Research on the Motivation of Construction Enterprises Accepting BIM

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Abstract. BIM applications are often accompanied by a series of organizational changes. The resistance of employees to changes is an important obstacle that affects BIM applications. Top manager’s function is to lead the change and promote the active participation of the employees in change, which can promote the successful implementation of BIM. And engineering construction information level will be improved accordingly. This article uses questionnaire survey method and statistical analysis method to explore the influence mechanism of construction enterprise's senior management on employees' active acceptance of BIM behavior, and provides useful experience for BIM implementation in construction engineering enterprises.

1. Introduction
BIM application is not only a technological change, but also requires changes in business processes and organizational structures. Studies have shown that employee resistance to change is an important obstacle to BIM application in construction companies (Oesterreich & Teuteberg, 2019) [13], and top manager can lead and support changes, have employees' support for change (Lv, Chen, & Wang, 2012) [11], and ultimately promote the success of the BIM implementation. MA (Ma, Jia, Ding, Shang, & Jiang, 2019) [12] found that insufficient top management support is the most critical factor for BIM adoption. According to Son (Son, Lee, & Kim, 2015) [14] and Lee (J.-C. Lee, Shiue, & Chen, 2016) [8], top management support can improve the individual's perceived usefulness of BIM, which is an important prerequisite for individual technology use behavior. However, there are few studies on the impact of executive support on BIM applications from the perspective of organizational change. Thus, the article constructs a model of top management support influencing employees' change-supportive behavior in the process of BIM application, and uses change-supportive behavior to define employees' active behavior that participate in change actively and work hard for the enterprise’s BIM in-depth implementation, and uses change-supportive behavior to define behaviors that employees continue to support and actively participate in change. FURST (Furst & Cable, 2008) [5] pointed out that it is not management strategy that affected employees' behavior, but employees’ interpretation and evaluation to the management strategy affected their behavior. Research on organizational change often defines employees’ evaluation and interpretation of change situation as organizational change cognition, which includes cognition of the success of change (efficacy) and the significance of change (valence).
2. Hypothesis Development

2.1. The impact of executive support on employees’ behavior of BIM application

In the process of organizational change, top managers can create an atmosphere conducive to change through providing resource, improving support systems, establishing organizational culture and other support activities. Studies have shown that this atmosphere can stimulate employees' change-supportive behavior (Wang, Zhu, & Zhu, 2018) [17]. In addition, social exchange theory found that when members of an organization feel the full support from leaders, they will be grateful and feel obligation to repay support (Eisenberger, Huntington, Hutchison, & Sowa, 1986) [4]. After the employees of construction companies feel the support and encouragement from their senior leader, they will actively participate in change because of gratitude, and take the initiative to apply BIM in their work. These discussions lead to the hypotheses.

H1: Top management support positively affects employees’ change-supportive behaviors.

2.2. The multiple mediating effects of change cognition

2.2.1. Efficacy’s mediating role

Studies found that employees can obtain the mission information about change from leaders’ interpreting of the vision of change, so as to determine the direction of their efforts, which helping to improve their recognition of self-worth, thereby enhance their efficacy (Liu & Yang, 2019) [10]. And when employees perceive the full support from their leaders, they believe that the organization can provide sufficient resources for the implementation of change, which can increase their confidence to the success of change (Guo, Xie, & Guo, 2016) [6]. The social cognition theory emphasizes that efficacy has an important influence on individual positive behaviors (Bandura, 1986) [3]. And the empirical research of Lee (Son et al., 2015) [14] confirmed that high efficacy tend can promote individuals to use BIM more actively.

H2: The two kinds of organizational change cognitions of employees play a Multiple mediating role in the relationship between top management support and employees’ change-supportive behavior.

3. Materials and Methods

A way of questionnaire survey was used to collect data. The subjects of the questionnaire are the owners, construction, design consulting and other construction units which are familiar with BIM applications, are prepare for or are applying BIM. The study distributed 371 questionnaires to project managers, department managers, heads or technicians of BIM centers, and grassroots staff of these units through emails, the Internet, and other media from January to March 2021. Among the valid data, 63.4% are males, 83.7% have a bachelor degree or above; 43.2% of the survey respondents are ordinary employees. The survey subjects from construction units are most, accounting for 34.4%

Top management support, valence, and efficacy all use the scale developed by Armenakis (Armenakis, Bernerth, Pitts, & Walker, 2016), each containing five items, and the composite reliability
is 0.896, 0.838, and 0.868, respectively. Change-supportive behavior adopts a scale developed by Kim (Kim, 2011) [7] and Song (Song & Wang, 2014) [15], which contains four items with a reliability of 0.818. The controlled variables are gender, educational background and working years. Use the Likert 5-level scale to score the questionnaire items (1 means strongly disagree, 5 means strongly agree).

4. Data Analyses and Results

4.1. Measurement Validation

The questionnaire was designed based on existing maturity scales. Harman single factor test was done, shows that variance contribution rate of the maximum factor is 45.74%, which does not exceed the 50% criterion, indicating common method biases is not serious. Using software AMOS 26.0 to perform confirmatory factor analysis. CFI, IFI, and TLI are all more than 0.9, RMSEA is less than 0.06, indicating the model fits well. The factor loading and AVE value of all variables are more than 0.5, and the CR value and Cronbach’s α coefficient are both more than 0.8, indicating that the stability and consistency of the variable measurement results are well. In addition, the square root of AVE of each variable is more than its correlation coefficient with other variables, indicating that it has better discriminative validity.

4.2. Hypothesis Testing

To test the hypothesis of parallel mediation of organizational change cognition, under the influence of controlling gender, education and working years, the macro program process3.5 compiled by scholar Hayes (2013) is used to test the multiple Mediation Model. The regression analysis results show (see Table 2): Firstly, top management support has a significant positive impact on employees' change-supportive behavior. Secondly, top management support has a significant positive impact on employee efficacy and valence cognition. Thirdly, executive support and employees’ cognition of organizational change are introduced into together the regression equation. Top management support, employee efficacy and valence have a positive impact on their change-supportive behavior.

The multiple mediation model test results show: Firstly, the direct effect of top management support on change-supportive behavior is 0.301, and the Bootstrap 95% confidence interval is [0.966, 1.438], excluding 0. Hypothesis H1 was verified. Secondly, indirect effect of top management support on change-supportive behavior through employee efficacy cognition is 0.16, Bootstrap 95% confidence interval is [0.167, 0.423], excluding 0, so employee efficacy cognition plays a partial mediating role, and the mediation effect accounts for 25.89% of the total effect. Thirdly, the indirect effect of top management support through employee valence cognition on change-supportive behavior is 0.142, and the Bootstrap 95% confidence interval is [0.037, 0.234], excluding 0, so employees' cognition of valence plays a partial mediating role, and the mediation effect accounts for 20.71% of the total effect. Hypothesis H2 was verified.

| Latent constructs | Item  | factor loading | AVE | CR  | Cronbach’s α | Latent constructs | Item   | Factor loading | AVE | CR  | Cronbach’s α |
|------------------|-------|----------------|-----|-----|--------------|------------------|--------|----------------|-----|-----|--------------|
| TMS1             | 0.842 | 0.634          | 0.896| 0.896| E1           | 0.708           |
| TMS2             | 0.84  |                |     |     | E2           | 0.746           |
| TMS3             | 0.822 |                |     |     | E3           | 0.787           | 0.583 | 0.868 | 0.876 |
| TMS4             | 0.763 |                |     |     | E4           | 0.761           |
| TMS5             | 0.707 |                |     |     | E5           | 0.765           |
| V1               | 0.743 | 0.568          | 0.838| 0.868| CSB1         | 0.500           | 0.548 | 0.818 | 0.824 |
| V2               | 0.661 |                |     |     | CSB2         | 0.814           |
| V3               | 0.670 |                |     |     | CSB3         | 0.824           |
| V4               | 0.679 |                |     |     | CSB4         | 0.776           |
| V5               | 0.789 |                |     |     |              |                  |        |        |        |
5. Conclusions

According to the research results, top management support is positively correlated with employees’ change-supportive behavior; employees’ cognition of efficacy and valence play a partial multiple mediating effect in the relationship between top management support and their change-supportive behavior. Based on the transformative nature of BIM applications, this article believes that top managers should not only provide resource support, but also be responsible for change management such as management process adjustments and pay high attention to management employee responses to change, especially psychological. Thus, construction enterprises’ top managers should formulate a reform plan based on the resource status of the enterprise and the characteristics of operation and management, and provide multi-faceted support, so that employees can fully feel the high attention from senior leaders attaching, which help them form a positive attitude towards the application of BIM to actively support BIM applications.

The organizational scale of Chinese construction companies is significantly different, which may make the role of senior leaders different. This article is limited by the research conditions and does not consider the impact of this factor on the results. In future research, researchers can further study the impact of top management support on employee BIM application behavior from these perspectives.

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