Practices to Improve Group Creativity: A Longitudinal Field Investigation

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Abstract

Emergent teams are ad hoc part-time teams of strangers with very different perspectives who are asked by their company to come together and solve novel strategic problems. Most research on creativity has focused on individuals, with relatively little research on practices to improve group creativity. In this study we build upon our earlier qualitative research and longitudinally surveyed members of 31 different teams varying in the level of emergence. At three points in time, we asked team members about the practices they used to manage their creative process, focusing particularly on two practices: maintaining engagement, and co-creating shared boundary objects. We found that these practices affected the customer's assessment of the team's innovativeness, but the timing of when these practices were introduced was critical. Implications for design of information systems includes 1) allowing members to maintain their engagement with the team's process even as they leave to attend to other activities and then rejoin the team, and 2) facilitate the co-creation of shared boundary objects early in the team's process. For managers, this research suggests the need to train team members in these two practices in order to further the innovative process.

1. Introduction

Temporary creative teams are increasingly used to solve novel problems in organizations [31], [46], [50], [51]. Temporary creative teams, also called creative project teams are self-managed quasi-formal organizational forms consisting of two or more individuals who engage in non-routine tasks to produce creative outputs and then disband with no explicit intention to become a team again [42]. “Creative project teams have traditionally been contrasted with stable work teams because membership in them is temporary, because creative processes are different from the processes of routine teams, and because of the one-off nature of creative team outputs” ([42]: 119).

We see creativity, like most in the field [23], as the generation of new and useful ideas, with innovation being the implementation of creative ideas. Generated ideas can pertain to solving problems, new practices or new procedures, as well as new ideas about products or services [41]. The task itself for these temporary teams is a creative task, i.e., the task can be approached in numerous ways and has no single correct answer [20].

Most creative project teams operate under time pressure [42]. The pressure arises because either the problem is time-bound as there is a limited window of strategic opportunity to respond to the novel problem [6], or team members have limited time to devote to problem-solving ([28], [30]). The teams are intended as temporary part-time endeavors to be accomplished in addition to members’ regular job responsibilities, creating more time pressure.

Most creative project teams include cognitively diverse individuals [42]. Teams are considered cognitively diverse when they include individuals from different disciplines and with different problem-solving approaches and experiences [31]. As organizations become more global, teams must solve problems in ways that accommodate varied global constituencies, cultures, and diverse organizational structures. The inclusion of team members representing these varied perspectives facilitates solving the problem in ways that align with the needs of the various constituencies. Additionally, differences in perspectives give rise to varied ideas, knowledge and skills that can improve the team’s ability to produce outcomes that are more original, divergent and complex than in groups with less diversity [32], [39].

Despite the clear value of such teams, achieving creativity in such contexts is difficult [39]. The drive for diversity and representation across disciplines or organizational units means that the members will have rarely worked with each other previously. Consequently, coupled with their diversity, they lack common work practices and language for understanding the problem or understanding each other’s contributions to the problem-solving process [12]. The iterative nature of
a creative process means that the problem definitions will frequently expand, contract, and be refocused such that the knowledge one brings to bear on the problem will change over time, making it difficult for others on the team to predict how each person will contribute new ideas. While the time pressure may encourage member focus [30], it will also create stress and negative emotions for the participants in the creative process [23]. Thus, creative project teams suffer from several significant challenges that make the co-creation of solutions difficult.

While there is much research identifying the challenges of these teams as well as the organizational and group structures that help such teams to collectively co-create, there is little research on specific practices that help members of such teams interact over time to overcome these challenges [15], [41]. While team creativity is likely to be a function of such individual factors as domain knowledge and creativity-relevant skills [1], group creativity is not completely determined by individual creativity, emerging synergistically when members interact in certain ways [22], [38], [45]. Pirolla-Merlo and Mann [38] refer to these interactions as a “fuzzy-compositional form of emergence”; team members interact in ways that iterate between different problem definitions, exploring different options, combining different viewpoints, and reflecting on what has been developed [41]. There is little research exploring the specific practices that creative project teams in natural settings engage in over time to move through this fuzzy-compositional form to emerge with a creative solution – all with time constraints [14], [21], [51]. Recently, researchers have become to identify specific team creativity-enhancing practices based on qualitative research [34]. From this research, we develop specific hypotheses about the effect of these practices on team creativity. We test these hypotheses based on a sample of 31 teams tracked longitudinally over time, with their innovation assessed by a third party, the team customer.

2. Background Literature

The challenges that creative project teams face given their starting conditions (lack of familiarity, cognitive diversity, and time pressure), can be grouped into two types: 1) difficulty in achieving conceptual creative synthesis and 2) the potential that individuals will withdraw from the team. For each type, we first describe the challenge and the extant research on factors that teams need to have in place to overcome each challenge. We argue that teams need to engage in practices that resolve these challenges.

**Challenge #1: Difficulties of Achieving Conceptual Synthesis**

A first problem that creative temporary teams face is achieving conceptual synthesis ([41], [42]). Conceptual synthesis refers to team members expanding and broadening their individual conceptualizations of the problem and possible solutions to derive new distinctions that can be conceptually recombined, reframed or expanded [47]. Conceptual synthesis involves the team iteratively discussing the problem and various potential solutions to foster reconceptualizations that eventually generate a new solution.

Conceptual synthesis requires both bricolage [6] and co-creation [47]. Team members engage in bricolage when they engage in associative thinking (which is the linking of ideas from multiple sources, categories or knowledge domains) based on the inputs of others, recognizing the relevance of old information to new problems, and combining concepts to generate more complex ones [23]. Team members must be able to engage in remote associations between seemingly disparate ideas, using metaphors to see the problem differently, using analogies to map knowledge from a more familiar domain to a less familiar one - essentially any technique that helps them to develop and consider unusual ideas [42]. Remote associations require team members to understand different categories or domains of knowledge so that they can generate new ideas or modify their own concepts by adapting different perspectives [47]. Co-creation requires that in addition to reconfiguring existing information into new patterns that gaps in existing information are identified and new ideas are generated to fill these gaps. To achieve conceptual synthesis, then, requires understanding each team members’ contributions to team discussions in sufficient detail to use those contributions to generate new ideas.

Conceptual synthesis, however, is difficult to achieve in teams composed of cognitively diverse individuals, i.e., teams of individuals with different experiences, domains, knowledge bases, and cognitive processes for accomplishing the group’s task [31], [32], [36]. Teams of cognitively diverse individuals face what Carlile [10] calls “knowledge boundaries” or Dougherty [13] refers to as different thought worlds, in which members have divergent syntactic, semantic, and pragmatic understandings of the problem. Because of these knowledge
boundaries, each person’s understanding of the same issue is often represented differently – called representational gaps – based on differences in the knowledge they already possess and the tacit assumptions they have about the problem [12]. Representational gaps create differences in how information is interpreted and evaluated to solve a problem, leading to misunderstanding which harms creativity [36]. Representational gaps are difficult to overcome unless assumptions can be surfaced and aligned, a task particularly difficult when, as happens in creative processes, the problem is repeatedly redefined, causing individuals to repeatedly and tacitly reframe their own experience and assumptions to new problem definitions [10]. Therefore, an alignment of assumptions between members that make creative conceptual synthesis possible may be fleeting. Without understanding each other’s thought worlds, representations and knowledge boundaries, it is difficult for members to use the ideas of others for “lateral” or associative thinking [32]. Consequently, members are more likely to follow preexisting paths of cognition, rather than engage in creative leaps from category to category [32].

The creative teams literature suggests several approaches for achieving conceptual synthesis among parties with diverse knowledge: metaphors [40], boundary objects [10], information-sharing to verify each other’s self-views [44], dialogic-based interaction [24], [47], and questioning each other’s assumptions [2], [41]. While, undoubtedly, these suggestions will help team members to understand each other better, they do not explain how the conceptual synthesis unfolds. For example, a suggestion of open dialogic interaction does not explain the form and nature of this interaction over time. The nature of the open interaction at the beginning of the team’s activities may look quite different than the nature of the open interaction at the middle or end of the project [18].

Moreover, the suggestions in the literature rely on starting conditions for teams that creative project teams do not meet. For example, team members interacting in a way that verifies each other’s self-views requires psychological safety [44]. In groups of strangers, psychological safety may not be present for this level of sharing [16]. Similarly, open interaction and questioning of others’ assumptions relies on semantic, syntactic, and pragmatic understanding of each other’s domain [10], an understanding that may not be immediately present among a group of strangers, which may take precious time to develop. Reliance on roles to replace this understanding due to critical time pressure is also unlikely to occur, given the lack of concrete roles and emergency situations that are generally required for "swift trust" to develop [35]. Tsoukas [47] explains that reconceptualization of a problem requires extended productive dialogues – extended time that these teams often do not have. Therefore, research exploring how time-pressured team members achieve conceptual creative synthesis over the life cycle of the creative project team’s activities is needed.

**Challenge #2: Withdrawal**

A second problem that creative project teams face is the possibility of withdrawal. Individuals exercise agency in creative teams. Engaging in the cognitive and behavioral aspects of producing ideas instead of following habitual action is a choice individual team members make throughout a team’s lifecycle [15]. Individuals can choose to engage or withdraw from conceptual synthesis in creative project teams.

Withdrawal, as the inverse of engagement, refers to a cognitive and psychological state in which an individual chooses not to expend the effort required to share ideas, listen to others’ contributions, and reframe one’s own ideas to accommodate to others [15], [47]. Withdrawal is a problem for team creativity because sharing of unique knowledge is needed to create divergent ideas that could expand conceptual breadth, foster associative thinking, and enable other individuals in the team to modify their concepts to adapt to others’ unique perspectives [41], [42]. When individuals limit their participation and withdraw from the team, the team will lose access to their unique knowledge. Withdrawal is also a problem for creativity because creativity requires individuals to expend cognitive energy to generate new ideas, view the familiar as strange and the strange as familiar, accept unusual ideas, reframe their own knowledge in light of others’ perspectives, carefully process the ideas being exchanged, and reflect on the ideas after exchange or brainstorming [37], [41]. These cognitions often require intense effort - effort that is unlikely if someone cognitively withdraws from the team. Finally, withdrawal removes a sense of active responsibility for improving the situation through joint action - what Tsoukas [47] refers to as relational engagement.

Withdrawal is likely in creative project teams for a variety of reasons. Time pressure leads to increased normative influence, e.g., greater conformity and less willingness to share divergent opinions [29]. Time pressure also harms one’s ability to generate new ideas [23]. Time pressure
results in fragmentation in the work and lack of focus on single important problems, distracting people from the task and making it difficult to exert the cognitive focus for idea generation. Withdrawal is also likely because creativity among diverse strangers is a struggle [15]. Different individuals may have opposing viewpoints which require negotiations to reach a final outcome. Tension pervades as different sense making processes continuously introduce new ideas to support new points of view [15]. Frustration and anger may arise during intensive work interaction especially among people with differing viewpoints and perspectives ([39]: 302). People with negative moods give fewer unusual first word associations and are less creative [26], [48]. “Being on a [cognitively] heterogeneous team seems to be hard work – and seems to take its toll on the emotions and the satisfaction of team members” ([31]: 61). Withdrawal may also be likely because diverse perspectives create different social categories that increase dysfunctional conflict, undermining cohesion, social integration, and informal communication, disrupting group processes needed for creativity [39]. Withdrawal may result from this conflict as the anticipation of conflict can affect a person’s mood, cognitive rigidity and willingness to participate [11]. Conflict tends to generate negative affect which often hinders creativity by decreasing cognitive effort to engage in ideational fluency and generation of unusual associations [32].

Literature on creative teams has offered several suggestions for overcoming the problem of withdrawal [45]. One suggestion is for the teams to heighten similarities among team members [39], but this may come at a cost of discouraging individuals from thinking and acting in unique ways. A similar suggestion is to encourage group cohesion since members are more willing to take risks when they have reliable bonds with each other [25], [39], [47]; however, newly formed teams are unlikely to have those bonds initially. Another suggestion to avoid withdrawal is for team members to feel psychologically safe [16], [19], [23], [33]. When people feel free to participate, they show higher commitment and tend to invest more energy in their work, engage in more risk-taking, more associative thinking, more divergent thinking, and more reflective learning that lead to creativity [9], [16], [32], [49]. Among strangers, however, psychological safety may not be an initial starting condition for the team. Therefore, while these suggestions are undoubtedly useful for creative project teams, they do not explain the specific interactions of creative project team members as they struggle over time to maintain their engagement in the creative process.

3. Hypotheses

In sum, the two challenges of potential psychological withdrawal and conceptual synthesis need to be overcome for teams to collectively co-create a solution to a novel problem. One practice that may be helpful, particularly for the conceptual synthesis challenge, is the use of boundary objects, which are co-created early in the team’s work process so that the team is able to share a common language and perspective on the problem.

Boundary objects are pragmatic representations that simultaneously satisfy the information requirements of multiple communities [43]. Boundary objects have been variously described as “tangible definitions” ([7], p. 326), physical products, components, prototypes, sketches, notes or drawings ([10], [43]), and metaphors [40], [47] used in conversational interaction [7], [43]. Boundary objects are viewed as helpful in facilitating knowledge integration by “invok[ing] the key differences in work contexts between [different] groups” ([7], p. 326). The boundary objects examined in this research are those that typically pre-exist, such as knowledge repositories [43], engineering drawings [10], or machines [7].

There has been significant research arguing for the importance of boundary objects in creative cross-functional teams (e.g.[8], [10], [40], [47]). However, research on the use of boundary objects in emergent teams that must create a novel solution is nascent. In emergent teams, since so little is understood at the team’s outset about each other’s perspective, and the novelty of the problem is likely to alter those perspectives over time anyway, the use of pre-existing boundary objects are likely to be of limited value. Moreover, use of any single individual’s boundary object (such as an engineering drawing, sketch, or prototype) are likely to require precious time for other members to understand since language differences are so great, and time that might end up being wasted if the individual’s boundary object is not used. Therefore, instead of the important practice for creative teams to be that of simply using boundary objects, it may be more important that the team members co-create a boundary objects early in the team’s lifecycle that they can repeatedly refer to later in the team’s process. The co-creation of the boundary object might include the creation of a common work story, as when they co-visit a workplace and see an interesting story about how work is done in the
workplace that then becomes a common referent point for the team. Or the co-created boundary object might become sketches that are created during the team process by the team members themselves to better understand each other’s perspective. Or the co-created boundary object might become a common conceptual framework that includes different definitions of the problem, issues, and solution concepts so that each person is able to see how their individual knowledge fits.

The co-creation of the boundary object may allow for small successes to emerge that helps to maintain motivation and confidence in the group’s efficacy, fostering the creative process [3]. Co-creation of these shared boundary objects, however, probably have their greatest impact on the ability of the team to create innovative outcomes when the objects are co-created at the beginning of the team, when the team is struggling to identify a common language and perception of the problem. If the boundary objects are introduced too late, the boundary objects may cause significant rethinking of evolving assumptions, slowing the team down. Therefore, we hypothesize:

**H1: Practices for co-creating shared boundary objects at T1 will affect the team’s innovativeness.**

One of the reasons why withdrawal is such a challenge in emergent teams is that members are often rarely full-time on these teams and thus are often pulled away from the team’s deliberations [34]. If the team simply ignores the departure and arrivals of team members, the team may find itself in a non-productive cycle, re-deliberating over decisions made earlier. An alternative suggested by Majchrzak et al [34] is for members to use practices that make it easy for members to quickly rejoin and regenerate their excitement about the team deliberations by making it easy for members to see what decisions have been made, what decisions yet need to be made, and the enthusiasm level of the team on the direction they are taking so far. With such practices, when team members return to the deliberation they are able to quickly determine how they can contribute, on which decisions in what direction. IDEO uses Post-its for this purpose; other teams might use team meeting minutes; still others might use frequent summarizations and reviews of decisions [34]. These practices are likely to be most helpful for innovativeness around the mid-project point when team members’ potential psychological withdrawal may be the highest [18]. Therefore, we hypothesize:

**H2: The use of practices to facilitate rejoining a team at the project’s midpoint will positively affect team innovativeness.**

### 4. Data Collection

To test the hypotheses, we carried out a field study in which we collected data from team members about their practices at three points in time over the life cycle of 31 emergent teams, and then obtained data on the innovativeness of the team from a third party, the team’s client. To identify the teams, we approached 12 companies known for their innovativeness in different industries. We asked senior executives in each company to identify one or more emergent teams that were about to start, which had a task that was novel for the firm, requiring some degree of creative solution-generation. We were informed of 31 teams prior to the start. We then asked members of each team to complete a survey of the practices they used to work together, shortly after they began, around the mid-point of the project, and at the end.

173 team members completed the questionnaires. The team members conformed to our understanding of the diverse composition of emergent teams, bringing a wide variety of personal experience in the number of innovative teams they have taken part in (mean 1.77, stdev 1.47), years in their current function (mean 9.8, stdev 8.62), and level of education (mean 5 years of post secondary education, stdev of 3 years). The teams averaged 5.54 members (stdev 2.71), and worked on a variety of projects, including new product development, business strategy, and process reengineering.

A James index was calculated for the practice variables to determine that the individual-level data could be aggregated to the team-level. All multivariate constructs were tested utilizing a James Index (also known as the intrarater agreement index, or $r_{wg}$) [27]. An aggregation to the team level is generally considered appropriate if the indices exceed .70 [17]. To ensure that each time period had a viable intrarater agreement, we examined each construct in each time period, and all exceeded .70, indicating that the constructs were viable and that team size was not a factor. Following the final major deliverable, an internal customer of each team was asked to assess the innovativeness of the team.

### Measures:

*Team Innovation* was measured by asking each team’s customer four questions: “To what extent (1-
5) were the team outputs: 1) not done before in the organization 2) helped to develop critical information and/or skills that were not previously available in-house, 3) provided a major breakthrough that had not currently been replicated in the organization and 4) provided a major competitive advantage that had not been replicated in other organization in our industry. A mean of 3.16 was obtained across the 31 teams, with a Cronbach's Alpha of .776.

Practices Encouraging Quick Rejoining were measured with three items asking the team member to indicate extent of reliance (1-5) on the team to the following statements: “Together we developed solutions that generated excitement among all members”, “Together, we made it easy for people to come and go from the project”, “We kept a continuous display of what was being done so everyone could see current status”. Team members were asked to respond to these questions at each time period, indicating reliance since the last survey. A mean of 3.40 was obtained across the 172 individuals, with a Cronbach's Alpha of .735.

Co-Created Boundary Objects Practices were measured by asking team members the extent to which (1-5) the team relied on the following: “Together, we referred to common work-related stories that helped to explain different perspectives on the project”, “Someone on the team created sketches that we used to understand each person’s perspective”, “Together, we created a conceptual frame that included different definitions of the problems, issues, and solution concepts so that each person’s individual knowledge fit”. Team members were asked to respond to these questions at each time period, indicating reliance of the team since the last survey. A mean of 3.04 was obtained across the 172 individuals, with a Cronbach's Alpha of .830.

To ensure that our results in team innovativeness were not due to the use of standard project management practices, we also asked team members to report at each time period on whether they used any of a list of ten standard project management practices. We use the total number of project management practices as a control in our model, to highlight the differences between the traditional understanding of team management and supporting co-creation and rejoining in the emergent creative process. These standard project management practices were offered as a checklist, including: “Use of common standards, use of common design systems, project plans that include schedules, coordinate through a project manager, assigning someone other than the project lead to be a full-time coordinator of team activities, have a hierarchy in the group to coordinate decisions, face-to-face meetings intended for coordination, use of teleconferences to coordinate, individuals informally taking part-time coordination responsibilities.” A mean of 5.79 standard project management practices were reported at the individual level.

5. Analysis Strategy

To test the hypotheses, we initially used a linear regression model test our innovation hypotheses, however there are simply too few teams to get consistent analysis across all three time periods (19 missing out of 93 total). In response to this difficulty, we split the sample into two groups utilizing the mean innovativeness score of 3.16. This split yielded 16 teams that were given above average assessments in innovativeness by their customers, and 15 teams that were below average.

We then performed our analysis with high and low innovativeness as the two treatment conditions, and each ANOVA was done separately by time period to reveal mean differences between the high and low performing groups. If there is not a significant difference in group means between the high and low performing groups, then we must reject the hypothesis that co-creation, rejoining, or project management has an effect on innovation during a particular time period. This treatment allowed us to reveal the time period effects of the data. The results for the three sets of practices: rejoining, co-creating boundary objects, and standard project management practices are shown in Table 1 below.

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<tbody>
<tr>
<td><strong>Beginning</strong></td>
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<tr>
<td>Rejoining</td>
<td>2.123</td>
<td>0.171</td>
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<tr>
<td>Co-Creation Project Management</td>
<td>16.211</td>
<td>0.002**</td>
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<td>Project Management</td>
<td>3.204</td>
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<tr>
<td><strong>Middle</strong></td>
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<td>Project Management</td>
<td>1.536</td>
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* = Significant at a < .05 level
** = Significant at a < .01 level
6. Discussion

The results of our analysis suggest that it is not simply the introduction of these co-creativity practices that are important, but when they are introduced, that help to determine how creative the team will be. In line with our first hypothesis, practices that support co-creation are significant early in the process, but lose importance as the project evolves and the need for co-creation diminishes. Additionally, we find that practices that support rejoining become more significant as a project matures, and the mid-way readmission of participants who have withdrawn contributes to the innovativeness of the project outcome. Finally, we find that neither co-creation, nor rejoining practices have an impact on the outcomes at the end of a creative process, indicating that there may be a point late the group creative process where additional creation and renewed participation are of limited benefit to the overall success of the project.

We also find it interesting that our control variable, the number of standard management practices, had no significant effect at any point in the level of team innovativeness, which lends further support to the necessity of co-creation and inclusion for innovation.

Applications, Limitations, and Future Research

Practically, our findings reaffirm that collaborative technologies that make practices such as easy rejoining and boundary object creation will be useful to teams to facilitate team creativity. These practices also extend the repertoire of practices to encourage team creativity that are available to managers today.

Our findings extend the common understanding of collaborative technologies by revealing that support for these practice in emergent creative teams are most critical during different times in the production process. Efforts to support co-creation and rejoining may be completely wasted in the late stages of a project that is focused on an innovative outcome. Additionally, the large amount of diversity in the teams, from industry and type of project, to individual factors such as experience with creative emergent teams and educational background, indicate that our results are generalizable to creative emergent teams.

While we have attempted to sample a broad range of standard project management practices, our examination of team interactions is not a holistic examination of the innovation process. Other non-standard project management practices, such as socialization activities early in the process to ameliorate the likelihood of withdrawal and bolster open interaction to increase the understanding of each other's domain were not addressed. Given the number of teams, companies, and different methods of managing a creative emergent process, we were unlikely to capture team interactions in the level of detail needed to make specific prescriptive suggestions to address issues related to non-standard project management practices.

We encourage future research in these areas to focus on specific practices used by teams in different time periods to effectively support co-creation and rejoining.

References


