is an example of the retrospective interpretation commonly found in collaborative emergence; actions are not fully determined by the intentions of the performer, but later take on meaning that is collectively attributed by the entire group. It would not make sense to say Elena created the personality conflict theme, even though she was the first actor to utter the line "let's do butterflies" that later took on the function of signifying a personality conflict between characters. Rather, the conflict theme emerged from the group as a whole, as a result of their interactions. Nor would it be appropriate to reduce the personality conflict theme into component actions and attribute each of those actions to individuals because individuals alone do not determine the meanings of their contributions. In the presence of retrospective interpretation, explanatory reduction of group creativity to individual creativity is particularly difficult.

With each successive rehearsal, the actors improvising the scene would choose to repeat their favorite elements from previous renditions. Over time, this resulted in a fairly consistent set of plot points, characterizations, and character relationships for the scene. In Miranda's words, "when somebody does something that really works, it sort of becomes a fixture." It was not the troupe's intention to create a fixed, line-by-line script for the scene, but rather to develop the actors' ability to improvise their way through the scene coherently.

The "Rock Paper Scissors" scene is typical of how all of the 11 scenes of *Squids Will Be Squids* were created. Each scene was relatively stable even though that stability can neither be attributed to a preexisting script written by a sole author, nor to the book's version. Instead, this stable narrative structure was a distributed creation of the group. The creation of this stable narrative structure was distributed across all members of the group, and explaining it requires an analytic account of the complex processes of symbolic interaction that resulted in its emergence.

### *The Collaborative Emergence of Bits*

Once they emerged, the basic narrative elements of the scene remained relatively constant. However, what about the specific dialogue used by the characters? Did they enact the overall narrative using completely different dialogue each time? Or did the performance take on a scripted character, with verbatim lines being used? To answer these questions, we transcribed all five performances of "Rock Paper Scissors" and conducted interaction analyses of the transcripts. Our analyses revealed only a few sections of each scene that were repeated verbatim. However, even in those portions of a scene that were most improvisational, there were bits, stable sequences of dialogue and action that recurred repeatedly across performances. In performances of *Squids*, bits were often replayed in a slightly different form, so that even once a bit became established, it continued to evolve, and often underwent subtle variations in the wording of the dialogue. Bits emerged and remained stable because they served one of two dramatic functions: Either they served as anchors for the otherwise improvised dia-

logue, by marking important plot developments; or they were funny one-liners that got a laugh. (The function of bits in *Squids* is also discussed in an earlier paper by DeZutter & Boote, 2003.)

Each stable bit emerged from the distributed creativity of the group across many months of rehearsal. Bits were created by collaborative emergence, just like the narrative elements described in the previous section: A bit that emerged improvisationally in one rehearsal of a scene might be repeated and embellished in a subsequent rehearsal of that scene. And of course, repeating a dialogue exchange from a previous rehearsal requires collaboration; if one actor initiated a bit of dialogue, but the other actors did not recognize it and continue it, the bit would not be successfully reenacted. As with any extended improvisational process, there were innumerable dialogue exchanges that were never repeated and are now lost to history. The bits that were retained were selected out of the many hours of free-flowing improvised dialogue. And this selection was made by the collective and distributed activities of the entire troupe.

Among the bits that were identified, there was a range in how structured the bits were. Some were repeated more or less verbatim in each performance; others had common dramatic elements, but slightly different dialogue and action each time. The following passage is an example of a verbatim bit, one that occurred in all five performances with only minor changes in wording:

(Teacher exits.)

Rock: So, what are we going to do our project on?

Paper & Scissors: Let's do butterflies!

Rock: Let's do rocks.

Paper: Butterflies are cooler.

Scissors: They're pretty colors and they can fly.

Rock: But I have a rock right here.

Verbatim segments were not written by any one actor, but instead collaboratively emerged from group rehearsals. In most cases, these segments involved the same characters speaking the same lines in the same order every time. With some verbatim segments, however, even though the same lines of dialogue always occurred, these lines were not consistently spoken by the same character; the speaker for each line was negotiated improvisationally during each performance. For example, here are two instances of a bit that occurred in all five of the scenes for the story "Straw and Matches":

#### *Performance 1*

Straw Kid (J'Rhea): We can go to my House and Watch TV.

Match 1 (Sandra): TV. Ok, well, we get the remote and the couch, //and you can order some food.

Match 2 (Natalie): // And we get to pick the channels

Match 1 (Sandra): And then you can wait for it, and bring it to us and then you can go //back outside.

Match 2 (Natalie): //Back outside.

#### *Performance 2*

Straw Kid (Elena) We can go to my house and watch TV.

Match 1 (Zoey): Oh, Straw Kid, ok. We get the couch //and the remote.

Match 2 (Natalie): //and the remote.

Match 1 (Zoey): We // pick the channels

Match 2 (Natalie): //You can = = Exactly. And you get to order food, then wait outside for it, and hand feed it to us then go back outside.

In Performance 1, Match 1 says the lines about the remote, the couch, ordering food, and waiting for the food, while Match 2 says the lines about picking the channels, and they both say "back outside." In Performance 2, Match 1 says the lines about the couch and picking the channels, while Match 2 says the lines about ordering the food, waiting for it, and going back outside, and they both say "and the remote." In each of the five performances we analyzed, these lines break down in a unique way between the two "Match" characters. The bit consists of a specific list of demands that the "Matches" must make, and the actors negotiate in the moment who will say which line.

In contrast to the verbatim segments, there were many bits that were performed using considerably different dialogue each time. For example, a bit about the project being "interactive" occurred in all five performances of the "Rock Paper Scissors" scene. This bit is an interactional routine that contains three basic elements: The students hand the Teacher their poorly constructed project; the Teacher then has trouble keeping it together, signifying the ramshackle nature of the project; finally, the students try to put a positive spin on this by calling the project "interactive." Here are three instances of the interactive bit:

#### *Performance 3*

Teacher (Josh): (nearly dropping the project) Oh, okay, it's kind of falling. Oh, um, //I'm just gonna leave that there

Rock (J'Rhea): //No, no, no

Teacher: //No?

Scissors (Miranda): //No, see it's interactive.

Teacher: Yes?

Scissors: That's the rock part of it.

Teacher: It's interactive, yeah. Very creative. You have some, //a rock,

Scissors: //It's Hands on, You Know

Teacher: and you //have the word "rock" (holds up piece of paper with the word "rock" written on it).

Paper (Rachel): //Look, look (places scissors hat on top of folder).

Rock: Yeah.

Paper: And you can draw, //you can draw the rock on the paper and cut it out.

Teacher: //And it's, it won't even help. Trust me, it's ok.

#### *Performance 4*

Teacher (Josh): (having trouble grabbing the project) all right, I'll just kind of, ok.

Rock (Sandra): There you go (lifts folder to teacher).

Teacher: There you go, (drops several items from folder) wow, um, hmmm

Rock: Isn't it beautiful?



Teacher: You Have a, oh, there's, there's Lots of parts to it, which is always a good thing.

Scissors (Miranda): Yeah, it's interactive, its =

Teacher: = Interactive, //I like how you have the scissors hat, that's creative

Scissors: //It's, uh-uh.

Rock: Draw the rock on the paper.

### Performance 5

Teacher (Josh): This is your project, this, oh and that down there is your project. This is your project?

Paper (Miranda): Um, // that is the main part of our project.

Teacher: //(to audience) This is their project.

Paper: See, //it's interactive, you can actually hold and feel the texture of the rock and yes.

Scissors (Chelsea): //This is the main part.

Teacher: Uh-huh. it's ok, you can, uh, thanks, yeah, so in case I didn't know what rocks looked like, //I have one.

Paper: //Exactly, exactly. This is an example of a rock, yes.

Teacher: Okay, great.

In all three performances above, the students suggest to the Teacher that their project is interactive, but the dialogue unfolds slightly differently each time. Key portions of the bit are performed by different characters in each performance. In Performance 2, it is Paper who suggests the idea of drawing the rock on the paper, and in Performance 4, it is Rock who does so. More interesting, in Performance 5, this idea is not brought up at all. Instead, the Teacher and Paper discuss the inclusion of an actual rock as an example of rocks.

The following bit in the "Rock Paper Scissors" scene, in which the Teacher grades the students' science project, unfolds slightly differently in each of five performances. In Performance 1, Josh, as the Teacher, says he will write the students' grade on their project and that they need an A or a B. As Josh begins a monologue about his low teacher salary (which was consistent with a characterization of the Teacher as unhappy with his job that had emerged in some of the later rehearsals), Miranda interrupts by initiating a discussion among the students about what grade they think they will get.

Teacher (Josh): All right, then, so I'm gonna put your grade right here, you need an A or a B to pass, so, you know, and being, you know, I being the teacher, working, // working on a very minimal,

Scissors (Miranda): //I guess we got an A. We got an A.

Teacher: minimal salary, // trying to help you students . . .

Paper (Rachel): // Maybe we got a B plus.

Teacher: Anyway, I guess that doesn't matter, // it does not matter.

Scissors: // Ahh, maybe an A minus.

Teacher: Anyway, I'm just gonna put your grade right on here.

In Performance 2, Josh picks up on Miranda's idea about discussing what grade they should get, and initiates this discussion himself.

Teacher (Josh): You need an A or a B to pass this grade—I'm just gonna put your grade right on here, and, uh, nice and big. // What do you think you should get on this?

Scissors (Miranda): We got an A. I think we got an A.

Rock (J'Rhea): An A, // an A.

Teacher: // An A? On this? (Teacher acts as though he is having trouble holding the unwieldy project and lets several items from the folder fall to the floor.)

Some of audience: //A!

Others in Audience: No! F! (most of audience begins chanting) F, F, F.

Unexpectedly, the audience responds to Josh's question by shouting out their opinions on what grade the students should receive.

In Performance 3, Sandra, as the teacher, also enacts this new element of the bit, cuing the discussion of the grade by asking the students what they think they should get on the project.

Teacher (Sandra): Well, now, what grade do you think you should get on this?

Rock (J'Rhea): //A plus, yeah.

Scissors (Natalie): //A plus.

Paper (Rachel): Maybe an A Minus.

Rock: No, I say an A plus.

Teacher: Ok, well, you needed an A or B to = (lets an item from the folder fall to the floor.) = Oh, just gonna leave that there. You needed an A or a B to pass the class, so, um, I'm just gonna write your grade on the paper.

Sandra also replays Josh's activity with the props, drawing additional attention to the poor quality of the project by reacting to its falling to pieces with a rather frazzled exclamation, "Oh, just gonna leave that there." Incidentally, this was a line Josh had used, in an earlier part of the scene, when he played the Teacher in performance one (see the "interactive" segment, above).

In Performance 4, Josh again plays the Teacher, and he again cues the grading discussion by asking the students what they think they should get on their project. However, this time, Josh also directs the question to the audience, remembering that in Performance 2 the audience had provided unsolicited shouts.

Teacher (Josh): What do you think you should get on, on this? (gestures, indicating the mess on the floor)

Rock (Sandra): //An A.

Scissors (Miranda): //An A.

Paper (Rachel): //An A. Plus.

Teacher: An A? On this?

Rock: Maybe an A minus, I mean I kind of felt bad.

Scissors: Hey, an A.

Teacher: (to audience, indicating the mess on the floor) //Ok, What do you think they should get on this?

Rock: //Just think we should be realistic here.

Audience member 1: A plus.

Audience member 2: //A minus.

Teacher: //(nods and gestures to the audience members who spoke)  
Ok, we'll just SEE in a second. Oh, uh sorry. I'm gonna write it nice  
and big. You need an A or a B. . . .

The variant of the grade discussion bit that appears in Performance 4 was created collaboratively by the group, with creative contributions from the audience. In Performance 1, Miranda mused "I guess we got an A" but this would not have turned into a recurring bit about discussing the grade if Rachel had not joined in with her line, "Maybe we got a B plus" and if Josh, in Performance 2, had not cued the other cast members to discuss their grade. The audience created their own involvement in Performance 2, and this became a repeating part of the bit when Josh cued the audience in Performance 4.

In Performance 5, the grade discussion bit did not occur at all because the scene emerged somewhat differently. In the prior four performances, after examining the project, the Teacher cued the students that he or she was ready to assign a grade. In Performance 5, while still examining the project, Josh as the Teacher notes that the project has a lot of information on butterflies. Ryan picks up on this by making a new proposal, one that had not appeared in any of the prior four performances.

Teacher (Josh): So, I'm really glad // that I have all this information  
on butterflies. // Even though your topic was =

Paper (Miranda): //Yeah. Um.

Rock (Ryan): = Can we change it to butterflies?

Teacher: No. What was your topic, everyone look. (Takes "Rock"  
sign from the scene intro, which Ryan had shoved into the folder, and  
holds it up to the audience) //What does it say, what does it say?

Rock: //Butterflies.

Audience: Rocks!

Teacher: Rocks, thank you, thank you very much.

When Ryan, as Rock, asks to change the topic to butterflies, Josh responds by asking the audience to read the "Rock" sign. Josh asked for audience interaction at about the same point in the scene as the grade discussion in the first four performances, but rather than asking what grade the students should get, he asks the audience to read the "Rock" sign so as to remind the students of their topic. If there had been future performances, "can we change our topic" might itself evolve into a stable bit, depending on the group's collective decision making process. Even relatively stable emergents are always subject to continuing processes of distributed creativity.

## Discussion

The goal of this study was to better understand how group creative products emerge from collaboration. As with any other socially emergent phenomenon, in improvised dialogue we find that the emergent narratives cannot be reduced to the intentions or actions of any participant (Sawyer, 2005). As a result, understanding distributed creativity requires an empirical focus on the moment-to-moment interactional process of the group, and how that collaborative, improvisational process leads to distributed creativity.

We used the methodology of interaction analysis to analyze a series of improvised performances by a group of adolescents. The

concept of collaborative emergence helped us to understand how these narratives emerged over time from the collective activities of the entire group, both in private rehearsals and in public performances.

In our analysis of the group's rehearsals, we identified two broad features of the performances that emerged. First, the group collaboratively created narrative elements for each scene, using improvisation to expand considerably on what was provided by the book version of each story: developing original characters, relationships, and plot events. Second, the specific dialogue and actions used throughout a scene often contained bits, relatively stable interactional routines. After months of rehearsals, the group had developed both a stable narrative structure and a set of bits that they used consistently to communicate essential plot points. Even though the scenes were not scripted, the actors' performances were guided by two broad types of emergent structure: overall narrative elements (plot, character, relationships), and specific bits of action and dialogue. The presence of a fairly stable set of bits that occurred regardless of which actors were in which role, and the stability of most of the narrative elements, despite the rotating cast, highlights the importance of understanding the narrative as a collective creation of the group. Neither the overall story nor the bits were created and enacted by any particular actor. The responsibility for performing the story was distributed across all members of the cast.

In public performances, we identified narrative elements that emerged across five performances. Even with months of rehearsals, the scenes in *Squids* changed every time they were performed, as we saw when in Performance 5 the cast left out the "interactive" bit and substituted a discussion about changing the project's topic. This was not because of memory failure or inattention on the part of the cast; rather, it was due to the unpredictable process of collaborative emergence. Such improvisation and embellishment is the nature of all collaborative creativity, as documented repeatedly in studies of verbal performances conducted by linguistic anthropologists. For example, the studies collected in Bauman and Sherzer (1974) show that even highly ritualized performances retain space for improvisation and undergo subtle variation over time.

These analyses demonstrate how studies of distributed cognition can complement and extend psychological studies of creativity. Despite the broader shift in cognitive science toward a distributed approach, creativity research has continued to focus almost exclusively on internal mental processes of specific individuals. If new ideas and significant innovations are so often the result of group processes, then a focus on individual mental processes would only be capable of providing a limited and partial explanation of creativity. This paper has demonstrated one alternative path forward—to draw on a well-established methodology that is widely used to study distributed cognition. Of course, studies of individual mental processes are also essential to a complete understanding of creativity; moving forward, studies that combine interaction analysis with studies of each participants' mental processes could provide a full picture of how innovations emerge. This sort of hybrid research is currently under way in studies of distributed cognition as well (Greeno, 2006; Nersessian, 2005). These researchers are beginning to map out the links between individual mental processes and group interactional processes.

## Conclusions

Our findings are consistent with theoretical perspectives that emphasize the collective nature of situated social activity, perspectives that include distributed cognition (Salomon, 1993) and sociocultural theory (Rogoff, 1990, 1998). These approaches emphasize that much cognition occurs “in the wild” (Hutchins, 1995)—in real-world settings that are deeply contextualized and within activity structures that are fundamentally collaborative. A distributed creativity approach becomes essential when attempting to explain the creative activity of an improvisational theater company like TheaterWorks.

Interaction analysis could be applied to a broad range of creative phenomena that are fundamentally collaborative. First, in many businesses, work teams are tasked not only with efficient execution, but also with creative problem solving or even with developing ideas for new products. Such groups could be videotaped and the interactions could be analyzed to help us better understand how collaboration generates business innovation. Second, the idea-generation methodology known as brainstorming is commonly used in organizations. However, interaction analysis has not been used to help us understand how conversation unfolds in brainstorming groups (see Paulus & Nijstad, 2003). Specifically, interaction analysis could help us better understand how to avoid the well-known factors that reduce idea productivity in groups, in particular the many forms of production blocking, such as the tendency for ideas to cluster in conceptually similar groups.

Ultimately, a complete understanding of distributed creativity would involve interaction analysis as well as traditional individual psychological study of participating individuals. If interaction analysis becomes more widespread in studies of creativity, eventually these analyses will need to be integrated with individual psychological study. This is likely to require new methodological innovations.

Earlier in this paper, we noted our intention to focus on groups that displayed collaborative emergence. Distributed creativity might also be found in relatively constrained and structured groups; for example, even in an autocratically guided business meeting, with a detailed agenda, unexpected outcomes occasionally result. Likewise, a symphony orchestra performance varies from night to night despite the presence of a score and a conductor. However, to the extent that a group does not manifest collaborative emergence, its creative processes would be more susceptible to individual psychological explanation, and less likely to require interaction analysis. The creativity of an orchestra performance resides, in large part, in the creativity of the composer and of the conductor. The creativity of a centrally managed business team resides in large part in the autocratic leader. Such individuals, and their creative processes, can be successfully studied using individualistic methods. However, to the extent that a group manifests collaborative emergence, it will be more likely to require interaction analysis to explain processes of distributed creativity.

Several prominent creativity researchers, influenced by the onset of sociocultural and distributed approaches to cognition in the 1980s, have begun to analyze the role of collaboration and context in creativity. This second wave of creativity research focuses on how novelty emerges from unstructured and improvised group collaborations. This collaborative turn in creativity research has provided us with a deeper understanding of how new things are

created—not only by solitary individuals, but also by collaborative teams and social networks. Interaction analysis provides a methodology that can be used to analyze such distributed creativity. Using interaction analysis, researchers can explore group creative processes and gain new insights into how creative products emerge collaboratively from groups.

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