
RESEARCH ARTICLE

Enhancing Project Citizenship Behavior by Psychological Empowerment: Roles of Work Engagement and Perceived Organizational Support

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ABSTRACT

Increasing evidence suggests that project citizenship behaviors (PCBs) are critical to project success. However, the mechanisms that enhance PCBs remain poorly understood, particularly regarding the role of individual psychological states. Based on self-determination theory, this study investigated how and when the psychological empowerment of information technology (IT) project managers affects their PCBs. Data were collected in two waves of time-lagged surveys ($N = 283$). Research hypotheses were tested by partial least squares structural equation modeling (PLS-SEM). It was found that psychological empowerment positively predicts PCBs, and work engagement plays a partial mediating role. Results of necessary condition analysis (NCA) provide additional evidence for this. Moreover, perceived organizational support strengthened the relationships between work engagement and two types of PCBs (i.e., loyalty behavior and initiative behavior), but did not significantly moderate the relationships between work engagement and the other two types of PCBs (i.e., helping behavior and compliance behavior). This study enriches the literature on PCB antecedents and expands the application of self-determination theory in project management.

KEYWORDS

Psychological empowerment; Project citizenship behavior; Work engagement; Perceived organizational support; Project manager

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1. Introduction

Due to increasing competition and economic pressure, various industries are increasingly inclined to adopt the project team to develop new products or provide services. However, project management is a highly dynamic and complex work. As the leader of the project team, the project manager has long been under stress from both inside and outside the team (An et al., 2019). Therefore, in recent years, research on the workplace behavior of project managers gradually shifted from "technology-oriented" to "people-oriented" (Chaudhry et al., 2019), and pays more attention to the effect of project managers' psychological states on their behaviors.

Psychological empowerment is an internalized experience that emphasizes an individual's subjective feelings and attitudes toward work. It consists of four aspects: meaning, competence, self-determination and impact (Spreitzer, 1995). Project managers with enough psychological empowerment are able to make important decisions at every stage of the project and, as a result, have a decisive influence on the direction and outcome of the project. When project managers have decision authority to impact the organization, they are more likely to adopt initiative behavior (Xia, Sun, et al., 2022). Self-determination theory provides a theoretical framework for understanding this process. Self-determination theory believes that human motivation is

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divided into internal motivation and external motivation. Fulfilling basic psychological needs such as autonomy, competence and relatedness is the key to stimulating an individual's intrinsic motivation (Gagné & Deci, 2005). When these psychological needs are met in the workplace (e.g., experiencing a high level of psychological empowerment), individuals are able to perform better in both job requirement and extra-role behavior (Roche & Haar, 2013). Within the project context, project citizenship behaviors (PCB) is just a crucial extra-role behavior.

For example, project managers fully assist the team members and promote mutual support among the team members (helping behavior). Project managers demonstrate commitment to the project goal and have a strong sense of collective responsibility (loyalty behavior). Project managers are not content with passive responses but actively seek opportunities to optimize project processes in the face of changes in the internal and external environment (initiative behavior). Project managers consciously adhere to project rules in daily management to minimize project risk (compliance behavior). The above helping, loyalty, initiative, and compliance behaviors are four typical PCBs (Braun et al., 2012). If a project manager exhibits less PCBs, it would result in low morale and more conflict within the team (Rahim, 2023). These negative effects increase the risk of project delay, and may directly lead to project failure (Serrador & Turner, 2015). However, the mechanisms of enhancing PCBs have not been fully explored, especially with regard to the role of individual psychological states. Hence, this study will investigate how project managers' psychological empowerment enhances the four PCBs.

In addition to psychological empowerment, work engagement is also a key factor in influencing PCBs of the project manager. Work engagement refers to vigor, dedication and absorption demonstrated by individuals in their work (Schaufeli et al., 2006). Previous studies have confirmed that high-level work engagement is usually accompanied by higher job performance (Corbeau & Iliescu, 2023) and more positive behavior tendencies (Xia, Sun, et al., 2022). In the context of project management, work engagement may be an important bridge connecting psychological empowerment and PCBs. On the one hand, when project managers feel enough psychological empowerment, they generally manifest stronger work motivation and sense of responsibility for their work, thus enhancing their work engagement (Wen et al., 2023). On the other hand, a high level of work engagement will encourage project managers to show more spontaneous behaviors in the project (Kapil & Rastogi, 2019), such as actively helping team members and solving potential problems. This virtuous cycle of internal drive and external performance provides theoretical support for revealing how psychological empowerment is transformed into actual behavior.

Nevertheless, PCBs of project managers are not completely determined by their internal psychological states. The support of the external environment is equally crucial. Perceived organizational support reflects employees' overall feelings about whether the organization cares about their well-being and contribution (Eisenberger et al., 1986). It is considered as an important external resource in organizational management research, which can significantly enhance employees' work motivation and behavior performance (Hafidhah & Martono, 2019). When project managers feel supported by the organization, they will have a higher sense of belonging to the organization (Ekrot et al., 2018), and are more likely to display higher work engagement and PCBs. Consequently, perceived organizational support may further amplify the positive relationship between work engagement and project citizenship behavior.

Based on the above background, this study proposed a mediation model in which work engagement explains the relationships between psychological empowerment and four types of PCBs, and tested the moderating role of perceived organizational support on the relationships between work engagement and PCBs. This study intends to make the following contributions. First, previous research on psychological empowerment mainly focuses on general employees or project members (e.g., Cavazotte et al., 2023), overlooking the uniqueness of project managers. By concentrating on project managers, the study helps to expand the applicability of psychological empowerment theory and provides a new theoretical perspective for improving project management effectiveness. Second, the existing literature primarily explored the impact of leaderships or external factors such as organizational culture, on PCBs (Zhao et al., 2023). This study enriches the literature on the antecedents of PCBs by revealing the intrinsic mechanism between psychological empowerment and PCBs. Third, this study deepens self-determination theory's understanding of intrinsic motivation and the interaction of work engagement and environmental support, which is valuable in advancing self-determination theory. It is of great value in advancing the development of self-determination theory. Fourth, the study sheds light on the differentiated effects of perceived organizational support as a boundary condition on the relationships between work engagement and different PCBs, pointing to a new direction for future research.

2. Literature Review and Hypothesis Development

2.1 Self-Determination Theory

Self-determination theory is a motivational process theory of human self-determined behavior proposed by Deci & Ryan (1985). When individuals possess a desire for continuous self-actualization and a psychological need to enhance their potential, they tend to achieve growth and improve the development level more readily (Deci et al., 2017). These psychological needs are innate

and exert a positive influence on the individual. With ongoing research, self-determination theory has gradually developed multiple branches, among which the basic psychological needs theory is the most widely applied. It posits that autonomy, competence, and relatedness together constitute the fundamental psychological needs of an individual (Deci et al., 2017).

The need for autonomy refers to individuals' need to choose their actions independently, such as initiating, regulating, and maintaining one's behavior. When this need is met, individuals experience a sense of personal freedom (Ng et al., 2012). The need for competence refers to the desire to accomplish challenging tasks and achieve the desired outcomes. When this need is satisfied, individuals experience a sense of control, accomplishment, and self-efficacy (Ryan & Deci, 2010). The relatedness need revolves around the desire to establish a connection with others. Fulfillment of this need leads individuals to feel acknowledged and valued (La Guardia & Patrick, 2008). Employees whose basic psychological needs are met tend to exhibit higher work performance. Otherwise, employees may reduce their efforts at work or even seek new employment (Wikaningtyas et al., 2023).

Self-determination theory emphasizes individual autonomy and competence in the workplace, which is closely related to individual psychological empowerment. Although many studies have applied self-determination theory to the field of project management (e.g., Lechler and Huemann, 2023; Zhang et al., 2023), few of them have drawn on it to explore the relationship between psychological empowerment and workplace behavior. Therefore, this article could expand the understanding of self-determination theory by focusing on the explanation mechanism of psychological empowerment on PCBs.

2.2 Citizenship Behavior in the Project Context

Organ (1988) introduced the concept of organizational citizenship behavior (OCB), noting that it is a type of discretionary behavior outside the role expected of an employee. In temporary organizations such as projects, delays and poor quality often occur due to misalignment of interests of all parties or lack of accountability on the part of project staff (Durdyev et al., 2017). To mitigate this phenomenon, Braun et al. (2012) applied OCB theory in the project context, coining the concept of PCB for the first time. PCBs are voluntary behaviors of individuals that transcends organizational boundaries and are embedded in the relational network of project teams. Although such behavior is not directly recognized by the project team's reward system, it effectively enhances project efficacy.

Braun et al. (2013) believe that PCBs include five aspects: helping behavior, loyalty behavior, initiative behavior, compliance behavior, and relationship maintenance. Helping behavior involves project employees voluntarily offering additional assistance to their colleagues (Wingate et al., 2019). Loyalty behavior reflects the extent of a project employee's commitment to the project team, and their willingness to go the extra mile to safeguard the team's interests (Gulesin & Gurol, 2018). Initiative behavior is manifested by project employees actively taking part in discussions, proposing innovative ideas, and showing concern for the project success, etc. (Guo et al., 2016). Compliance behavior asks project employees to strictly follow project regulations (Guo et al., 2019). Relationship maintenance refers to maintaining personal contact with project colleagues even after the project's termination. Synthesizing past research experiences, we chose the first four as the dependent variables in this study.

Recently, researchers have discovered that PCBs positively predict project performance (Luo et al., 2023), trustful collaboration (Sieben et al., 2016), and sustainable construction (Guo et al., 2019). Hence, how to stimulate PCBs has become a major issue in contemporary enterprise management. However, the literature on antecedents of PCBs is still scarce. Specifically for project managers, only a few empirical studies explored the explanatory roles of job stressors (Xia, Sun, et al., 2022) and work-family conflict (Xia et al., 2018).

2.3 Psychological Empowerment and PCB

Psychological empowerment is a composite inner experience of the individual, involving meaning, competence, self-determination, and impact (Spreitzer, 1995). Meaning refers to an individual's perception of the value of the work, involving an understanding and alignment with the significance of their job. Competence, also called self-efficacy, reflects an individual's perception of the skills required in the job, indicating confidence in their capability to meet challenges and achieve results. Self-determination is the individual's sense of choice and autonomy in initiating and regulating actions. Impact relates to the extent to which individuals believe they can affect the organization in areas such as strategy, administration, and operations.

According to self-determination theory, employees with high competence feel that they have the ability to control the progress and outcomes of tasks (Ryan & Deci, 2023). This sense of self-efficacy makes them more willing to proactively offer help to team members because they trust in their ability to effectively solve problems. Meanwhile, when employees perceive their work as highly meaningful, they develop a strong sense of identification with the organization (Reissner, 2010). The identification leads them to engage in loyal behaviors, such as protecting the reputation of the project. In addition, team leaders with high impact usually have a clear positioning of their work roles, and tend to adhere to the best practices within the team to ensure the smooth progress of the work (Howard et al., 2016). Instead, when lacking decision-making authority and resource support,

project managers may believe that they cannot influence the project (Kapogiannis et al., 2021). This further result in their reluctance to proactively use knowledge accumulated from past projects and suggest improvements to the project without explicit requests (Hwang et al., 2018). In summary, psychological empowerment should be an intrinsic motivational factor that leads to positive workplace behaviors. Based on the above analysis, we propose the following hypothesis.

Hypothesis 1: Psychological empowerment positively influences PCBs, including helping behavior (H1a), loyalty behavior (H1b), compliance behavior (H1c) , and initiative behavior (H1d).

2.4 Mediating Role of Work Engagement

Work engagement consists of vigor, dedication and absorption (Schaufeli et al., 2006). It is a positive and active work state, mostly associated with high performance, creativity, and well-being (Corbeau & Iliescu, 2023). Self-determination theory emphasizes three basic psychological needs. On one hand, psychological empowerment meets these basic psychological needs by providing more decision-making power and autonomy. When these needs are met, employees are likely to exhibit higher work engagement (Rahmadani et al., 2019). On the other hand, when employees internalize external goals as their own, they engage in activities aimed at achieving these goals. Psychological empowerment provides the opportunity for this internalization of goals, as individuals feel they have the right to participate in the decision-making process, rather than just passively executing tasks. Employees with high psychological empowerment enjoy more autonomy and a sense of accomplishment, which in turn enhances their job satisfaction (Mathew & Nair, 2022). Job satisfaction is closely related to work engagement, as individuals who are satisfied are more willing to invest energy and effort in their work (Yalabik et al., 2017). Additionally, psychological empowerment provides the condition that encourages individuals to develop. By participating in decision-making and facing challenges, project managers have the opportunity to improve their abilities. There is also a positive correlation between this experience of ability growth and work engagement (Xia, Ding, et al., 2022). Based on the above analysis, we proposed the following hypothesis.

Hypothesis 2: Psychological empowerment positively influences work engagement.

An individual's intrinsic motivation is an important factor that leads to corresponding behavior. If the vigor for the work are insufficient, employees may find the job boring or unsatisfying, resulting in a lack of initiative to go beyond basic duties (Mustafa et al., 2023). Work engagement represents the desire for the work. This intrinsic motivation makes individuals driven by the value and meaning of the work itself, rather than relying solely on external rewards (Zeng et al., 2022). At the same time, intrinsic motivation also makes individuals voluntarily offer help to others in the team, because they believe it contributes to teamwork and collective success. Dedication and absorption to work are accompanied by a strong sense of organizational belonging (Gillen-O'Neel, 2021). A sense of belonging inspires project managers to display loyalty behavior towards a project because they can feel the team's cohesion and the value of the collective efforts. An increased level of work engagement is often associated with a range of positive psychological states and emotional experiences (Ouweneel et al., 2012). These factors prompt project managers to go to great lengths outside of the project to protect the interests of projects, reflecting the loyalty to the project. As mentioned earlier, self-determination theory emphasizes the importance of internalizing external goals into internal goals. Project managers with high dedication may view the project goal as a personal goal and are more willing to comply with relevant project regulations to facilitate the smooth progress of the project. Based on the above analysis and Hypothesis 2, the following hypotheses are proposed.

Hypothesis 3: Work engagement positively influences PCBs, including helping behavior (H3a), loyalty behavior (H3b), compliance behavior (H3c) , and initiative behavior (H3d).

Hypothesis 4: Psychological empowerment positively influences PCBs (i.e., helping behavior (H4a) , loyalty behavior (H4b), compliance behavior (H4c), and initiative behavior (H4d)) through work engagement.

2.5 Moderating Role of Perceived Organizational Support

Eisenberger et al. (1986) defined perceived organizational support as employees' perceptions of how the organization values their contributions and cares about their well-being. Self-determination theory asserts that when employees experience autonomy, competence, and relatedness, their intrinsic motivation is stimulated, leading them to engage more actively (Deci et al., 2017). From the perspective of the need for autonomy, when employees perceive support from the organization, they feel that their decisions and actions are encouraged. This fulfillment of autonomy makes employees align their actions with the requirements of the organization (Kurtessis et al., 2017). For example, project managers may take the initiative to engage in extra actions to optimize project processes and increase the efficiency of team collaboration. These behaviors essentially reflect a higher level of professional autonomy and intrinsic motivation, which in turn ignite their active behaviors in the project, such as sharing knowledge, helping colleagues or other citizenship behaviors (N. Li et al., 2010).

The fulfillment of the competence need plays a significant role in this process. Organizational support generally involves providing sufficient resources, training, and recognition, which can increase employees' sense of professional efficacy and confidence in their ability to solve problems (Caesens & Stinglhamber, 2014). The increased sense of competence not only promotes employees' work engagement as they believe that efforts can lead to tangible results, but also encourages employees to exhibit more citizenship behaviors (Yang et al., 2016). Besides, a supportive organizational environment helps build a sense of belonging and relatedness, thereby strengthening trust and collaboration among employees. Employees within a positive social network are more willing to adhere to organizational rules and maintain the organization's image (Loi et al., 2006). Based on the above analysis, we propose the following hypotheses.

Hypothesis 5a: Perceived organizational support positively moderates the relationship between work engagement and helping behavior, such that the positive relationship of work engagement with helping behavior is stronger when perceived organizational support is higher.

Hypothesis 5b: Perceived organizational support positively moderates the relationship between work engagement and loyalty behavior, such that the positive relationship between work engagement and loyalty behavior is stronger when perceived organizational support is higher.

Hypothesis 5c: Perceived organizational support positively moderates the relationship between work engagement and compliance behavior, such that the positive relationship between work engagement and compliance behavior is stronger when perceived organizational support is higher.

Hypothesis 5d: Perceived organizational support positively moderates the relationship between work engagement and initiative behavior, such that the positive relationship of work engagement with initiative behavior is stronger when perceived organizational support is higher.

Figure 1 shows the conceptual model of this study.

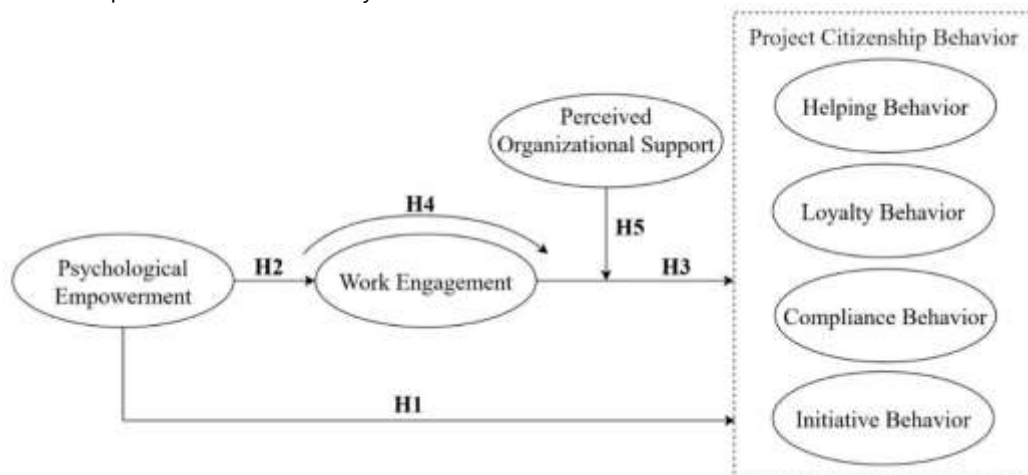


Figure 1: Conceptual Model

3. Methods

3.1 Sample and Procedure

Compared to other project types, information technology (IT) projects (e.g., blockchain, artificial intelligence) have to adapt to more market changes and technical challenges (Reich & Sauer, 2010), which may make psychological empowerment more typical in shaping the workplace behavior of project managers. Therefore, IT project managers were selected as the target sample for this study. All participants are from China, but the original scales were written in English. We converted the scales from English to Mandarin and then converted the Mandarin scales back to English, and checked the equivalence of the questionnaires in both languages (Brislin, 1980). Questionnaires were distributed on the online survey platform Credamo. The data quality and reliability from the platform have been proved by previous studies (e.g., Li et al., 2023).

We used a time-lagged design to collect data through surveys at two time points approximately eight weeks apart. This design provides stronger causal inference (Wang et al., 2017) and reduces common method bias (CMB) (Podsakoff et al., 2003). At Time 1 (T1), 378 participants completed measures of demographic information, psychological empowerment, and perceived organizational support, with a response rate of 87.3%. At Time 2 (T2), 312 participants completed measures assessing their work engagement and PCBs, with a response rate of 82.5%. Each participant who completed the questionnaire was paid CNY 30 each time.

After performing a completeness check and eliminating invalid questionnaires due to excessively short completion time or patterned responses, this study ultimately obtained 283 valid questionnaires, resulting in an overall valid response rate of 65.4%. In the final sample, 64.3% were male; the age intervals 20-29 and 30-39 were the most represented, with 30.4% and 40.3%, respectively; those with a bachelor's degree or higher accounted for 80.6%; tenure of 2-4 years and 5-7 years were the most common, with 35.7% and 27.6%, respectively.

3.2 Measure

All research constructs were measured on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree).

Psychological Empowerment (T1). We assessed psychological empowerment using the 12-item scale developed by G. M. Spreitzer (1995). This scale consists of four dimensions, each with three items: meaning (e.g., "My job activities are personally meaningful to me"), competence (e.g., "I am self-assured about my capabilities to perform my work activities"), self-determination (e.g., "I can decide on my own how to go about doing my work"), and impact (e.g., "I have a great deal of control over what happens in my department").

Work Engagement (T2). We assessed work engagement using the 9-item Utrecht work engagement scale (UWES-9, Schaufeli et al., 2006). This scale includes three dimensions, each with three items: vigor (e.g., "At my job, I feel strong and vigorous"), dedication (e.g., "I am proud of the work that I do"), and absorption (e.g., "I feel happy when I am working intensely").

Perceived Organizational Support (T1). We assessed perceived organizational support using a 7-item scale recommended by Rhoades et al. (2001). This scale is a condensed version of Eisenberger et al.'s (1997) 36-item scale and has been widely applied in project management research (e.g., Ekrot et al., 2018). An example item is "My organization is willing to help me if I need a special favor."

PCBs (T2). We captured four types of PCBs using the scale developed by Braun et al. (2013), with each behavior containing 3 items: helping behavior (e.g., "I help project staff when they have heavy workloads"), loyalty behavior (e.g., "I feel strongly committed to the project"), compliance behavior (e.g., "I conform to all contractual obligations I have in the project with great care"), and initiative behavior (e.g., "I outline chances and potentials that could arise in the course of the project").

Control Variables (T1). Considering that individuals of different age or gender may exhibit differences in workplace behaviors (Ajlouni et al., 2021), we treated age and gender as control.

3.3 Data Analysis

According to Hair et al. (2020), partial least squares structural equation modeling (PLS-SEM) is a powerful solution when dealing with complex model and non-normal data. Our research model is relatively complex, including two second-order structures, mediation and moderation; the result of Kolmogorov-Smirnov test indicated that item data for all constructs did not follow a normal distribution ($p < .05$). Therefore, we used SmartPLS 4 for hypothesis testing in this study.

PLS-SEM primarily examines sufficient conditions rather than necessary conditions in causal relationships. The academic community encourages the combination of PLS-SEM with necessary condition analysis (NCA) to strengthen the argument for causality (Richter et al., 2020). The basic logic of necessary (but not sufficient) conditions is that if a necessary condition is present, the expected outcome may not necessarily occur, but if a necessary condition is absent, the expected outcome will definitely not occur. Hence, we used R to perform NCA to identify the necessary predictor variables for work engagement and four types of PCBs.

4. Results

4.1 Measurement Model Assessment

4.1.1 Reliability and Validity

Table 1 shows the outer loadings, composite reliability (CR), and average variance extracted (AVE) of all constructs. All CR and Cronbach's α values are above 0.7, indicating good reliability of the scale data (Hair Jr, Hult, et al., 2017). The outer loadings of all constructs are greater than 0.7, also reaching an acceptable level (Hair et al., 2020). In addition, the AVE value of each construct exceeds the threshold of 0.5, reflecting satisfactory convergent validity (Pesämaa et al., 2021). Table 2 shows the mean, standard deviation and correlation. The square root of the AVE for each latent variable exceeds its Pearson correlations with other latent variables in the model, fulfilling the criterion of Fornell & Larcker (1981).

Table 1: Outer Loadings, Composite Reliability (CR), and Average Variance Extracted (AVE)

Construct	Outer loading	CR	AVE
Psychological empowerment ($\alpha = .84$)		.81	.52
Meaning ($\alpha = .79$)		.88	.71
Meaning1-The work I do is very important to me.	.83		
Meaning2-My job activities are personally meaningful to me.	.84		
Meaning3-The work I do is meaningful to me.	.86		
Competence ($\alpha = .82$)		.89	.73
Competence1-I am confident about my ability to do my job.	.85		
Competence2-I am self-assured about my capabilities to perform my work activities.	.86		
Competence3-I have mastered the skills necessary for my job.	.86		
Self-determination ($\alpha = .74$)		.85	.66
SD1-I have significant autonomy in determining how I do my job.	.81		
SD2-I can decide on my own how to go about doing my work.	.82		
SD3-I have considerable opportunity for independence and freedom in how I do my job.	.80		
Impact ($\alpha = .74$)		.85	.66
Impact1-My impact on what happens in my department is large.	.81		
Impact2-I have a great deal of control over what happens in my department.	.79		
Impact3-I have significant influence over what happens in my department.	.83		
Work engagement ($\alpha = .88$)		.80	.58
Vigor ($\alpha = .83$)		.90	.75
Vigor1-At my work, I feel bursting with energy.	.86		
Vigor2-At my job, I feel strong and vigorous.	.87		
Vigor3-When I get up in the morning, I feel like going to work.	.86		
Dedication ($\alpha = .86$)		.92	.79
Dedication1-I am enthusiastic about my job.	.88		
Dedication2-My job inspires me.	.88		
Dedication3-I am proud of the work that I do.	.90		
Absorption ($\alpha = .86$)		.91	.78
Absorption1-I feel happy when I am working intensely.	.90		
Absorption2-I am immersed in my work.	.87		
Absorption3-I get carried away when I am working.	.88		
Perceived organizational support ($\alpha = .87$)		.90	.57

POS1-My organization really cares about my well-being.	.71		
POS2-My organization strongly considers my goals and values.	.80		
POS3-My organization shows much concern for me.	.76		
POS4-My organization cares about my opinions.	.81		
POS5-My organization is willing to help me if I need a special favor.	.75		
POS6-Help is available from my organization when I have a problem.	.72		
POS7-My organization would forgive an honest mistake on my part.	.74		
Helping behavior ($\alpha = .81$)		.88	.70
HB1-I help project staff when they have heavy workloads.	.87		
HB2-I offer the project team members a helping hand if they need it at some stage in the course of the project.	.86		
HB3-I intervene and try to balance interests when disputes in the project team occur.	.85		
Initiative behavior ($\alpha = .88$)		.91	.77
IB1-I make innovative suggestions to improve the project work.	.84		
IB2-I outline chances and potentials that could arise in the course of the project.	.83		
IB3-I propose my own ideas and suggestions in the project work, even when it is not explicitly requested.	.88		
Compliance behavior ($\alpha = .85$)		.89	.72
CB1-I follow strictly the rules and instructions that apply to the project.	.86		
CB2-I strictly comply with the rules which were set during the kick-off meeting.	.89		
CB3-I conform to all contractual obligations I have in the project with great care.	.88		
Loyalty behavior ($\alpha = .79$)		.89	.72
LB1-I defend the project when it is criticized from the outside.	.86		
LB2-I feel strongly committed to the project.	.83		
LB3-I describe the project positively if someone from outside asks me.	.85		

Table 2: Means, Standard Deviations (SD), and Correlations

Variable	Means	SD	1	2	3	4	5	6	7
1. Psychological empowerment	4.81	.73	.72						
2. Work engagement	4.69	.77	.56	.76					
3. Perceived organizational support	5.01	.84	.31	.43	.76				
4. Initiative behavior	5.19	.80	.57	.59	.33	.84			
5. Compliance behavior	5.18	.95	.44	.45	.31	.44	.88		
6. Loyalty behavior	5.31	.80	.56	.59	.36	.55	.44	.85	

7. Helping behavior	5.16	.84	.52	.57	.38	.56	.36	.49	.85
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Note. Bold numbers are square root of AVE values. Numbers below diagonal are inter-construct correlations.

4.1.2 Common Method Bias

Since all variables in this study were measured through self-report scales, there is a potential CMB (Podsakoff et al., 2012). Upon completion of the data collection, we performed the Harman's single factor test. The results indicated multiple factors with eigenvalues greater than 1. The maximum unrotated factor explained 29.9% of variance, which did not reach the threshold of 50% (Harman, 1976), preliminarily ruling out the presence of CMB. Furthermore, we performed Kock' (2015) full collinearity test. This method suggests that the data are not contaminated by CMB as long as all inner variance inflation factors (VIFs) in the structural model are below 3.3. The test results showed that all inner VIF values were less than 1.7. This means that CMB should not be a problem in our research.

4.2 Structural Model Assessment

4.2.1 Model Quality

Aloe et al. (2010) define R^2 above .25 and .50 as "medium" and "large," respectively. The results showed that the R^2 values in the model range from .29 to .50, which suggests that, on average, our structural model has a medium level of explanatory power. Another important quality statistic of structural modeling is Q^2 . It is based on a cross-validation process known as "blindfolding", to evaluate the predictive relevance of endogenous latent variables. If the Q^2 value for an endogenous latent variable is greater than zero, it indicates that the model has acceptable predictive power for that variable (Hair Jr, Sarstedt, et al., 2017). The testing results showed that Q^2 values range from .15 to .34, thus, the model has nice predictive power.

4.2.2 Hypothesis Testing

Table 3 presents the testing results for all hypothesized relationships. Psychological empowerment positively predicts helping behavior ($\beta = .28, t = 4.99, p < .001$), thus Hypothesis 1a was supported. Psychological empowerment positively predicts loyalty behavior ($\beta = .33, t = 6.37, p < .001$), thus Hypothesis 1b was supported. Psychological empowerment positively predicts compliance behavior ($\beta = .26, t = 4.11, p < .001$), thus Hypothesis 1c was supported. Psychological empowerment positively predicts initiative behavior ($\beta = .34, t = 6.74, p < .001$), thus Hypothesis 1d was supported. Similarly, psychological empowerment positively predicts work engagement ($\beta = .56, t = 14.07, p < .001$), thus Hypothesis 2 was supported.

Table 3: Hypothesized Relationship Testing Results

Hypothesis	Causal path	β	t value	p value	Result
Hypothesis 1a	Psychological empowerment → Helping behavior	.28	4.99	.000	Supported
Hypothesis 1b	Psychological empowerment → Loyalty behavior	.33	6.37	.000	Supported
Hypothesis 1c	Psychological empowerment → Compliance behavior	.26	4.11	.000	Supported
Hypothesis 1d	Psychological empowerment → Initiative behavior	.34	6.74	.000	Supported
Hypothesis 2	Psychological empowerment → Work engagement	.56	14.07	.000	Supported
Hypothesis 3a	Work engagement → Helping behavior	.40	7.45	.000	Supported
Hypothesis 3b	Work engagement → Loyalty behavior	.41	8.22	.000	Supported
Hypothesis 3c	Work engagement → Compliance behavior	.30	5.44	.000	Supported
Hypothesis 3d	Work engagement → Initiative behavior	.40	7.20	.000	Supported
Hypothesis 4a	Psychological empowerment → Work engagement → Helping behavior	.22	6.80	.000	Supported
Hypothesis 4b	Psychological empowerment → Work engagement → Loyalty behavior	.23	7.23	.000	Supported
Hypothesis 4c	Psychological empowerment → Work engagement → Compliance behavior	.17	4.92	.000	Supported
Hypothesis 4d	Psychological empowerment → Work engagement → Initiative behavior	.22	6.19	.000	Supported
Hypothesis 5a	Perceived organizational support × Work engagement → Helping behavior	.05	1.04	.300	Rejected
Hypothesis 5b	Perceived organizational support × Work engagement → Loyalty behavior	.11	2.56	.011	Supported
Hypothesis 5c	Perceived organizational support × Work engagement → Compliance behavior	.06	1.65	.099	Rejected
Hypothesis 5d	Perceived organizational support × Work engagement → Initiative behavior	.20	4.17	.000	Supported

Note. Based on 5,000 bootstrapped samples.

Work engagement positively predicts helping behavior ($\beta = .40, t = 7.45, p < .001$), thus Hypothesis 3a was supported. Work engagement positively predicts loyalty behavior ($\beta = .41, t = 8.22, p < .001$), thus Hypothesis 3b was supported. Work engagement positively predicts compliance behavior ($\beta = .30, t = 5.44, p < .001$), thus Hypothesis 3c was supported. Work engagement positively predicts initiative behavior ($\beta = .40, t = 7.20, p < .001$), thus Hypothesis 3d was supported.

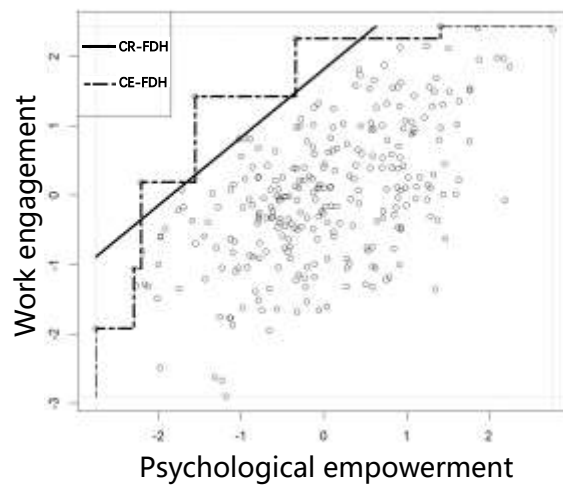
Next, we tested the mediating role of work engagement. The indirect effect of psychological empowerment on helping behavior through work engagement is significant ($\beta = .22, t = 6.80, p < .001$), which supports Hypothesis 4a. The indirect effect of psychological empowerment on loyalty behavior through work engagement is significant ($\beta = .23, t = 7.23, p < .001$), which supports Hypothesis 4b. The indirect effect of psychological empowerment on compliance behavior through work engagement is significant ($\beta = .17, t = 4.92, p < .001$), which supports Hypothesis 4c. The indirect effect of psychological empowerment on initiative behavior through work engagement is significant ($\beta = .22, t = 6.19, p < .001$), which supports Hypothesis 4d. Thus, all four mediation hypotheses were supported. Since the direct paths of psychological empowerment on the four types of PCBs were significant ($p < .05$), work engagement only partially mediated the relationships between psychological empowerment and PCBs.

Inconsistency appears in the results of the moderating effect. The interaction term “perceived organizational support \times work engagement” had significant effects on loyalty behavior ($\beta = .11, t = 2.56, p = .011$) and initiative behavior ($\beta = .20, t = 4.17, p < .001$). It indicated that perceived organizational support positively moderates the relationships between work engagement and both loyalty behavior and initiative behavior. Therefore, Hypothesis 5a and Hypothesis 5d were supported. However, the effects of the interaction term on helping behavior ($\beta = .05, t = 1.04, p = .30$) and compliance behavior ($\beta = .06, t = 1.65, p = .10$) did not reach a statistical significance. Hypothesis 5b and Hypothesis 5c were rejected.

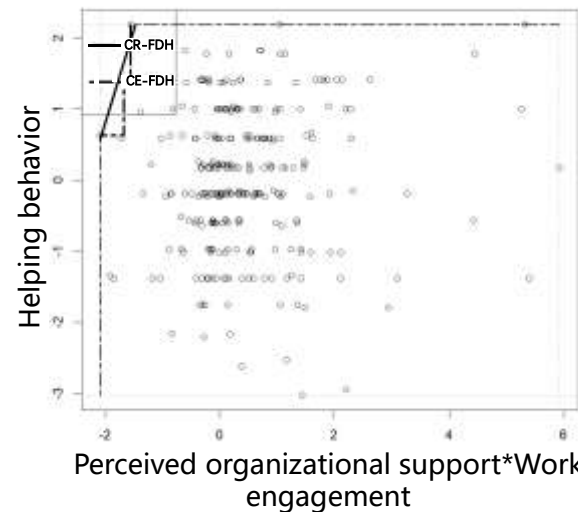
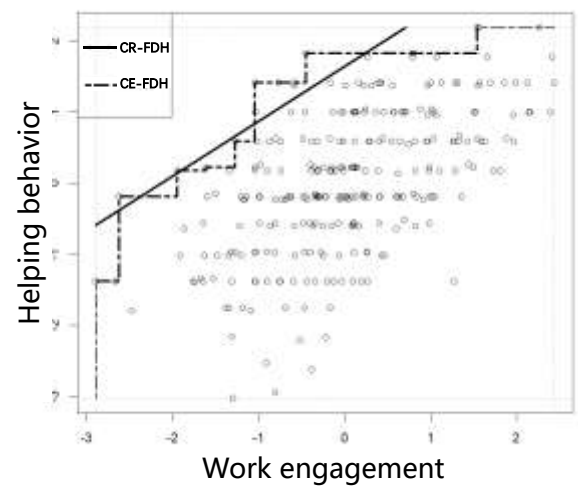
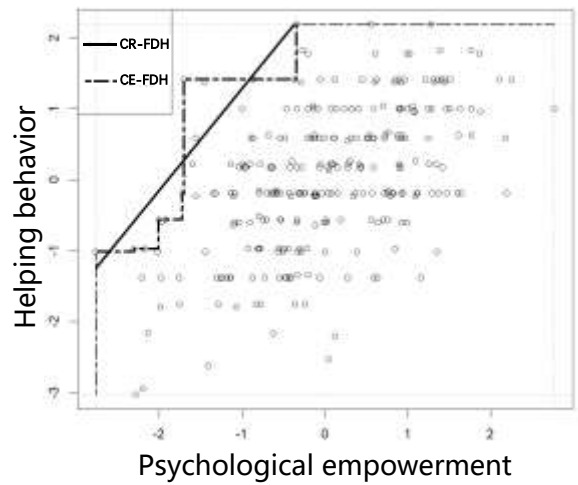
Among control variables, only age negatively impacts loyalty behavior ($\beta = -.14, t = 3.09, p = .002$), compliance behavior ($\beta = -.15, t = 3.04, p = .004$), and initiative behavior ($\beta = -.13, t = 2.89, p = .003$), respectively. It is possible that older project managers experience changes in their physical and cognitive abilities, which reduces their initiative to take on additional tasks, particularly in the project environment that demands a lot of energy and quick adaptability.

4.3 Necessary Condition Analysis

This study performed NCA for five outcome variables: work engagement, helping behavior, loyalty behavior, compliance behavior, and initiative behavior. Due to space constraints, only the scatter plots with work engagement and helping behavior as outcome variables are provided in this paper, shown as Figure 2. The ceiling zone and scope represent the blank area in the upper left corner of the scatter plot and the total area of the plot, respectively. The necessity effect size (d) is calculated by dividing the ceiling zone by the scope, resulting in a value between 0 and 1. The thresholds of effect size for medium and large are 0.1 and 0.3, respectively (Dul et al., 2020).



(a) Outcome variable: Work engagement



(b) Outcome variable: Helping behavior

Figure 2: Scatter Plots of Necessary Condition Analysis

Note. CR-FDH = ceiling regression with free disposal hull; CE-FDH = ceiling envelopment with free disposal hull.

Table 4 shows the effect sizes and significance of all condition variables (i.e., predictor variables). Psychological empowerment is a necessary condition variable for both work engagement and helping behavior, as evidenced by the very clear blank area in the upper left corner of the corresponding scatter plots. More precisely, the effect sizes of psychological empowerment on work

engagement and helping behavior were .19 ($p < .001$) and .14 ($p = .001$), both achieving a medium effect. Similarly, work engagement is also a medium necessary condition for helping behavior ($d = .18, p < .001$). These results provide additional evidence for our Hypotheses 1-4, further substantiating that work engagement partially mediates the relationships of psychological empowerment with four types of PCBs. However, the effect sizes of interaction term were all not significant, suggesting that while perceived organizational support plays a moderating role in the relationships between work engagement and specific PCBs (i.e., loyalty and initiative behaviors), it did not reach the degree of a necessary condition.

Table 4: Necessary Condition Analysis Results

Outcome variable	Condition variable	Accuracy	Ceiling zone	Scope	d	p value
Work engagement	Psychological empowerment	98.6%	5.63	29.48	.19	.000
Helping behavior	Psychological empowerment	98.6%	4.11	28.85	.14	.001
	Work engagement	97.2%	5.01	27.83	.18	.000
	Perceived organizational support × Work engagement	99.3%	.50	41.89	.01	.913
Loyalty behavior	Psychological empowerment	98.6%	4.04	30.11	.13	.000
	Work engagement	98.9%	5.13	29.04	.18	.000
	Perceived organizational support × Work engagement	99.3%	.96	43.72	.02	.697
Compliance behavior	Psychological empowerment	98.6%	2.11	25.41	.08	.041
	Work engagement	98.9%	3.42	24.51	.14	.000
	Perceived organizational support × Work engagement	98.9%	.85	36.89	.02	.490
Initiative behavior	Psychological empowerment	97.2%	4.64	30.22	.15	.000
	Work engagement	97.9%	5.10	29.16	.18	.000
	Perceived organizational support × Work engagement	100.0%	.31	43.88	.01	.932

Note. Based on the ceiling regression with free disposal hull (CR-FDH) method.

5. Discussion

Using PLS-SEM and NCA, we empirically investigated the mechanisms by which psychological empowerment of 283 IT project managers predicts four PCBs. The results supported most of our hypotheses. It was found that psychological empowerment positively predicts PCBs, and work engagement partially mediates this relationship. In other words, when IT project managers experience higher levels of psychological empowerment, they tend to present higher levels of work engagement, which in turn leads to more PCBs. Results of necessary condition analysis (NCA) provide additional evidence for this. Moreover, perceived organizational support strengthened the relationships between work engagement and two types of PCBs (i.e., loyalty behavior and initiative behavior). Therefore, although the moderating effect of perceived organizational support did not reach the level of a necessary condition, it still serves as an important contextual factor in promoting specific PCBs.

5.1 Theoretical Implications

First, past research on psychological empowerment has largely focused on general employees' job satisfaction (Gong et al., 2012) or routine organizational behaviors, such as innovative behavior (Khan et al., 2022) and task performance (Ambad et al., 2021). However, project management is an organizational activity that involves time constraints, uniqueness, and the need for cross-functional collaboration (Nicholas & Steyn, 2020). Project managers have distinct roles and responsibilities that differ from those of general employees. This study introduced the concept of psychological empowerment to the field of project management. This broadens the application scope of psychological empowerment and offers new theoretical instruction for enhancing the efficacy of project management.

Second, by unraveling the "black box" of how psychological empowerment influences PCBs, this study helps to understand the formation mechanism of PCBs, thus enriching the literature on the antecedents of PCBs. Previous literature mainly treated PCBs as the independent variable to study its various consequences, such as close collaboration (Sieben et al., 2016), goal achievement and project success (Shafi et al., 2021). Meanwhile, research related to citizenship behavior is mostly associated with factors such as organizational culture and leadership style (Mi et al., 2019; Z. Zhang et al., 2023), with insufficient exploration of individual psychological state. By confirming the positive relationships between psychological empowerment and PCBs, our study highlights the importance of project managers' internal psychological state, and demonstrates that improving psychological empowerment is an effective way to enhance PCBs. Moreover, PCB are often conceptualized as either single- or three-

dimensional construct when investigating their antecedents (e.g., Xia et al., 2022a; Zhao et al., 2023). This study considers four types of PCBs simultaneously, contributing to a more comprehensive understanding of the internal differences among PCBs.

Third, this study provides an empirical evidence for the applicability of self-determination theory in project management practice. On one hand, the study underscores the value of psychological empowerment in igniting project managers' intrinsic motivation. Psychological empowerment involves an individual's competence and self-determination (Spreitzer, 1995). By demonstrating the positive relationship between psychological empowerment and PCBs, our study results reaffirm the opinion of self-determination theory that autonomy and competence improve workplace behavior. On the other hand, the study reveals the mediating role of work engagement between psychological empowerment and PCBs. According to self-determination theory, intrinsic motivation fosters higher levels of work engagement, which, in turn, produces better work outcomes (Kong & Ho, 2016). Our findings validate this theoretical chain and further refine the specific mechanism between intrinsic motivation and work outcomes. Furthermore, the role of perceived organizational support as a moderating variable is consistent with the theoretical perspective within self-determination theory on the influence of environmental factors on individual behavior. Self-determination theory emphasizes the impact of the social environment on individual intrinsic motivation, suggesting that environments supporting individual autonomy enhance intrinsic motivation and improve performance and well-being (Gabriel et al., 2014; Manganelli et al., 2018). This study confirms that the impact of their work engagement on PCBs is strengthened when project managers perceive a high level of organizational support, providing the empirical support for the theory of how environmental factors enhance or inhibit intrinsic motivation.

Lastly, we extend the findings of Xia, Ding, et al. (2022) by demonstrating the relationships of project managers' work engagement with their PCBs are subject to a certain boundary condition. When project managers feel supported by their organizations, the positive relationships between work engagement and two types of PCBs (loyalty and initiative behaviors) become stronger. According to self-determination theory, organizational support can be seen as one of the environmental factors that help satisfy individuals' basic psychological needs (van den Broeck et al., 2014), especially the need for relatedness. Therefore, when project managers feel that their efforts are recognized and supported by the organization, their intrinsic motivation is strengthened (Liu et al., 2018), which in turn makes them more likely to exhibit positive work attitudes and behavior. However, our findings also indicate that perceived organizational support does not significantly moderate the relationships between work engagement and the other two types of PCBs (compliance and helping behaviors). In other words, the mechanisms underlying compliance behavior and helping behavior differ from the other two types of PCBs. This may be because compliance behavior and helping behavior are sometimes seen as basic responsibilities of project managers (Reich & Sauer, 2010), rather than extra contributions driven by internal motivation. Another possibility is that perceived organizational support may influence different types of PCBs through different psychological mechanisms. For instance, compliance behavior is more influenced by an individual's organizational commitment, while helping behavior is more affected by the interactions between colleagues (De Jong et al., 2007).

5.2 Managerial Implications

This study demonstrates the effect of psychological empowerment on PCBs. For project managers, this finding highlights the importance of establishing and maintaining psychological empowerment. In practical work, project managers need to recognize that empowerment serves both as a tool for managing team members and as an important aspect of their self-management. Project managers need to actively seek and create opportunities to increase their own influence, such as participating in the decision-making process, advocating for the rational allocation of resources, and clarifying their values or contributions to the project success.

Furthermore, work engagement is a source of professional fulfillment and additionally strengthens an individual's commitment to the project (Yalabik et al., 2015), thereby increasing the likelihood of making extra contributions. Work engagement acts as a mediator between psychological empowerment and PCBs, suggesting that project managers should pay attention to and improve their level of work engagement. To this end, some desirable actions include setting challenging yet achievable personal and team goals, developing a sound time management plan, and focusing on the positive aspects and joys of work.

For organizational executives, it is essential to recognize that psychological empowerment is not a simple switch that can be turned on or off at will. It is a complex process that needs to be cultivated through trust, respect, and positive psychological mechanisms. Management should strive to ensure that project managers have sufficient autonomy to make important decisions and provide appropriate guidance when needed. Maintaining a balance between managerialism and decentralization is crucial for project managers to sustain vigor and proactivity.

Management should also create and maintain a supportive environment. Perceived organizational support plays an important moderating role in the process by which work engagement explains PCBs. Perceived organizational support amplifies the

impacts of work engagement on loyalty behavior and initiative behavior. Therefore, management must ensure that project managers feel organizational support at all times. This can be achieved by publicly acknowledging the achievements of project managers, offering necessary training, and creating a culture that encourages feedback and communication.

5.3 Limitations and Further Research

This study has several limitations. First, we adopted a cross-sectional design. The hypothesized causality cannot be fully substantiated although we collected data at two time points, conducted NCA, and examined the robustness of the results. Future research could employ a longitudinal or experimental design to address this concern. Second, the choice of the sample might limit generalizability of the study. Chinese culture tends to be collectivist, which may strengthen employees' loyalty and compliance behaviors. At the same time, IT projects usually face higher innovation pressure, which may affect their psychology and behavior. We urge future research to take these factors fully into account and to sample across countries or industries to assess the generality of our findings. Third, self-report data could be influenced by social expectation bias because participants tend to create positive images of themselves. We suggest that future research use more objective measurement methods, such as 360° feedback, or introduce social desirability as a control variable in the model to control for such bias. Lastly, the current study has not fully revealed the role of perceived organizational support as a boundary condition in the formation mechanism of different types of PCBs. Perceived organizational support may interact with other factors not considered, such as personal attributes, job satisfaction, and organizational culture (Najeemdeen et al., 2018; Y. Zhang et al., 2012). Further investigation of these factors may help to better explain project managers' compliance and help behaviors.

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