

Project Technological Capacity and Project Outcomes: The Moderating Role of Team Creativity

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Abstract— The creativity models and approaches promote high-quality creativity and innovation to improve organizational performance. Extensive studies exist in the literature on creativity and innovation. However, relatively fewer studies have explored how team creativity affects project performance. Therefore, the present study tries to reveal how team creativity impacts project outcomes by using the Bootstrap-Based Method and Process. The results reveal that the relationship between project technological capacity and project performance is significantly stronger when team creativity is higher. Hence, the findings show that team creativity enhances the potential project performance. Moreover, the findings also reveal that team creativity negatively moderates the relationship between project technological capacity and project performance. This suggests that the positive relationship between project technological capacity and performance becomes stronger when team creativity weakens. A possible explanation of this negative moderation is that project technological capacity and team creativity do not have a linear relationship; rather, it is curvilinear. Future research should clarify this negative moderating influence on team creativity.

Keywords: Project Management, Project Performance, Creativity, Project Technological Capacity.

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I. INTRODUCTION

Chen (2021) and Omri (2015) research has documented how important creativity is to any organizational performance. For example, Yuan and Woodman (2010) examined 216 managers and employees in four large companies using Structural Equation Modeling (SEM) and concluded that expected image risks, expected image gains and expected positive performance outcomes significantly affect employee creative behavior further influences business performance. Hence, employees' behavior for the business performance is very important. Particularly, the reputation and well performance of the business is the key reasons behind the employee's creativity. However, Stenholm (2011) also assesses 232 small and medium companies using a longitudinal experiment based on hierarchical linear regression analysis and it is concluded that employee creative behavior significantly influences company growth and performance. Furthermore, Romero and Martínez-Román (2012) analyzed 747 self-employed workers using logistic regression analysis. They found that education is the main factor whose effect on creative behavior comes from its impact on self-employed motivation and management style, which influences organizational performance and growth.

However, despite the abundance of studies acknowledging the importance of creativity to organizational performance, relatively few studies have explored how team creativity influences project outcomes. This shows that a lack of research on the relationship between project team creativity, project technological capacity and project performance has been done in the existing literature. Therefore, the objective of this study is to investigate how team creativity impacts project outcomes using the Bootstrap-Sampling Method and Process (Hayes, 2012; Preacher & Hayes, 2008).

II. RESEARCH HYPOTHESES

We propose a moderated model shown in figure 1 to explore how team creativity affects the relationships between project technological capacity and project outcomes. The central idea of this model is that project team creativity increases project technological capacity, which further improves the level of project performance. In other words, we argue that project technological capacity has a stronger positive impact on project performance when team creativity is stronger. Moreover, the importance of creativity for organizational competitiveness and efficiency is widely recognized, and creative behavior has become an important corporate asset in business environments characterized by ever-increasing competition (Chen, 2021; Ng & Lucianetti, 2016). For example, Romero and Martínez-Román (2012) state the important effects of employee creative behavior in the early stages of small business conception and development on their following economic outcomes. They showed that employee education and training are key determinants of creativity. In addition, Madrid et al. (2014) state that creative behavior often enables businesses to function more efficiently. They further provided

a multilevel and interactional creativity model that explains employee creative behavior.

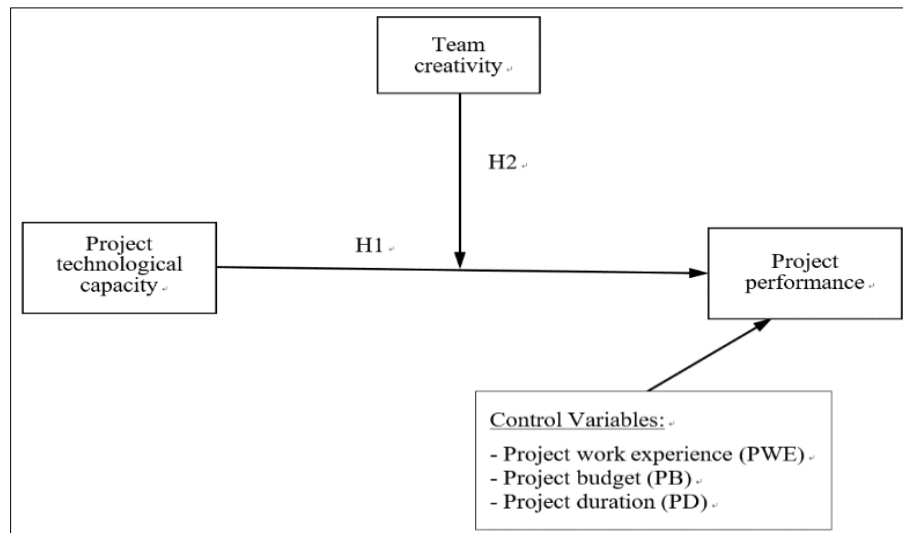


Fig. 1 Moderating effects of team creativity on project technological capacity toward project performance.

Likewise, Ng and Lucianetti (2016) used a sample of 267 employees from 60 companies to develop a moderated mediation model to explain what motivates employees to improve organizational performance via creative behavior. In other words, individual creativity involves idea dissemination and execution that motivate and inspire team members to work creatively over time (Gong et al., 2009). In teams, creative behavior brings and employs new knowledge and technologies that are likely to enhance technological capacity over time, further advancing firm performance (Yuan & Woodman, 2010). Therefore, we hypothesize:

Hypothesis 1: Project technological capacity positively influences project performance.

Similarly, we expect that project technological capacity affects project performance to some degree that is contingent on team creativity. Specifically, the connection between project technological capacity and project performance becomes stronger when team creativity improves. We hence hypothesize:

Hypothesis 2: Team creativity moderates the connection between project technological capacity and project performance.

III. RESEARCH METHODOLOGY

Participants

To explore the hypotheses, we employ a survey research design. The survey instrument is based on a systematic review of literature in the project-management field. The final version of the survey

questionnaire comprises two sections. The first section, composed of open-ended questions, gathers detailed background information such as annual revenue, project type, and project cost. The second section gathers data for the project-management variables and measures that data. Section two consists of multiple-choice questions in which respondents indicate on a 5-point scale the extent to which certain project-management performance variables likely affect project outcomes. A sample of randomly selected 700 company members from the CNAGC was invited to participate, and 108 companies participated in this research, with a 15.43 percent response rate and each of the 108 companies assigned a project manager who had just completed the process of the initiation and planning of a capital project, where the project had to be scheduled to be finished within the next two years. The 108 capital projects were classified into four types: 20 are industrial facility projects, 17 are environmental facility projects, 16 are transportation facility projects, and 55 are building projects. Years of experience as a project manager of the 108 participants are between 1 and 30 years: 20 participants less than three years; 29 participants between 3 and 5 years; 32 participants between 5 and 10; 13 participants between 10 and 15 years; six between 15 and 20 years; five between 20 and 25 years; and three participants between 25 and 30 years.

Measures and Analysis

Project performance is measured according to the six-item scales of Chen (2014, 2015, Chen & Lin (2018). The Cronbach's α for project performance is 0.92. Project technological capacity is measured according to a nine-item scale of Chen (2014) and Prajogo & Ahmed (2006). The Cronbach's α for project technological capacity it is 0.96. Team creativity is measured according to Janssen (2001) three-item scales (Cronbach's $\alpha = 0.86$). This study controls the potential impact of project budget (henceforth PB), project duration (henceforth PD), and the project work experience (henceforth PWE) of a project manager, as these variables may affect project performance. The methodology to examine the hypotheses is straightforward. Specifically, this study employs the hypothesis testing procedure in Tangirala et al. (2007) as well as the Bootstrap-Sampling Method and Process to examine the hypothesized model (Hayes, 2012; Preacher & Hayes, 2008).

IV. RESULTS AND DISCUSSION

Hypothesis testing follows the procedure in (Tangirala et al. 2007). We first regress the dependent variable (i.e., project performance) on the independent variable (i.e., project technological capacity) with control variables (i.e., (PB, PD, and PWE) in the equations. The significance for an independent variable in such a regression equation suggests support for the hypothesis (i.e., hypothesis 1). Second, we introduce team creativity as a moderator of the relationships between project technological capacity and project performance. Significance of the interaction term involves team

creativity using the Bootstrap-Sampling Method and Process (Hayes, 2012; Preacher & Hayes, 2008), which suggests support for the cross-level prediction (i.e., hypothesis 2). Table 1 reports the bootstrap-based hierarchical linear regression results with 1,000 bootstrap samples for hypothesis 1 analysis. Table 2 exhibits the results of moderation (i.e., team creativity) analysis using the Bootstrap-Sampling Method and Process (Hayes, 2012; Preacher & Hayes, 2008) with 1,000 bootstrap samples. Table 1 shows the regression coefficient for project technological capacity (0.688) that is significant at the $P < 0.001$ level. The bootstrapping test produces the bias-corrected 95% CI of 0.622 to 0.754, which excludes zero. This further confirms the significance of project technological capacity to project performance. The result supports Hypothesis 1 that project technological performance positively influences project performance (Hypothesis 1). As shown in table 2, the regression coefficient for the interaction term Team creativity x Project technological capacity -0.073 at the $P < 0.05$ level. The bootstrapping test generates the bias-corrected 95% CIs of -0.134 and -0.011 that exclude zero, confirming the significance of the interaction term. The result suggests that team creativity moderates the relationship between project technological capacity and project performance (hypothesis 2).

Table 1: Bootstrap-based hierarchical regression results for hypothesis 1

| Variables and Sources | Products of | | Bias-Corrected 95% | |
|----------------------------|-------------|----------|--------------------|--------|
| | Estimate | SE | Lower | Upper |
| Intercept | 1.449 | 0.149*** | 1.158 | 1.742 |
| Control variable | | | | |
| PWE | 0.003 | 0.006 | -0.008 | 0.015 |
| PB | -0.001 | <0.001 | <0.001 | <0.001 |
| PD | 0.000 | <0.001 | -0.001 | <0.001 |
| Independent variable | | | | |
| Project technical capacity | 0.688 | 0.035*** | 0.622 | 0.754 |
| Adjusted R-squared | 0.605 | | | |

Note: 10,000 bootstrap samples. *** $P < 0.001$, ** $P < 0.05$, and * $P < 0.10$.

Table 2: Bootstrap-based method for testing the moderating effect of team creativity on project technical capacity and project performance

| Variables and sources | Products of coefficients | | Bias-corrected 95% CI | |
|--|--------------------------|----------|-----------------------|--------|
| | Estimate | SE | Lower | Upper |
| Intercept | 0.614 | 0.244** | 0.133 | 1.096 |
| Control variables | | | | |
| PWE | 0.002 | 0.005 | -0.001 | 0.012 |
| PB | -0.001 | 0.001 | -0.001 | 0.002 |
| PD | -0.001 | 0.001 | -0.001 | 0.002 |
| Independent variables | | | | |
| Team creativity | 0.622 | 0.101*** | 0.423 | 0.821 |
| Project technical capacity | 0.589 | 0.101*** | 0.389 | 0.788 |
| Moderating effects (hypothesis 4b) | | | | |
| Team creativity x Project technical capacity | -0.073 | 0.031* | -0.134 | -0.011 |
| | | | | |
| R-square | 0.710 | | | |
| Improved R-square due to interaction (%) | 0.008 | | | |
| | | | | |
| F-value | 85.399*** | | | |

Note: 1,000 bootstrap samples. SE = standard error, t = student t-statistic, CI = confidence interval, ***P < 0.001, **P < 0.01, and *P < 0.05.

Previous studies focus on how employee creativity influences organizational performance (Newman et al., 2018; Stenholm, 2011). Relatively fewer studies have investigated how team creativity influences project performance. Hence, it is concluded that there are a small number of studies in the literature that have explored the relationship between project team creativity, project technological capacity and project performance. Thus, the present study's aim is to examine the theory that team creativity facilitates high-quality project technological capacity, which in turn enhances project performance. The research results demonstrate that team creativity moderates the relationship between project technological capacity and project performance. In particular, the moderating role of team creativity in Table 2 reveals interesting nuances in the relationships. The interaction term Team creativity x Project technological capacity is negative, suggesting that team creativity negatively moderates the relationship between project technological capacity and project performance. In other words, the positive relationship between project technological capacity and project performance turns stronger when team creativity weakens. One possible explanation is that project technological capacity and team creativity do not have a linear relationship; rather it is curvilinear such as an inverted u-shaped relationship (Chen, 2021).

CONCLUSION

Extensive studies on creativity are added to the literature, which develops creativity models and defines approaches that promote high-quality creativity and innovation that's further improving organizational performance. However, little research explores how team creativity affects project performance. Therefore, this research study uses the Bootstrap-Based Method and Process to explain how team creativity impacts project outcomes. The results revealed that the relationship between project technological capacity and project performance is significantly stronger when team creativity is higher. Hence, the findings show that team creativity enhances the potential project performance.

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