Impact Mechanism of Shared Leadership Behavior on the Performance of Large-scale Engineering Construction Projects

Yuelan Ding¹, Jing Wang¹* and Jian Su²

¹School of International Business, Shaanxi Normal University, Xi’an, Shaanxi, 710119, China
²School of International Business, Shaanxi Normal University, Xi’an, Shaanxi, 710119, China
*Corresponding author’s e-mail: wangjing2013@snnu.edu.cn

Abstract. As a new type of leadership style that can enhance team effectiveness, shared leadership has received a lot of attention from scholars. However, few studies have focused on its positive role in the engineering construction team. This paper explores the impact of shared leadership behavior on the performance of large-scale engineering projects and discusses the mediating role of employee participation. The research of the employees and their direct leaders in 41 project teams of the 12 construction companies shows that shared leadership behavior has a significant positive effect on project performance, employee participation plays a part mediating role in the relationship between shared leadership behavior and project performance. In a society where the knowledge economy and information technology are developing rapidly, combining shared leadership behavior with large-scale engineering construction projects will inevitably bring benefits to large-scale engineering construction projects.

1. Introduction

In recent years, the investment subjects in China’s engineering construction market tend to be diversified, such as government, enterprises, foreign capital, etc. With the rapid development of China’s basic engineering facilities construction and economic construction, China’s demand for engineering construction projects has increased, and engineering construction projects are increasingly becoming larger. Traditional engineering construction projects generally adopt a pyramid-like organizational structure with strict hierarchy, clear hierarchy, clear command, and centralized power. The structural model mainly emphasizes division of labor and centralization, and information transmission from top to bottom. However, in the face of complex, volatile and dynamic external environments, as well as the increasing size and complexity of engineering construction projects, the traditional pyramidal organizational structure has not been able to adapt to the management needs of large-scale engineering construction projects.

In order to adapt to the economic and project development, the organizational structure of more and more large-scale engineering construction projects tends to be flat, which can reduce the management level, speed up the transmission of information, better adapt to the external environment, and facilitate the development of the project. The development of the Internet and information technology not only provides certain technical support for the flattening of the organizational structure of large-scale
engineering construction projects, but also promotes the degree of flattening of the structure. Changes in the external environment, the enlargement of the project, and the flattening of the project structure have driven the project managers to adopt different management methods and leadership styles than in the past, and also promoted the decentralization of project managers to other members and promoted the project. Members are more involved in the decision-making of the project and other activities of the manager.

Konu and Viitanen believed that the work of large-scale engineering construction projects mainly depends on those members with high-level skills and autonomy, and the project teams focusing on large-scale engineering construction projects mainly rely on those members who with high-level skills, require work autonomy, and want to have more opportunities to influence team work and participate in leadership. The flat organizational structure of large-scale engineering construction projects and the growing popularity of self-management teams, the development of information technology, etc., all emphasize that one cannot perform all leadership tasks and ensure the success of the project in large-scale engineering construction projects. The long-term and complex nature of large-scale engineering construction projects, the dynamics and uncertainties of the external environment of the project, the flattening of its organizational structure and the way of the project team performs, the development of networks and information technology, and the speed of knowledge update, all lead to the sharing of leadership responsibilities and power among project team members and provide conditions for the formation of shared leadership behavior[1].

In view of this, based on the theory of cognitive theory and social exchange, this paper takes shared leadership behavior as an entry point, explores the mechanism of shared leadership behavior, and opens a "black box" between shared leadership behavior and the performance of large-scale engineering construction projects. And provide targeted suggestions for managers of construction industry to encourage positive work behavior and improve project performance.

2. Literature review and research hypothesis

2.1. Shared leadership behavior and project performance

Most scholars' research on project performance focuses on shared leadership behavior and considers it to be a booster for project performance improvement. Based on a cultural perspective, Zaheer, McEvily, and Perrone believe that when employees share their powers with superiors, they will be more determined and more willing to contribute their knowledge and skill stocks unreservedly. Shared leadership behavior can reduce communication costs and power distances, and guide members to actively contribute knowledge to team work and effectively improve project performance [2]. It can be predicted that if the organization has high shared leadership behavior, it can enhance the individual's perception of self-ability and effectively improve performance. Based on this, the following research hypothesis is proposed:

H1: Shared leadership behavior has a significant positive impact on project performance.

2.2. The intermediary role of employee participation

Employee participation as a special organizational communication, through the interaction between employees, sharing of experience and opinions, successfully achieve work tasks and goals, enhance the use of professional knowledge of supervisors to solve important problems in management. According to social cognition theory, the participation behavior of employees in organizational management decisions is affected by environmental factors. When the organization presents high shared leadership behavior, it promotes a series of positive work attitudes and behaviors of employees [3]. Zhang Zhen, Ma Li and Ma Wenjing confirmed this conclusion, pointing out that shared leadership behavior was especially important for employee participation. In summary, the following research hypothesis is proposed:

H2: Shared leadership behavior has a significant positive impact on employee participation.
The definition of shared leadership behavior shows that employee participation is the basic premise to improve project performance. Knowledge sharing and responsibility sharing are important contents of employee participation. Therefore, when participating in providing employees with opportunities for self-management work, employees are more willing to undertake the task without the strict control and supervision of superior leaders. The employees will actively share knowledge, skills, experience with colleagues, and the difficulties, conflicts, and responsibility for the entire work, so that the performance of the project team has been effectively improved. Based on this, the hypothesis is proposed:

H3: Employee participation has a significant positive impact on project performance.

The theory of social information processing believed that individuals can guide their actions through understanding of the received information. In this process, there was sufficient information flow between the action and the specific target, and finally the results of the targeted processing of this target will be stored, and service for future targets and actions. When employees are in an atmosphere of shared leadership behavior, the support and inclusiveness of supervisors and colleagues increases the sense of belonging of employees in the organization. This sense of belonging guides them to fully integrate into the organization and participate in the development and implementation of management decisions based on the authorization of superiors, so that when the organization needs expertise and skills in a certain field to achieve the work objectives, employees with knowledge in this area will assume leadership obligations and responsibilities to guide the team to complete the tasks. It is inferred that shared leadership behavior will increase employee participation and thus improve project performance. Based on this, the following research hypothesis is proposed:

H4: Employee participation mediates the shared leadership behavior and project performance.

Based on the above hypotheses, the theoretical model is presented in Figure 1.

3. Research design

3.1. Scale design and data collection

In order to verify the research hypotheses of this paper, 12 construction companies were selected in 6 cities, such as Beijing, Guangzhou and Shenzhen. The leaders-members were used to conduct questionnaire surveys on the staff and leaders of the project department. The questionnaires were distributed in sets. Among them, the staffs of the same department answer the shared leadership behavior and employees participation, and the leaders of the same department answer the project performance. In the end, 41 valid questionnaires were obtained, including 49 leadership questionnaires and 326 employee questionnaires. The average size of the team is 9.15, with males accounting for 66.1% and organization average serving time of 3.17 years.

In order to ensure the reliability and validity of the research, a mature scale developed by domestic and foreign scholars was adopted. The shared leadership behavior was based on the scale by Muethel, Gehrlein and Hoegl (2012) [4]. Employees participation in the measurement questionnaire used in the study by domestic scholar Zhang Zhen et al. (2002), project performance used a scale revised and used by Chinese scholar Li Ning et al. (2007).

3.2. Confirmatory factor analysis

The scales used in this study are validated maturity scales with good content validity. Therefore, based on the confirmatory factor analysis to test the structural validity of the scales, the results show that the
4. Data analysis and results

In this study, project performance belongs to the team level, and shared leadership behavior and employee participation belong to the individual level. It can be seen that this study investigates the relationship between cross-level variables. Therefore, SPSS20.0, AMOS21.0, and HLM7.0 are used for multi-level inspection and analysis of data.

4.1. Common method deviation test

According to the recommendations of Zhou Hao and Long Lirong, in order to investigate the common method deviation of the data used by the research institute, the harman single factor test was used to test the nested data, and finally the five unrotated factors were extracted using the principal component analysis method, explain 71.31% of the total variation. The first principal component explained 32.43% of the total variation, less than 40%, so the common method deviation problem is not serious.

4.2. Polymerization test

The rationality of project performance data aggregation is tested by using intra-group consistency coefficient Rwg, intra-group correlation coefficient ICC (1) and ICC (2). The results show that project performance (Rwg=0.875, ICC (1) =0.146, ICC (2) =0.920), therefore, the project performance meets the requirements of data aggregation.

4.3. Descriptive statistics

The mean, standard deviation, and correlation coefficient between all variables used in this paper are shown in Table 1. The results showed a significant positive correlation between shared leadership behavior and employee participation (r = 0.434, p < 0.01).

Table 1. Mean, standard deviation and correlation coefficient of variables

| Variable                        | Mean | Standard Deviation | 1     | 2     | 3     | 4     | 5     | 6     |
|---------------------------------|------|--------------------|-------|-------|-------|-------|-------|-------|
| Individual level: N =326        |      |                    |       |       |       |       |       |       |
| 1.Gender                        | 1.360| 0.479              |       | 1     |       |       |       |       |
| 2.Date of birth                 | 4.060| 1.175              | 0.120*| 1     |       |       |       |       |
| 3.Education level               | 2.520| 0.847              | 0.117*| 0.178**| 1     |       |       |       |
| 4.Organization serving time     | 2.300| 1.166              | -0.140*| -0.048| 1     |       |       |       |
| 5.Shared leadership behavior    | 3.427| 0.825              | 0.034 | -0.010| 0.041 | 0.030 | 1     |       |
| 6.Employee participation        | 3.355| 0.736              | 0.094 | 0.027 | 0.211**| 0.134*| 0.434*| 1     |
| Group level: N =49              |      |                    |       |       |       |       |       |       |
| 1.Team size                     | 9.146| 3.759              |       | 1     |       |       |       |       |
| 2.Project performance           | 2.884| 0.679              | -0.164| 1     |       |       |       |       |

Note: * indicates a significant correlation at the 0.05 level (both sides), ** indicates a significant correlation at the 0.01 level (both sides), and *** indicates a significant correlation at the 0.001 level (both sides), the same below.
4.4. Hypothesis testing
According to Table 2, Zero Model 2, the intergroup variance of project performance is $\tau_{00} = 0.237$, $\sigma^2 = 0.571$, can carry out multi-layer model analysis.

Using the intercept prediction model, shared leadership behavior has a significant positive impact on project performance after controlling sex, year of birth, education level, organizational service time, and team size (Table 2, Model 5, $\gamma_{02} = 0.618$, $p < 0.001$). And the group difference of project performance is 43.9%, which can be explained by shared leadership behavior. The hypothesis 1 of this paper is verified.

According to Table 2, Zero Model 1, the intergroup variance of employee participation is $\tau_{00} = 0.219$, $\sigma^2 = 0.477$, so 31.5% of the variances in employee participation come from differences between groups (ICC (1) = 0.315), which can be further analysis.

Shared leadership behavior has a significant positive impact on employee participation after controlling sex, year of birth, education level, organizational service time, and team size (Table 2, Model 3, $\gamma_{02} = 0.649$, $p < 0.001$), compared with the zero model, it can be seen that 30.6% of the differences of employee participation can explained by shared leadership behavior ($R^2_{Level2} = 0.306$).

Employee participation has a significant positive impact on project performance (Table 2, Model 6, $\gamma_{02} = 0.310$, $p < 0.001$), and 48.9% of intra-group differences in project performance are explained by employee participation ($R^2_{Level1} = 0.489$). After shared leadership behavior and employee participation are added to project performance, shared leadership behavior is positive for project performance, but the effect is smaller (Table 2, Model 7, $\gamma_{02} = 0.606$, $p < 0.001$). At this time, compared with the main effect model, $R^2_{Level1} = 0.175$, $R^2_{Level2} = 0.436$, indicating that when joining employee participation, the 17.5% differences of project performance can be explained by employee participation, and 43.6% of the differences between groups can be explained by shared leadership behavior. Thus, the hypothesis 2, 3, 4 of this paper are verified.

Table 2. Hierarchical regression analysis

| Variable                      | Employee participation | Project performance |
|-------------------------------|------------------------|---------------------|
|                               | Zero model 1           | model 2             | model 3             | Zero model 2           | model 4 model 5 model 6 model 7 |
| Level1                        |                        |                     |                     |                        |                     |
| Intercept term $\gamma_{00}$  | 3.469***               | 3.966***            | 3.445***            | 3.475***               | 1.099* 3.394*** 1.023* |
| Sex $\gamma_{10}$             | -0.057                 | -0.056              | 0.019               | 0.019                  | 0.038 0.038         |
| Year of birth $\gamma_{20}$   | -0.020                 | -0.024              | 0.047               | 0.042                  | 0.053 0.049         |
| Education level $\gamma_{30}$ | -0.024                 | -0.035              | 0.038               | 0.036                  | 0.043 0.042         |
| Organization service time $\gamma_{40}$ | -0.001     | -0.003              | 0.056               | 0.056                  | 0.057 0.057         |
| Employee participation $\gamma_{50}$ |                      |                     |                     |                        | 0.310*** 0.310**    |
| Level2                        |                        |                     |                     |                        |                     |
| Team size $\gamma_{01}$       | -0.029                 | -0.010              | -0.051              | -0.033                 | -0.050 -0.038       |
| Shared leadership behavior $\gamma_{02}$ | 0.649***               | 0.618***            | 0.606***            |                        |                     |
| $R^2_{Level1}$                |                        |                     |                     |                        | 0.489 0.175        |
| $R^2_{Level2}$                | 0.306                  | 0.439               | 0.436               |                        |                     |
| $X^2$                         | 328.683***             | 687.473***          | 260.373***          | 345.654** 495.146** 265.259** 233.297** 182.242** |

5. Conclusions and discussion
This paper constructs a model of the impact of shared leadership behavior on the performance of large-scale engineering construction projects. The analysis shows that: (1) Shared leadership behavior has a significant positive impact on project performance; (2) Employee participation plays a part in mediating role in the relationship between shared leadership behavior and project performance. The conclusions of this study have the following implications for the management practice of large-scale engineering construction projects: (1) Project team managers should recognize the important role of
shared leadership in project performance improvement; (2) Project managers should fully recognize the intermediary role of employee participation, and improve the enthusiasm and enthusiasm of employees by establishing a platform.

References
[1] Pearce, C.L., Conger, J.A. (2003) Shared leadership: Reframing the hows and whys of leadership. Leadership Quarterly, 17: 105-108.
[2] Pavlou, P.A. (2002) Institution-based trust in interorganizational exchange relationships: The role of online b2b marketplaces on trust formation. Journal of Strategic Information Systems, 11: 215-243.
[3] Nerstad, C.G.L., Searle, R., Matej Černe, Dysvik, A., Scherer, R. (2017) Perceived mastery climate, felt trust, and knowledge sharing. Journal of Organizational Behavior, 38: 429-447.
[4] Muethel, M., Gehrlein, S., Hoegl, M. (2012) Socio-demographic factors and shared leadership behaviors in dispersed teams: Implications for human resource management. Human Resource Management, 51: 525-548.