Team efficacy in project management: antecedents and consequences

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ABSTRACT

Using a model-based quantitative research design, we investigated the antecedents and performance consequences of perceived team efficacy in a sample of 56 capital projects implemented in four continents by 15 Fortune 500 companies in the process industries. Empirical analysis of our field survey identified that team efficacy was positively linked to multiple dimensions of project performance and also to stakeholder satisfaction. Team ability, empowering leadership, and performance feedback all predicted team efficacy beliefs. Team efficacy mediated between these inputs and project performance. Implications for team management and research were discussed.

Keywords: teams; efficacy; project management; project performance

The effective management of teams is considered today to be a core competency (Nadler and Tushman, 1999) contributing to organizational competitive advantage (Gibson, Randel and Earley, 2000). As a result, companies are seeking to understand the underlying mechanisms that make teams work effectively (Offermann and Spiros, 2001).

Collective efficacy is a relatively new construct in team research (Hecht et al., 2002) that shows great potential for improving team performance (Jung and Sosik, 2003). Defined as the “belief in one’s capabilities to organize and execute the courses of actions required to produce given attainments” (Bandura, 1997:212), perceived efficacy acts as a cognitive mediator between employees’ abilities and their task performance.

While a large body of research in different domains shows that the performance effects of efficacy are robust at the individual level (Gibson et al., 2000), research is still in its infancy at the team level (Baker and Salas, 1997). Initial indications of the importance of team perceived efficacy for successful team performance in student populations (Hoyt et al., 2003; Jung, Sosik and Baik, 2002) has prompted calls for further collective efficacy research (Bandura, 2000; Hecht et al., 2002) in actual work teams, and in different workplace settings (Jung and Sosik, 2003).
To our knowledge, there is no study of the impact of team efficacy in manufacturing sector projects, nor is there an existing model of project team effectiveness that includes team efficacy as a predictor of task performance. Therefore this study explores whether the construct of team efficacy adds to our understanding of managing teams in a project context. We investigate a.) whether team efficacy directly impacts project outcomes, b.) whether team efficacy mediates between the impact of team ability and organizational structures on project performance, and c.) we attempt to identify antecedent organizational factors that contribute to the development of strong team efficacy beliefs.

LITERATURE REVIEW AND HYPOTHESES

We use the existing literature to develop the proposed conceptual model of the antecedents and performance consequences of project team efficacy presented Figure 1.

FIGURE 1
Proposed Model of the Antecedents and Outcomes of Team Efficacy

Performance effects of team efficacy

Perceived team efficacy or the team’s “shared beliefs in their collective power to produce the desired results” (Bandura, 2000:75), is a group-level belief about how competent the team is
to perform specific tasks. In other words, “we think we can successfully complete this current project, therefore we can”. It is this specificity that distinguishes team efficacy from the related concept of team potency. Potency (Guzzo et al., 1993) is more a generalized belief, such that “we think we can, therefore we can.”

Although research into the possible team level effects of efficacy is relatively new (Gibson, 1999; Hoyt et al., 2003), Gully et al.’s, (2002) recent meta-analysis of studies involving a variety of teams confirmed that team efficacy exhibits a strong relationship with team performance, which strengthens as goal, task and outcome interdependence increases. A team’s efficacy beliefs are also related to stakeholder satisfaction in terms of higher levels of customer satisfaction and greater team satisfaction (Jex and Bliese, 1999; Zellars et al., 2001). Therefore we predict that:

Hypothesis 1 Team efficacy will be positively related to project performance outcomes.

Antecedents of team efficacy

There is little available research about the determinants of team efficacy (Hecht et al., 2002). According to Bandura (1997), people acquire their efficacy beliefs from personal experience (learning through action), through watching the experiences of others (learning through modeling) or socially, through encouragement or criticism from others (learning through persuasion). Building on the efficacy and management literatures, we propose two organizational factors that may facilitate team efficacy: empowering leadership and performance feedback.

Empowering leadership style Although some authors have theorized about the positive relationship between leadership and collective efficacy (Kozlowski et al., 1996), relatively few have empirically tested this relationship (Sivasubramanian et al., 2002). Kumpfer et al. (1993) found that empowering leadership increased efficacy in health care teams. Leaders who
communicate their belief in the team’s capacity to perform designated tasks, enhance their team’s efficacy beliefs (Hoyt et al., 2003). Based on these initial findings we predict that:

**Hypothesis 2** Empowering leadership will be positively associated with team efficacy.

**Performance feedback** Successful completion of previous projects, or smaller sub-tasks in their current project is likely to enhance the team’s belief in their competence (Lindsley et al., 1995). A strong belief in the team’s ability can also be learned vicariously (Bandura, 1997) from hearing valued others (such as other team members, managers and colleagues) express that belief, or from observing competent team mates successfully performing tasks. In addition, explicit and appropriate task-related feedback about what went right and wrong is associated with greater collective efficacy (Lindsley et al., 1995; Prussia and Kinicki, 1996). In view of these findings, we hypothesize that:

**Hypothesis 3** Performance feedback will be positively associated with team efficacy.

**Team efficacy as a mediating variable**

Efficacy provides the link between team ability and team performance (Bandura, 1997) by serving as a regulator of team behavior (Prussia and Kinicki, 1996). Team efficacy is a mediating variable (Bandura, 1986; Campion et al., 1993) that explains the mechanism underlying the relationship between team inputs, such as team ability (Hecht et al., 2002), collective team leadership (Sivasubramanian et al., 2002), and task feedback (Prussia and Kinicki, 1996; Jung and Sosik, 2003) and performance outcomes. In the light of these results, we predict that:

**Hypothesis 3** Team efficacy will mediate the relationship between organizational inputs and project performance outcomes.
METHODS

Sample

The field survey was conducted with 252 team members from 56 completed capital projects ranging from small (US$270,000) to very large (US$203.25 million), with a median cost of US$8.73 million. Projects were located in the USA, Canada, France, Germany, Australia, Singapore and Korea. Projects were executed by 15 large Fortune 500 processing companies representing the chemical processing sector, oil refineries, the steel sector, pharmaceutical products, consumer goods and forest products. The mean team size was 7 members, who had served on the project for a mean of 1.9 years and had an average of 13.5 years project experience.

Procedure

The research method was transnational, cross-sectional and retrospective in design, with teams surveyed at project completion. A standard procedure was followed at data collection. Individual team members anonymously and confidentially completed the written surveys at their scheduled project close-out meetings.

Measures

The level of analysis in this study was the project team at the project level. To operationalize the selected constructs we used valid, reliable 7-point Likert response scales, where 1 = very strongly agree and 7 = very strongly disagree. For empowering leadership, we used a modified version of Kirkman and Rosen’s (1999) External Leader Behavior Scale, with a reported reliability $\alpha$ of .91. We used Pinto and Slevin’s (1987) five-item Monitoring and Feedback Scale to measure performance feedback. Due to its demonstrated relationship to performance outcomes (Barrick et al. (1998), we included team ability as a control variable measured by three items from Pinto and Slevin’s (1987) Technical Tasks Scale. Since a large number of project studies have used Pinto and Slevin’s (1987) Project Performance Scale, we
selected this proven scale as a measure of perceived project success. Items measure a variety of project outcomes, including project budget, schedule and scope adherence, as well as client and team satisfaction.

Research into the appropriate measurement of team efficacy is still at an early stage (Baker and Salas, 1997; Bandura, 2000) and there is little agreement over scales or assessment levels (Gully et al., 2002). Bandura (2000) recommends aggregating individual members’ appraisals of their team’s capability to complete a specified task. Hence we asked team members to individually respond to the task-specific statement “our team felt confident about its ability to complete the project successfully” on a 1-7 Likert scale.

RESULTS

Factor analysis indicated that common method bias was not likely to be a problem (Podsakoff et al., 2003) and also confirmed the structure and validity of the perceptual scales, showing item loadings greater than .50 for each factor. The measures exhibited high reliability, with Cronbach’s alpha scores ranging from .82 to .94. Statistical checks using ANOVA and the multiple-item estimator for within-group inter-rater reliability justified the aggregation of individual responses (James et al., 1984). The variable means, standard deviations, scale reliabilities and Pearson’s bivariate correlations are shown in Table I.

Performance outcomes of team efficacy

Team efficacy was strongly associated with each of the disaggregated project outcomes and predicted 57 percent of variance in overall project performance ($\beta = .86, p < .001$). Therefore Hypothesis 1 received strong support.
TABLE 1
Descriptive Statistics and Bivariate Correlation Matrix

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Team ability</td>
<td>2.48</td>
<td>.77</td>
<td>(.82)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2 Leadership</td>
<td>2.05</td>
<td>.78</td>
<td>.72**</td>
<td>(.89)</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>3 Feedback</td>
<td>1.98</td>
<td>.75</td>
<td>.65**</td>
<td>.57**</td>
<td>(.94)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Team efficacy</td>
<td>1.89</td>
<td>1.02</td>
<td>.53**</td>
<td>.55**</td>
<td>.58**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Project performance</td>
<td>2.01</td>
<td>1.16</td>
<td>.54**</td>
<td>.46**</td>
<td>.59**</td>
<td>.75**</td>
<td>(.93)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Cost</td>
<td>1.96</td>
<td>1.41</td>
<td>.43**</td>
<td>.26*</td>
<td>.60**</td>
<td>.49**</td>
<td>.81**</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>7 Schedule</td>
<td>2.41</td>
<td>1.74</td>
<td>.48**</td>
<td>.43**</td>
<td>.51**</td>
<td>.71**</td>
<td>.95**</td>
<td>.71**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Quality</td>
<td>2.07</td>
<td>1.42</td>
<td>.52**</td>
<td>.57**</td>
<td>.56**</td>
<td>.76**</td>
<td>.88**</td>
<td>.59**</td>
<td>.83**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Client satisfaction</td>
<td>1.80</td>
<td>.90</td>
<td>.58**</td>
<td>.54**</td>
<td>.67**</td>
<td>.61**</td>
<td>.77**</td>
<td>.69**</td>
<td>.62**</td>
<td>.70**</td>
<td></td>
</tr>
<tr>
<td>10 Team satisfaction</td>
<td>2.16</td>
<td>1.29</td>
<td>.59**</td>
<td>.59**</td>
<td>.66**</td>
<td>.78**</td>
<td>.86**</td>
<td>.64**</td>
<td>.80**</td>
<td>.76**</td>
<td>.72**</td>
</tr>
</tbody>
</table>

a. Pearson Product-moment correlation  * p < .05; ** p < .01; *** p < .001
b. Chronbach’s alpha
n= 56 teams

Antecedents of team efficacy

To test for the hypothesized relationships between team efficacy and the two
organizational characteristics, empowering leadership, and performance feedback, we entered
both predictor variables simultaneously into a multiple regression equation, while controlling for
team ability. The results are presented in Table 2.

TABLE 2
Results of Regression Analysis for Antecedents of Team Efficacy

<table>
<thead>
<tr>
<th>Model 1 Team Efficacy</th>
<th>Step 1</th>
<th>Step 2</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>β</td>
<td>t</td>
</tr>
<tr>
<td>Team ability</td>
<td>.53</td>
<td>4.64***</td>
</tr>
<tr>
<td>Leadership</td>
<td>.26</td>
<td>1.66†</td>
</tr>
<tr>
<td>Feedback</td>
<td>.36</td>
<td>2.49**</td>
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</tbody>
</table>

| R²                    | .29    | .41 |
| Adjusted R²           | .27    | .38 |
| F                     | 21.50***| 12.01***|
| df                    | 1.54   | 3.52 |
| ΔR²                   | .12    |     |
| ΔF                    | 5.48** |     |

† p < .10   * p < .05   ** p < .01   *** p < .001 (one-tailed)
Team efficacy as a mediator

To test team efficacy as a mediator of the relationship between team inputs and project outcomes, we used Baron and Kenny’s (1986) procedure. Earlier regression had indicated that overall project success was predicted by team efficacy, satisfying the first requirement. Then using a hierarchical regression analysis (see Table 3), we controlled for team ability in the first step, and for team efficacy in the second step. In step 2, the $R^2$ change of .30 was significant, indicating that team efficacy was a more powerful predictor of project performance than team ability alone. Team ability was only marginally significant, indicating that team efficacy partially mediated between team ability and project performance. In the third step, we entered empowering leadership and performance feedback to determine residual variance. Team efficacy remained significant, but neither of the other input variables was significant. Therefore team efficacy fully mediated the relationship between empowering leadership and project performance, and between performance feedback and project performance, supporting Hypothesis 4.

<table>
<thead>
<tr>
<th>TABLE 3</th>
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<tbody>
<tr>
<td>Mediation effects of team efficacy on project performance</td>
</tr>
<tr>
<td>Model 2 Project Performance</td>
</tr>
<tr>
<td>Predictor Variables</td>
</tr>
<tr>
<td>Team ability</td>
</tr>
<tr>
<td>Team efficacy</td>
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<tr>
<td>Leadership</td>
</tr>
<tr>
<td>Feedback</td>
</tr>
<tr>
<td>$R^2$</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
</tr>
<tr>
<td>$F$</td>
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<tr>
<td>$df$</td>
</tr>
<tr>
<td>$\Delta R^2$</td>
</tr>
<tr>
<td>$\Delta F$</td>
</tr>
</tbody>
</table>

Level of significance: † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$ (one-tailed)
THEORETICAL IMPLICATIONS AND FUTURE RESEARCH

Our results confirm that the cognitive-behavioral concept of team efficacy is a robust team-level construct that readily generalizes to the context of project management in the manufacturing industries. In our sample of capital projects executed in the process industries, team efficacy was strongly associated with all aspects of project success, including adherence to budget, schedule and scope constraints, as well as with stakeholder satisfaction. This finding is consistent with research conducted with other team types in other domains (Gibson, 1999; Gully et al., 2002), but it is the first time that the performance-enhancing effects of this motivational state have been demonstrated in the context of capital project management.

Our findings also expand the limited literature on the antecedents of team efficacy, by demonstrating that team ability is a strong predictor of efficacy. Prussia and Kinicke (1996) note that most collective efficacy studies ignore team ability. The strong relationship found here signals that future efficacy research needs to take team ability into account, either as a substantive variable, or at least as a control.

These findings also add empirical weight to the theoretical contention that empowering team leadership and performance feedback are important mechanisms for building and maintaining team efficacy beliefs in the workplace. Empowering leadership and performance feedback predict team efficacy, which is then associated with better project performance. Team efficacy fully mediates the relationship between both these variables and project performance. This result is consistent with cognitive-behavior theory (Bandura, 1997).

Although our cross-sectional design precludes inferences of causality, our findings confirm that the association of efficacy beliefs with performance-enhancement holds at the group level for project teams. The results suggest that team efficacy may be of key significance for
improving team effectiveness. Practices such as the selection of competent team members, appointing a project manager with an empowering leadership style, and ensuring that appropriate project monitoring and feedback processes are in place, are all likely to bolster team efficacy leading to improved project outcomes and greater stakeholder satisfaction.

REFERENCES


