The positive effect of expressing negative emotions on knowledge creation capability and performance of project teams

John Paul Stephens\, a,\,1, Abraham Carmeli\, b,\,c,*

\textit{Department of Organizational Behavior, Weatherhead School of Management, Case Western Reserve University, 11119 Bellflower Rd., Peter B. Lewis Bldg., Rm. 428, Cleveland, OH 44113, USA}

\textit{Faculty of Management, Ramat-Aviv, Tel Aviv University, Tel Aviv 69978, Israel}

\textit{University of Birmingham, Birmingham, United Kingdom}

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Abstract

Organizations are built around teams as a way to better manage complex work, such as technological projects. However, complex teamwork presents challenges that can often generate positive and negative emotions, as well as demand efforts to generate new knowledge. We examine whether and how the capacity of technological product development teams to constructively express negative emotions facilitates knowledge creation capabilities and thereby enhances project outcomes. Results indicate that with greater capacity for constructively expressing negative emotions, teams enhance their capability to access crucial knowledge and exchange and integrate that knowledge in ways that enhance both project performance outcomes and project budget adherence. In so doing, we hope to open up new avenues for research on how expressing negative emotions in project teams can help in building knowledge creation capabilities and drive multiple performance outcomes.

Keywords: Emotional expression; Negative emotions; Knowledge creation capability; Project team performance

1. Introduction

Technological projects in organizations that develop new applications and enhance extant operations tend to be complex and thus demand effective teamwork (Hoegl and Gemuenden, 2001). Teamwork, or the set of interactions that align work contributions (Marks et al., 2001), is difficult to build (Hackman, 1990), requiring elements such as shared understandings among team members (Bechky, 2003; Klimoski and Mohammed, 1994), and structural elements, such as the provision of routines, spaces, and rewards for collaboration (Dougherty, 1992; Hargadon and Bechky, 2006).

The interactions and communications that occur in the relationships among members enhances the team’s capability for developing new, team-level knowledge that is crucial to the success of the project (Bartsch et al., 2013). Teams developing sophisticated methodologies and products are often functionally diverse, in order to draw on the different knowledge bases of their members. In such cases, challenging others’ opinions or expressing doubts is necessary for knowledge creation (e.g., Leonard and Sensiper, 1998). Such interactions involve affective experiences, or felt reactions to stimuli that can be positive or negative (Watson et al., 1988). Emotions are one form of affective experience and refer to short-lived, intense feelings that can be linked to specific events (Elfenbein, 2007), such as anger and joy. They may influence group processes and

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outcomes (Bartel and Saavedra, 2000; Kelly and Barsade, 2001, and thus teams benefit from promoting and recognizing a range of emotions (e.g., Chang et al., 2012; Druskat and Wolff, 2001; Elfenbein, 2006). However, research on team knowledge creation has mostly focused on the exchange or transformation of pieces of specialized knowledge (e.g., Hargadon and Bechky, 2006), and less on the expression of emotions (see Aarrestad et al. (2015) for a recent exception).

Learning more about the usefulness of expressing negative emotions is of broad significance for project teams since repressing the constructive expression of negative emotion may very well limit the capability to create new knowledge. Uncertainty and ambiguity accompany challenging project work, so project failure is a common occurrence. Learning from these failures is aided by negative emotions signaling the importance of the loss and prompting the search for plausible causes of the loss/failure (see Shepherd et al., 2011). Repressing negative emotions can paralyze useful project team action (Lüscher and Lewis, 2008; Smircich and Morgan, 1982, as cited by Shepherd et al., 2011). Yet, on the other hand, team processes can be “hijacked” by “barrages” of negative emotions (e.g., Liu and Maitlis, 2014). This leaves project team leaders and members in a quandary over how expressing the negative emotions that arise in daily disappointments and frustrations can effectively influence information elaboration and knowledge creation. Here, we address how project team members can avoid the negative effects of either effortfully repressing or unconstruefully expressing negative emotions (Shepherd et al., 2011) and instead reap the informational benefits of negative emotional expressions.

To examine the role of emotional expression in the knowledge creation capability of project teams, we conducted a study of how a team’s capacity to constructively express negative emotions (hereafter, expression of negative emotions [ENE]) is related to knowledge creation capabilities and drives team project outcomes. ENE describes a particular facet of high-quality relationships, in which the capacity of the connection between people allows them to achieve more enduring and expansive outcomes (Dutton and Heaphy, 2003; Stephens et al., 2011). In high-quality relationships among team members, “it is acceptable for people to display a range of emotions in the relationship, increasing the probability that [they] will be understood” (Carmeli et al., 2009: 84). Following this line of thinking, we theorize about the importance of ENE in developing knowledge creation capability and driving project team outcomes. Our findings indicate that ENE positively predicted knowledge creation capability, which in turn enhances project performance. These findings first contribute specificity to our understanding of how the quality (and not just the incidence) of intra-team communications, as manifested in ENE, enables team knowledge creation capabilities. We know more about the instrumental nature of what is exchanged in knowledge-creating relationships (e.g., help seeking and help giving; Hargadon and Bechky, 2006) rather than the emotional substrate that may be necessary for resource generation (Dutton, 2003). Second, our study highlights the importance of non-rational aspects of knowledge creation. The way people feel and how it is expressed has consequences for their motivation to coordinate with others in meaningful ways (Quinn and Dutton, 2005). While in the following sections we emphasize their informational aspects, the sense of connection derived from sharing negative emotions among team members is also foregrounded (Dutton and Heaphy, 2003), suggesting a complementary rather than competing role alongside the cognitive processes typically highlighted in research on knowledge creation.

2. Theory and hypotheses

2.1. Project team processes and emotionality

Communication among team members is essential to team success and often filled with emotion. Technical knowledge work often involves research and development or engineering teams comprised of members from different specialties. It is assumed that members’ diversity in strengths, knowledge, skills, and abilities reduces decision-making biases such as the escalation of commitment and overconfidence (Burke and Steensma, 1998, as cited by Bunderson and Sutcliffe, 2002) or groupthink that stifles discussion and prevents sound evaluation of alternatives (Janis, 1972). Team members use teamwork processes (Marks et al., 2001) such as coordination, balance of member contributions, mutual support, effort, and cohesion (Hoegl and Gemuenden, 2001) to integrate their diverse efforts and perspectives. These processes are all ultimately driven by communication and its quality.

Project team members’ communications involve emotional expressions (e.g., of liking) that influence important outcomes such as commitment to each other and to the task (Hoegl and Gemuenden, 2001). Although there is a range of perspectives about emotions in organizations, we take an interpretivist view of emotions (Ashforth and Humphrey, 1995) that strikes a “middle ground” between the positivist view, in which certain stimuli reliably lead to certain emotional responses (e.g., getting fired makes one sad), and the social constructionist view (Fineman, 1993), in which individuals learn how to respond from others (e.g., learning from others’ responses whether it is permissible to cry at work). We further suggest that this interpretivist view incorporates a third, psychoanalytic perspective that characterizes emotions as variable and sometimes unconscious (Gabriel, 1998). In short, we expect that certain emotions will indeed be elicited by certain stimuli (positivist view), but emotions can change, and their sources may be unclear even to the focal person (psychoanalytic view). Thus, some emotions may elicit explicit expression, and developing and sharing interpretations with others (social constructionist view). From this perspective, communications among team members have potential to be ripe with emotional expression.

2.2. The capacity to express negative emotions and knowledge creation capability

Intra-team communication is important for team members to make sense of what they feel and what they know.
Communication is thus essential for a team’s knowledge creation capability (KCC), or the ability of members to “(1) access [to] people or groups with specialized information (access to parties); (2) absorb and combine information that has been exchanged (combination capability); and (3) anticipate value from the exchange and combination process” (Smith et al., 2005: 352-353). Communication occurs within the interactions that comprise work relationships, or “patterns of exchanges” among project team members (Ferris et al., 2009: 1379). While there is considerable diversity in conceptualizations of the quality of workplace relationships (Dutton and Ragins, 2007), the concept of high-quality connections (HQCs) has recently been linked to knowledge creation practices (Aarrestad et al., 2015). HQCs are relevant to knowledge creation since they describe how interactions build new resources, rather than simply exchange them (Dutton and Heaphy, 2003). Emotional expression is an important aspect of the generativity of HQCs between individuals (Stephens et al., 2011), and also within teams (Brueller and Carmeli, 2011; Stephens et al., 2013).

Emotional expression helps to communicate individuals’ immediate and genuine responses to issues and events in the workplace (Weiss and Cropanzano, 1996), through verbal and nonverbal behaviors that represent internal feelings (Kennedy-Moore and Watson, 2001). We focus here on the team’s capacity for constructively expressing negative emotions (ENE) and how it provides a substrate or “growing material” for sharing and building on knowledge by virtue of its three main features, viz. expressing more absolute emotion, expressing negative emotion in particular, and doing so constructively.

2.2.1. Expressing more absolute emotion and knowledge creation capabilities

With fuller emotional expressions in the team, members have access to more information about each other’s thoughts, reactions, and capabilities (Keltner and Haidt, 1999). With more information about each other’s feelings and responses, team members can better cope with uncertainty, develop a better understanding about where each person is coming from, and thus build on each other’s knowledge. An example of these benefits stems from research on emotional ambivalence, in which individuals simultaneously experience positive and negative emotions (e.g., Larsen et al., 2001; Rees et al., 2013). While we cannot make predictions about specific combinations of discrete emotions, individuals accessing more of these varying kinds of emotions in ambivalent states are more deliberative (Rothman, 2011) and can make better judgments (Rees et al., 2013). By expressing more of these varied emotions (positive, negative, and ambivalent), individuals can potentially expose their teammates to these cognitive benefits. The expression of emotion itself within a team is distinct from the process of affect management, which involves “calibrating” team members’ feelings (Marks et al., 2001). Without the expression of the emotions themselves to communicate the significance of ideas and events to others, team members would be without necessary information that may or may not require further management.

2.2.2. Expressing negative emotions and knowledge creation capabilities

Not only is the expression of more emotion useful for team knowledge creation, but so is the expression of negative emotions in particular. Considerable research has pointed to how positive emotions “broaden and build” individuals’ thinking and action (Fredrickson, 1998), and strengthen the interpersonal relationships needed for information flows amongst team members (Fredrickson, 2003; Waugh and Fredrickson, 2006). Positive emotions also facilitate the reinterpretation of challenging situations (Folkman and Moskowitz, 2000), which is important when having to integrate potentially conflicting sets of inputs or information in a team. However, expressing negative emotions is an important response to issues and events since it signals that something needs addressing (Quigley and Feldman Barrett, 1999).

It may seem intuitive to presume that ENEs would tear apart the relationships among team members (e.g., Brundin and Nordqvist, 2008; Liu and Maitlis, 2014). However, not all negative emotions (e.g., with high arousal like anger) elicit antagonistic tendencies; other negative emotions (e.g., with low arousal like sorrow) elicit a desire to be with others (Frijda et al., 1989), suggesting that they may benefit the relationships through which team members share knowledge. For example, the expression of negative emotions such as guilt, anger, and envy can motivate individuals and their interaction partners to repair transgressions (Keltner et al., 2006). Some researchers are more equivocal, finding that expressing negative emotions induces varying perceptions about the focal individual that are neither purely negative nor positive (Tiedens, 2001). Overall, research has thus far focused much more on the benefits of diffuse negative affect in the form of individual mood on creativity (e.g., George and Zhou, 2002; George and Zhou, 2007), or trait negative affectivity in groups on their information elaboration (Kooij-de Bode et al., 2010). Based on these findings, we suggest that knowledge creation capability can be enhanced by expressing negative emotions of varying kinds that can help team members attend to important problems (e.g., with expressions of fear, anxiety, and distress) and also approach each other with support (e.g., in response to expressions of sorrow or disappointment).

2.2.3. Expressing negative emotions constructively and knowledge creation capabilities

In order to accommodate negative emotions, teams must be able to express them constructively, or in ways that enable, rather than cripple, the work of the team. The “constructive” nature of expressing negative emotions relies on the form of the expression (e.g., respectful and authentic), and on the perceptions individuals have about how their expressions will be received (e.g., with understanding and a view to problem solving).

First, communicating emotions with respect is important for creating the “holding space” that allows for exploration of, and appreciation for the various feelings being shared (Miller and Stiver, 1997). Expressing negative emotions (e.g., doubt) in ways that enable collaboration (Loveland et al., 2001), and
lessen feelings of blame or threat (Gibson and Vermeulen, 2003), is important for enabling learning amongst team members (Carmeli and Gittell, 2009). Interpersonally, individuals elicit perceptions of warmth and friendliness when they engage in authentic emotional expressions, such as deep acting or outwardly expressing their internal feelings (Ashkanasy and Humphrey, 2011). Even if the (nonverbal) emotional expressions are negative, if they are aligned with the (verbal) content of the message being shared, they predict better relational interactions are negative, if they are aligned with the (verbal) content (Newcombe and Ashkanasy, 2002). This should support the interactions needed for the exchange and collaborative search for information.

Second, we suggest that individuals are more likely to be respectful and authentic in their emotional expressions if they feel that others will treat such expressions in useful ways. Emotional expressions by one team member can influence and be recursively reinforced by the reactions of other team members, setting up “emotion cycles” (Hareli and Rafaeli, 2008). We know that when positive emotions are met with negative ones, “emotional tugs-of-war” can result that disrupt teams (Liu and Maitlis, 2014). However, the notion of recursive, interpersonal influences suggests the potential for breaking cycles. As Maitlis and Ozcelik (2004) point out, negative emotions are a daily occurrence in organizational life, and toxicity develops when they are treated in a “harful, rather than healing way” (p. 377). Conversely, team members who treat each other’s ENE as legitimate, focus on the substance of the ENE, and approach the airing of problems as issues to be resolved collaboratively, should find it easier to express their negative emotions respectfully and authentically.

If individuals perceive that their team members treat their emotional expressions as legitimate, it helps them feel closer and more knowledgeable about each other (Kennedy-Moore and Watson, 2001). Focusing on the substance of what is being communicated can help team members to transcend psychological barriers in knowledge exchange and integration (Eisenhardt & Santos, 2001). One example of how this is done is where team members in the airline industry communicate and deal with problems through relationships of mutual respect, shared knowledge and shared goals (Gittell, 2001). As a ramp manager described, “agents can come in and talk to a supervisor or manager … Even when you did something wrong, they’ll ask what happened. You know you screwed up. They’ll tell you what you can do so it doesn’t happen again. You walk away so upbeat that you work even harder.” (Gittell, 2001: 477). In a team context where expressing negative emotions is treated with legitimacy, individuals may be apt to express more of these emotions in ways that elicit respect and problem solving.

Taken together, these three features of constructively expressing negative emotions are likely to enable the knowledge creation capability that helps a team to develop a flow of ideas from which they can learn and develop new knowledge. Complex project work demands that members transcend differences in understanding and appreciate the emotions that coincide with knowledge creation processes (e.g., Greer and Jehn, 2007). Greater ENE should foster comprehensiveness in decision-making and problem solving, as well as appreciation for conflicting ideas and perspectives. Thus, Hypothesis 1. There is a positive relationship between a team’s capacity to constructively express negative emotions (ENE), and team knowledge creation capabilities (KCC).

2.3. Team knowledge creation capabilities and project performance

Successful teamwork, undergirded by constructive patterns of communication in the relationships among team members, provides a capability for knowledge creation. Since organizations develop teams to respond to complex and rapid changes, relationships in teams are examined in terms of how they facilitate developing knowledge about the task, rather than how people feel about the situations they encounter. More specifically, project team success depends on the development of a “dynamic knowledge integration capability,” or “a reliable pattern of team communication that generates joint contributions to the understanding of complex problems in a team” (Gardner et al., 2012: 1001). Collaborative dynamics underpin this capability and are developed and reinforced by the frequent sharing of information among team members, and the propensity for members to identify new needs, consolidate new knowledge with past knowledge and routines, and direct searches for new knowledge (Lee et al., 2003). These dynamics help project teams to enable learning and satisfaction within the team, produce high-quality, innovative outputs for customers and enhance the capability for future success (Collins and Smith, 2006; Hackman, 1987).

Hypothesis 2. There is a positive relationship between team knowledge creation capabilities and team project outcomes.

2.4. The mediating role of team knowledge creation capabilities

We argue that team ENE is ultimately linked to project performance through enabling a team’s knowledge creation capability. Project performance can be assessed in terms of product delivery within the targeted time, cost, and quality (Agarwal and Rathod, 2006). In turn, efficient product delivery is based on the ability of the team to use knowledge effectively to shape their taskwork and teamwork. With ENE, team members are open to important information about when they go off course in their tasks (e.g., a particularly frustrating late delivery of parts) and relationships (e.g., unhelpful, snide comments). Since emotions serve as appraisals of what events and situations mean for people (Schwarz and Clore, 2007), teams with greater ENE have more potential to know and act on the meaning of issues that will affect their coordination, balance of member contributions, mutual support, effort, and cohesion (Hoegl and Gemuenden, 2001), ultimately enhancing project outcomes. Thus,
Hypothesis 3. Knowledge creation capabilities (KCC) mediate the positive link between the capacity to constructively express negative emotions (ENE) and team project outcomes.

3. Method

3.1. Sample and data collection

To examine the links between team ECC, KCC, and project team performance, we studied, as part of a larger research project (Carmeli and Azeroual, 2009), 122 project teams in four companies operating in the Israeli defense industry. The defense industry is a significant vehicle in the economic activity and technological advancement of the country (Kagan et al., 2010). Each project team consisted of at least three members, had a common goal and identity, and exerted substantial time and effort in developing new knowledge and technologies. The teams were involved in projects (e.g., developing antenna transmission technology, guided weapons, and other technology enhancements) that lasted between 6 and 12 months. These were stable groups with high levels of task and goal interdependence (Van der Vegt and Van de Vliert, 2002). At the same time, team leaders could exert considerable influence over the project and its underlining processes.

The second author presented the details and potential contribution of the research to seven senior managers, as well as several project group members, in order to gain the support and involvement of key personnel in the research. We administered a pilot survey to each person we met and asked her or him to complete it and provide us with comments regarding the clarity and suitability of the questionnaire for the potential sample units. Overall, we received sixteen surveys with minor comments.

Next, we finalized the structured questionnaire. We drew on the literature to construct the measurement of our research variables, and items were translated into Hebrew, and then retranslated back into English by a professional copy editor. To mitigate common method bias and variance, we collected data from multiple respondents (project team members and their leaders) and used a time lag of two months between the data collected for the independent and mediator variables from the data collected on project team performance.

Surveys were administered and collected on site. We promised full confidentiality to all respondents and provided a stamped envelope for direct return to a university address. Overall, we collected useable data on 122 project teams after removing two teams from subsequent analysis due to missing data, for a response rate of 76.25%. In each team included in the sample, both members and project leader participated. The average project group size was 6.48 members ($SD = 8.62$). De-identified data from the sample can be obtained from the second author upon request.

3.2. Measures

3.2.1. Expression of negative emotions (ENE)

We assessed ENE by modifying a 5-item scale developed by Carmeli and colleagues (e.g., Brueller and Carmeli, 2011; Carmeli et al., 2009). Using a 5-point scale (ranging from 1 = “not at all” to 5 = “to a very large extent”), items captured the extent to which members experienced their project group as one where they could constructively express and handle negative emotions. The items included the following: (1) Project group members do not have any difficulty expressing their feelings toward each other; (2) Project group members are not afraid to express unpleasant feelings at work; (3) Whenever a member of the project group expresses an unpleasant feeling, she/he always does so in a constructive manner; (4) If a project group member gets upset with other members of the project, she/he knows they will try to understand her/him; and (5) Project group members are able to express their frustrations without offending other members.

The mean of each team’s members’ responses was used as a team-level measure of the extent to which negative emotions were constructively expressed and handled. ICC(1) and ICC(2) values of .46 and .81, respectively, showed support for aggregation, and Cronbach’s $\alpha$ was .83. Using mean-level measures, or an additive form of aggregation “is appropriate when team members can compensate for one another with respect to task-focused contributions” (LePine, 2003, p. 33).

We think such an aggregation model is more feasible for this construct, where the entire team would benefit from all members being able to express and handle others’ emotions constructively. Since emotions within teams are contagious, negative emotions expressed by one person can “infect” other team members and reduce team effort and cooperation (Barsade, 2002; Sy et al., 2005). Thus, to be effective, all team members should be able to constructively express and respond to negative emotional expression. By contrast, a conjunctive model would suggest that what defines the team’s ability to constructively express and handle negative emotions is the person who is least able to do this. A disjunctive model suggests the opposite, that it is the person who is best able to do this that sets the tone for the rest of the team. We believe that if there is one member who is particularly weak in ENE, the size of the teams in our sample (six people on average) would allow for considerable compensation by the other members. Conversely, having a particularly strong team member might be helpful in the short run, but not sustainable for that member, or for the team, due to burnout. We therefore argue that it is most appropriate to rely on the additive model to meaningfully model this construct at the team level.

3.2.2. Knowledge creation capability (KCC)

We used Smith et al.’s (2005) 12-item scale to assess KCC. The original scale items were slightly adapted to take on a referent-shift consensus wording (Chan, 1998) that captured KCC at the project team level. Responses were on 5-point scales ranging from 1 = “not at all” to 5 = “to a very large extent.” Sample items are as follows: (1) “Project group members meet frequently to discuss project-related ideas and new developments (access); (2) Project group members are capable of sharing their expertise to bring new projects or initiatives to fruition (combination); and (3) Project group members believe that, by exchanging and combining ideas,
members can create value out of this project (anticipated value).” As in Smith et al.’s (2005) study, we averaged the 12 items to create a single measure of KCC. Cronbach’s α for this measure was .91, similar to the reliability of .87 reported by Smith et al. (2005). In addition, we calculated measures of within-group agreement (intra-class correlations), which gave support for aggregation (ICC(1) = .40 and ICC(2) = .89).

3.2.3. Project performance

Following previous research (de Wit, 1988), we used six items to assess project performance. Responses obtained from the project group leader were on 5-point scales ranging from 1 = “not at all” to 5 = “to a very large extent.” The results of an exploratory factor analysis indicate a two-factor solution (see Appendix A). The first factor, labeled Project Performance Outcomes, consists of four items that tap the functionality, delivery time, and the quality of performance, while the second factor, labeled as Project Budget Adherence, consists of two items that tap adherence to the budget and financial performance. This is consistent with the literature in which project performance is assessed by both process and performance outcomes that cover functionality, delivery time, and budget, as well as quality of products. The first and second factor explained 44.34% and 21.53% of the variance and had eigenvalues of 2.66 and 1.29, respectively. Cronbach’s α was .83 for Project Performance Outcomes and was .63 for Project Budget Adherence.

3.2.4. Control variables

We controlled for environmental munificence and project team size. Environmental munificence is the extent to which a project team perceived the external environment as abundant and offering copious opportunities. In a more abundant environment there is sustained demand and high potential growth. Environmental munificence can thus influence the need and capacity to create new knowledge and meet the project performance requirements. Project team members were asked to indicate on a five-point scale the extent to which (1) “demands in the industry have grown or declined over the past three years,” (2) “changes in demands in the industry have grown (or decline) over the past three years,” and (3) “the prospects regarding the demand in the industry for the upcoming three years is positive.” Cronbach’s α = .83; ICC(1) = .62, and ICC(2) = .83. Project team size was controlled for because large teams tend to be more diverse, which may influence the ability to access knowledge, exchange and combine it, and thereby produce performance outcomes.

4. Results

The means, standard deviations, and correlations between the research variables are presented in Table 1.

4.1. Hypothesis testing

We used the computer program PROCESS (Hayes, 2012) to estimate our research model and hypotheses. This program provides ordinary least squares (OLS) estimates for mediation models (cf. Model 4 in PROCESS). It provides standard tests and bootstrap confidence intervals (CIs), which were here based on 10,000 samplings, for individual regression coefficients and for indirect effects.

Table 2 presents the results of the indirect influence of ENE (through knowledge creation capability) on project performance outcomes. The results, which are shown in Table 2 and illustrated in Fig. 1, indicate that the link between ENE and project performance outcomes was fully mediated by knowledge creation capability (i.e., the bootstrap CI for this coefficient did not include zero (CI (95%) = [.0885, .3085]), and normal theory tests for indirect effect (Z = 2.2072, p = .0273), providing a reliably significant effect).

The results of Table 3 show the indirect influence of ENE (through knowledge creation capability) on project budget adherence. The findings, which are shown in Table 2 and illustrated in Fig. 1, indicate that the link between ENE and project budget adherence was fully mediated by knowledge creation capability (i.e., the bootstrap CI for this coefficient did not include zero (CI (95%) = [.0767, .3419]) and normal theory tests for indirect effect (Z = 2.2072, p = .0273), providing a reliably significant effect). These support Hypotheses 1–3.

5. Discussion and implications

Project team members are constantly faced with a host of emotional experiences, including negative emotions that arise from frustrations and disappointments. An inability to effectively deal with these emotions can hamper progress (Schaubroeck et al., 2016). This study demonstrated that a team’s capacity to constructively express negative emotions (ENE) in the relationships among team members was an important mechanism for the knowledge creation capabilities that ensured team project success. Project teams with greater ENE were better able to share knowledge, identify who held which knowledge, and appreciate the value of such knowledge sharing and integration in such ways that contribute to multiple

<table>
<thead>
<tr>
<th>Mean (SD)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Project group size</td>
<td>6.48</td>
<td>8.62</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Environmental munificence</td>
<td>3.39</td>
<td>.46</td>
<td>–</td>
<td>(.83)</td>
<td></td>
<td></td>
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<tr>
<td>3. Emotional carrying capacity</td>
<td>3.35</td>
<td>.42</td>
<td>–</td>
<td>–</td>
<td>(.83)</td>
<td></td>
</tr>
<tr>
<td>4. Knowledge creation capability</td>
<td>3.30</td>
<td>.45</td>
<td>–</td>
<td>–</td>
<td>.01</td>
<td>.42** (.91)</td>
</tr>
<tr>
<td>5. Project budget adherence</td>
<td>3.37</td>
<td>.58</td>
<td>–</td>
<td>.17</td>
<td>.19* .34** (.63)</td>
<td></td>
</tr>
<tr>
<td>6. Project performance outcomes</td>
<td>3.81</td>
<td>.43</td>
<td>–</td>
<td>.02</td>
<td>.21* .43** .26** (.83)</td>
<td></td>
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</tbody>
</table>

* p < .05.
** p < .01.

Table 1
Means, standard deviations (SD), and correlations.

N = 122; two-tailed test; reliabilities are in parentheses on the diagonal.
project performance outcomes. These findings suggest several theoretical and practical implications.

First, our findings help to specify mechanisms by which emotional expression in work teams facilitates knowledge creation capability. Team-level emotions matter for individual and team outcomes and can be studied in terms of consistency or diversity across team members (Barsade and Gibson, 2012; Barsade and Knight, 2015). While research on constructs such as team emotional intelligence describes members’ abilities to individually appraise, regulate, and use their affect for team performance, it does not capture how the team as a whole treats their expressions of certain emotions (Chang et al., 2012).

### Table 2
Results of mediation analyses: the indirect effect of expression of negative emotions on project performance outcomes (through knowledge creation capability).

<table>
<thead>
<tr>
<th>Predictor variable</th>
<th>B</th>
<th>SE</th>
<th>t</th>
<th>R²</th>
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</thead>
<tbody>
<tr>
<td>Model 1: Main effect on knowledge creation capability</td>
<td>.18</td>
<td></td>
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<tr>
<td>DV: Knowledge creation capability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Expression of negative emotions</td>
<td>.46**</td>
<td>.11</td>
<td>4.05</td>
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<tr>
<td>- Environmental munificence</td>
<td>.02</td>
<td>.07</td>
<td>.26</td>
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<tr>
<td>- Project group size</td>
<td>.00</td>
<td>.00</td>
<td>.06</td>
<td></td>
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<tr>
<td>Model 2: Total effect of expression of negative emotions and knowledge creation capability on project performance outcomes</td>
<td>.19</td>
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<tr>
<td>DV: Project performance outcomes</td>
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</tr>
<tr>
<td>- Knowledge creation capability</td>
<td>.39**</td>
<td>.10</td>
<td>3.82</td>
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<tr>
<td>- Expression of negative emotions</td>
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<td>.11</td>
<td>.32</td>
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<td>- Environmental munificence</td>
<td>.03</td>
<td>.08</td>
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<tr>
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<td>.05</td>
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<tr>
<td>DV: Project performance outcomes</td>
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</tr>
<tr>
<td>- Expression of negative emotions</td>
<td>.21*</td>
<td>.11</td>
<td>1.94</td>
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<tr>
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<td>.03</td>
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Bootstrap results for indirect effect

<table>
<thead>
<tr>
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<th>UL 95% CI</th>
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<tbody>
<tr>
<td>Indirect effect of expression of negative emotions through knowledge creation capability</td>
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<td>.0550</td>
<td>.0885</td>
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Normal theory tests for indirect effect

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** p ≤ .01.

* p ≤ .05.

### Table 3
Results of mediation analyses: the indirect effect of expression of negative emotions on project budget adherence (through knowledge creation capability).

<table>
<thead>
<tr>
<th>Predictor variable</th>
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<td>- Expression of Negative Emotions</td>
<td>.46**</td>
<td>.11</td>
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<td>- Environmental munificence</td>
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<td>.00</td>
<td>.06</td>
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<tr>
<td>Model 2: Total effect of expression of negative emotions and knowledge creation capability on Project Budget Adherence</td>
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<td></td>
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<tr>
<td>- Knowledge Creation Capability</td>
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<td>.14</td>
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<td>- Expression of Negative Emotions</td>
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<td>.83</td>
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<td></td>
</tr>
<tr>
<td>- Project group size</td>
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<td>.08</td>
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<td></td>
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<td>DV: Project Performance Outcomes</td>
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<td>- Expression of Negative Emotions</td>
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<td>- Project group size</td>
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<td>.00</td>
<td>−1.11</td>
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Bootstrap results for indirect effect

<table>
<thead>
<tr>
<th>Boot B</th>
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<th>LL 95% CI</th>
<th>UL 95% CI</th>
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<tr>
<td>Indirect effect of expression of negative emotions through knowledge creation capability</td>
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Normal theory tests for indirect effect

<table>
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<th>Effect</th>
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<tbody>
<tr>
<td>.1819</td>
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<td>2.2072</td>
<td>.0273</td>
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** p ≤ .01.

* p ≤ .05.

**Fig. 1.** Illustrating the results of the hypothesized research model. **Note.** Statistics are standardized coefficients derived from the regression results. Statistics in the parentheses are standardized coefficients when the mediator was specified in the regressions. *p ≤ .05, **p ≤ .01.
Encouraging the expression of negative emotions does not suggest mindlessly fostering a negative team affective tone but instead suggests constructively expressing the negative emotions that will arise in intense, challenging teamwork, and handling them sensitively. The constructive and sensitive treatment of members’ feelings may be especially important for cross-functional project teams, whose members need to be mindful of letting certain contributions dominate, or of retreating into their respective knowledge silos (cf. Bechky, 2003; Dougherty, 1992). An atmosphere that values emotional expression, in which members’ negative feelings are accepted and understood, and where members help each other to make use of the information derived from those feelings should also enable constructive responses to requests for help that are important for collective project work (Hargadon and Bechky, 2006).

Our focus on how teams manage their expressions of, and reactions to, negative emotions contrasts with other research that has explained team performance in terms of the traits members possess (e.g., Chang et al., 2012; Elfenbein et al., 2007). This focus on the quality of the emotional norms within a team highlights various aspects of team emotional skills or intelligence, such as team self-awareness and team empathy. Teams are self-aware when they are mindful of the shared and individual affect currently experienced by its members (Goleman et al., 2002). This may involve team emotion recognition accuracy, wherein individual members are able to accurately recognize each other’s emotional expressions (Elfenbein et al., 2007). These operationalizations would do well to include the qualitative aspect of constructively expressing negative emotions, which would help make difficult conversations more palatable and understandable to those involved. Where team empathy has been described in terms of attending and being responsive to the needs of other teams or the organization (Goleman et al., 2002), it would be useful to consider how to operationalize intra-team empathy, where members mutually and collectively feel each other’s needs and respond with care.

Constructively expressing emotions in a team can also be facilitated by components such as mutual respect and communications aimed at solving problems rather than directing blame (Gittell, 2001; Gittell et al., 2010). One could measure how members mutually display respect for each other’s expressed feelings by examining the responsiveness of their behaviors toward each other, i.e., the attention paid to each other’s communications, and the relevance and usefulness of their responses (Davis and Perkowski, 1979). Communicating and responding to negative emotional expressions with a view to initiating and supporting problem solving should also mitigate detrimental effects such as leaving team members with a shared sense of frustration or dejection. By considering these aspects, future research can develop more precise assessments of the relational context for team ENE.

Second, from another perspective, the current study helps to bring emotions to the forefront of how work relationships are implicated in explaining team performance. Emotions are set in the background in concepts of positive work relationships, such as leader–member exchange, mentoring, trust, or social network analysis (see Ferris et al., 2009). Emotional expression and responsiveness at work are particularly overlooked in operational and technical settings (Gino and Pisano, 2008). Our study on team ENE suggests that team success depends on teams having a healthy approach to the negative emotions being shared among their members. Emotional expressions can usefully provide quick, felt responses to the swirl of information faced by team project members. However, being willing to express one’s negative emotions requires some vulnerability on the part of project team members who wish to fully express themselves, and a requisite openness and acceptance on the part of the team members perceiving and responding to the emotional expressions. Acknowledging members’ emotional expressions should validate members’ diverse contributions, making them feel more included and willing to process differing kinds of information. In the course of appropriately processing these emotional expressions, perhaps in the form of constructive feedback, information can flow among team members in ways that allow for accurate interpretation and that limit groupthink (Gelbard and Carmeli, 2009).

5.1. Practical implications

Our theory and findings suggest several practical implications for project teams. The first implication concerns the interplay of power and emotions in the relationships among project team members. The emotional expressions of team leaders have significant impact on the affective climate within a team (e.g., Chang et al., 2012; Sy et al., 2005). On the one hand, this suggests that team leaders are well placed to be trained in modeling the constructive expression of negative emotions for the benefit of their team members. This could then enable the team to achieve functional outcomes from their emotional expressions. Team leaders can show members how to express anger so that others become aware of unfairness (e.g., Bies, 1987; Gibson and Callister, 2010), or how to express doubt so that others learn about potential mistakes (Edmondson et al., 2001).

On the other hand, we are mindful that it is possible that individuals may use non-constructive ENEs to impose authority and thus be conferred a higher status position (as can occur with expressions of anger; Tiedens, 2001). In no way do we advocate that team leaders abuse others with negative emotions, or impose norms to force others to express their emotions as a form of instrumental control. In the end, influence through fear of retaliation or punishment can lead to suppression of negative emotions, and ultimately dysfunction (Kish-Gephart et al., 2009). While expressing negative emotions can elicit perceptions of competence, they also elicit perceptions of low likability (Tiedens, 2001), which may impede the collaboration needed for teamwork. If it is important that negative emotional expressions not be repressed, but constructively expressed, then powerful team members must strike a delicate balance, being mindful about the target of their expressions (e.g., Is it the
expressions.

Time taken to go off-task to constructively deal with emotional
do not simply encourage collaboration, but also support the
creation may also involve organizational reward systems that
constructively handling emotions for effective knowledge
situations (Rothman and Wiesenfeld, 2007). Where adhering
feelings and mitigate negative inferences of ambivalent
constructively can help the team to understand the sources of
example, training members to express negative emotions
constructively can help the team to understand the sources of
feelings and mitigate negative inferences of ambivalent

Dougherty (1992) and Hargadon and Bechky (2006)). This
value and support the effortful emotional work that is involved
face-to-face and electronically mediated communications,
what is their point of view. Where project teams use both
express how they feel and why, as well as where they stand and
necessary if the team is to meaningfully encourage members to
coordinating knowledge flows, as well as managing how and
important consideration. Setting ground rules in meetings for
coaching may be instrumental for these purposes (e.g., Boyatzis

Managing how interactions unfold would be another
important consideration. Setting ground rules in meetings for
coordinating knowledge flows, as well as managing how and
when different kinds of emotions will be expressed and
handled, will be important. In meetings, such ground rules are
necessary if the team is to meaningfully encourage members to
express how they feel and why, as well as where they stand and
what is their point of view. Where project teams use both
face-to-face and electronically mediated communications,
members should develop specific rules for handling difficult
conversations, such as taking them off-line, and allowing for
face-to-face discussions. The organizational context must also
value and support the effortful emotional work that is involved
in developing shared understandings and influence (see
Dougherty (1992) and Hargadon and Bechky (2006)). This
might involve access to private meeting rooms or travel for
face-to-face meetings where physical emotional cues are more
accessible. Meetings that allow team members to feel that they
are on equal footing with each other (whether due to turn-taking
rules, or physical positioning such as being in a circle) can help
reduce status differences that limit the sharing and validation of
emotions (Stephens et al., 2011). Developing the capacity for
constructively handling emotions for effective knowledge
creation may also involve organizational reward systems that
do not simply encourage collaboration, but also support the
time taken to go off-task to constructively deal with emotional

5.2. Limitations and future research directions

The results of this study should be interpreted cautiously
while attempting to generalize to other work settings. Although
we believe that the project teams in our research do not differ
significantly from project teams in other settings, it may well be
that the nature of tasks may influence the knowledge creation
process. For example, in more standardized projects, team
members would need limited problem solving capacity to
tackle issues and complete tasks, whereas, in new technological
projects, ambiguity may drive team members to facilitate wider
access to knowledge bases, greater knowledge sharing and
systematic application of the exchanged knowledge to solve
problems.

Although often overstated, survey studies may be suscepti-
ble to common method variance. We attempted to address this
issue by using time-lagged data and multiple sources of data.
The relatively low correlation between the independent variable
and mediator also indicate that common biases are less likely to
impact our suggestions regarding the influence of team ENE
and KCC on project performance outcomes. In addition, data
might be subject to recollection bias (Robinson and Clore,
2002), particularly with regard to ENE, thus requiring cautious
interpretation of the findings. Further, we did not measure
project performance objectively, but used project team leader
assessments. Although this is common in small group research,
future studies could utilize objective measures of project quality
and meeting budget and time constraints. However, measures
of “desirable” time for completion may differ based on different
stakeholders’ perspectives (Agarwal and Rathod, 2006).
Furthermore, team functionality and product quality may be
difficult to objectively measure in situations such as new
product development (Gelbard and Carmeli, 2009) where
uncertainty plays an important role in moderating the links
between relational resources and knowledge creation (Gardner
et al., 2012). Qualitative measures, as applied in our study, may
thus be appropriate in such a context.

Future research can shift the focus to the influence of team
leaders on their teams’ affect. Although prior work has assumed
that leaders’ affective displays have disproportionate influence
on the moods of their team members (e.g., Sy et al., 2005), this
was established in contexts where leaders had frequent and
direct contact with team members. By contrast, many project
teams have to be led through collaborative technologies that
electronically mediate less-frequent communications. Recent
research suggests that team leaders must be knowledgeable of
these technologies and adapt them to enhance communication
and understanding amongst team members (Thomas and
Bostrom, 2010). However, much more can be done to explore
how team leaders might model managing negative emotional
expressions, and how they set and reinforce ground rules for the
rest of the team, all the while manipulating technology to
manage changes in the team’s emotional tone. Finally, our
study does not account for whether particular ratios of positive
to negatively valenced emotional expressions enable knowl-
edge creation, an issue currently under scrutiny in the field
(e.g., Fredrickson, 2013). Future research, utilizing qualitative,
observational methods might better ascertain whether and how different ratios of emotional valences predict how knowledge creation unfolds.

Conflict of interest

None.

Acknowledgments

We wish to thank the associate editor and two anonymous reviewers for their constructive feedback. We also thank Esther Singer for her helpful editorial comments, and we acknowledge the financial support of the Henry Crown Institute of Business Research in Israel for this study.

Appendix A. Items measuring project performance

<table>
<thead>
<tr>
<th>Project performance outcomes (functionality, delivery time, quality)</th>
<th>Project budget adherence</th>
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<tbody>
<tr>
<td>1. The project goals were met (functionality)</td>
<td>.85</td>
</tr>
<tr>
<td>2. The project met its planned schedule (delivery time)</td>
<td>.78</td>
</tr>
<tr>
<td>3. The quality of the developed products/services in the project was good (quality)</td>
<td>.81</td>
</tr>
<tr>
<td>4. The products/services developed in the project were of a high value to customers (quality)</td>
<td>.81</td>
</tr>
<tr>
<td>5. The project was performed in low-cost structure and in compliance of the budget framework (budget)</td>
<td>.02</td>
</tr>
<tr>
<td>6. The project budget was meticulously kept (budget)</td>
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<tr>
<td>Eigenvalue</td>
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<tr>
<td>Variance explained</td>
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References


