Factor Analysis of Worker Engagement in Construction Projects in Thailand

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Abstract. Factor analysis of worker engagement in Thai construction projects was undertaken. Exploratory factor analysis (EFA) was conducted on a sample group of 210 construction project workers in the study area of the northeastern central region of Thailand. Results indicated six factors of worker engagement as (1) relationship and dedication, (2) workplace, (3) part of the company, (4) expertise, (5) pride in work, and (6) relationship with supervisors. Strategies for strengthening worker engagement in construction projects are presented in the conclusions.

1. Introduction

In Thailand, rapid population increase along with industrial and social growth have resulted in the construction industry becoming the beating heart of economic development [1]. Demand for construction labor has increased with the establishment of the ASEAN economic community, allowing provinces in the region to experience rapid economic growth with high investment in infrastructure and building construction. Provinces in the northeastern central region of Thailand as Roi Et, Khon Kaen, Maha Sarakham and Kalasin are continuously expanding in population, economy and the society. The construction business is a service industry where contractors emphasize the quality of their work to satisfy project managers and compete for engagement on future projects [2]. The construction industry in Thailand is highly competitive in terms of cost, quality of work and duration of construction. To be successful, a construction project requires the services of skilled labor to positively engage with the organization or company and generate high-quality work to complete the project on time. A contractor is responsible for providing all the materials, labor, equipment, and services necessary for the construction of a project [3]. To sustain business in the industry, contractors need to know and understand the factors relating to maximizing worker engagement and the optimal strategies to be followed. Hence, this study analyzed the factors and measurement items related to worker engagement in the Thai construction industry. Results will allow contractors to retain and engage their workers within the industry. The scope of this study is based on an opinion survey in terms of engagement of construction project workers in the study area of the northeastern central region of Thailand consisting of Roi Et, Khon Kaen, Maha Sarakham and Kalasin Provinces. Strategies for the development and support of worker engagement in construction projects in Thailand are presented.

2. Research background
The Cambridge Dictionary [4] defines a contractor as a person or company that arranges to supply materials or workers for building construction and performs work on a contractual basis. A contractor is responsible for providing all materials, labor, equipment, and services necessary for the construction of a project. A general contractor often hires specialized subcontractors to perform all or parts of the construction work [3]. When using subcontractors, the general contractor is responsible for the quality of all work performed by any and all of the hired workers [3]. Employee engagement had been defined by many reputable research institutions such as Gallup Strategic Consulting [5], Mercer Consulting Group [6], Hay Group [7] and Aon Hewitt [8]. To summarize, employee engagement involves a positive attitude with confidence and faith in the organization through accumulation and continuous development. Employees must feel that they are a part of the organization and want the company mission to succeed. Employee engagement is an expression of behaviors (3S: Say-Stay-Strive) [8]. (1) Employees speak (Say) positive things about the organization, (2) from their existence (Stay) employees desire to continue to be members of the organization, and (3) employees use their best efforts (Strive) to help or support the success of the organization. Employee engagement is not a spontaneous asset but something that must be created through proactive activities. Employee engagement reduces staff turnover and this increases revenue and profit [9]. In the construction industry, employee engagement is termed as worker engagement and the employer is referred to as the contractor. Worker engagement can be measured by many factors including pride in work, part of the organization, desire to see the organization succeed, relations with and acceptance by colleagues and supervisors, and nature of the workplace [5], [6], [7], [8], [9].

3. Research methods

3.1. Identification of the factors

The Delphi technique is a widely used and accepted method for achieving convergence of opinion concerning real-world knowledge solicited from experts within certain topic areas [10]. This technique is designed as a group communication process of experts that aims at conducting detailed examinations and discussions of a specific issue. The process can be continuously iterated until a consensus is determined to have been achieved. This technique was used to confirm the factors and the conceptual research model. The Delphi technique began by identifying the factors, related theories and literature available as textbooks and research articles. All the factors were summarised, listed and then confirmed by the experts using the Delphi technique. A group of five experts in related fields was chosen based on their experience and included two construction project managers with more than 20 years of experience in the Thai construction industry, two experts from construction consultancy companies, and one expert from an academic institution. The listed factors were confirmed by a consensus of opinions of the five experts both directly and individually starting from expert 1, 2 ..., 5 and returning to expert 1 circularly. All experts carefully and individually considered the listed factors without meeting each other for at least two times per expert until the consensus was saturated. Once the listed factors were confirmed and categorized by the experts they were constructed and made ready for analysis. Initial factors and items are listed in Table 1.

3.2. Questionnaire design

Data collection was carried out using a questionnaire survey to determine the principal causal factors leading to Thai construction workers. The questionnaire was subdivided into two factor categories with the items selected as listed in Table 1. The initial section covered demographic data including gender, age, marital status, work experience, education, daily income, project location, project value, and project duration (9 items). The second section covered organizational engagement (12 items), while the third section covered personal engagement (10 items). Demographic data were presented by frequency and percentage, while the other sections asked respondents to answer questions using a 5-point Likert scale from ‘strongly disagree’ to ‘strongly agree’.
Table 1. Initial factors and items

| Factor                        | Item                                                                 |
|-------------------------------|----------------------------------------------------------------------|
| Organizational engagement     | WE1: Pride in the profession                                        |
|                               | WE2: Being accepted by colleagues and helping each other well        |
|                               | WE3: Being entrusted to take responsibility for duties that match knowledge and expertise |
|                               | WE4: Freedom to work and be able to offer opinions about work responsibility |
|                               | WE5: Able to work with supervisors and understand each other well     |
|                               | WE6: Supervisors always advise and give you support                  |
|                               | WE7: Able to work well with colleagues                              |
|                               | WE8: You and your colleagues have good relations with each other, there is regular cooperation and assistance |
|                               | WE9: The company/contractor has work for you to do consistently and continuously |
|                               | WE10: Having the opportunity to be promoted                          |
|                               | WE11: The workplace is clean and tidy                                |
|                               | WE12: Modern work tools                                               |
|                               | WE13: Ready to dedicate and sacrifice to the company/contractor       |
|                               | WE14: Ready to cooperate with the company/contractor without any doubts |
|                               | WE15: Proud to be part of this company/contractor                      |
|                               | WE16: The problem of the company/contractor is like your problem      |
|                               | WE17: This company/contractor is like your home                       |
|                               | WE18: Higher wages cannot make you decide to change jobs              |
|                               | WE19: It is wrong to decide to leave this company/contractor while the company/contractor is experiencing problems |
|                               | WE20: You and your colleagues have a good relationship with each other, have regular cooperation and help each other |
|                               | WE21: Proud to tell others that you work here                         |
|                               | WE22: When you work, you try your best to do more than you can        |

3.3. Validity and reliability tests

Validity and reliability tests were employed to ensure that the questionnaire items were suitable for their purpose. Validity testing involved interviews with five experts to discuss the factors identified in the previous section. The expert reviewers confirmed that the items selected were appropriate for the measurement of the study, while also making further suggestions for items that might improve the validity in this particular context. Validity testing is an important step to ensure that the items are valid while avoiding confusion and ambiguity. Cronbach’s alpha was used to analyze the reliability of the items and assess the responses in a pilot study involving 30 participants who were Thai construction workers and matched the study population. Twenty-two questionnaire items, measured by a Likert scale (12+10 items of organizational and personal engagement categories, respectively) were analyzed using statistical software. Overall, Cronbach’s alpha coefficient for the 22 items was 0.731, and it was observed that the result would be 0.736 without the presence of item WE9. Accordingly, WE9 was removed from the study. For the organizational and personal engagement categories, the Cronbach’s alpha coefficients were 0.722 and 0.727, respectively. Since none of the coefficients fell below 0.7, the questionnaire was deemed as reliable [11].

3.4. Data Collection

After completing the questionnaire design, the next stage involved selection of the sample group of Thai construction workers using a convenience non-probability sampling approach. The respondents were predominantly based in the study area of the northeastern central region of Thailand consisting of Roi Et, Khon Kaen, Maha Sarakham and Kalasin Provinces. The survey was carried out over a three-month period. Interviews were conducted face-to-face to ensure that all the respondents fully understood the
purposes of the research. A total of 300 questionnaires were distributed, and 210 were accepted as valid and processed.

| Table 2. Descriptive results |
|-------------------------------|
| Description                  | Frequency | Percentage |
| Gender                        |           |            |
| - Male                        | 109       | 51.9       |
| - Female                      | 101       | 48.1       |
| Age (years)                   |           |            |
| - Less than 30                | 23        | 11.0       |
| - 40 - 31                     | 58        | 27.6       |
| - 50 - 41                     | 74        | 35.2       |
| - More than 51                | 55        | 26.2       |
| Marital status                |           |            |
| - Single                      | 73        | 34.8       |
| - Married                     | 114       | 54.3       |
| - Widow/divorce               | 23        | 11.0       |
| Work experience (years)       |           |            |
| - Less than 1                 | 75        | 7.35       |
| - 1 - 5                       | 78        | 1.37       |
| - 6 - 10                      | 30        | 3.14       |
| - 11 - 15                     | 11        | 2.5        |
| - 16 - 20                     | 10        | 8.4        |
| - More than 21                | 6         | 9.2        |
| Education                     |           |            |
| - Primary school              | 129       | 61.4       |
| - Secondary school            | 73        | 34.8       |
| - High school                 | 2         | 1.0        |
| - Vocational certificate      | 6         | 2.9        |
| Daily income (Baht)           |           |            |
| - Less than 300               | 41        | 19.5       |
| - 300 - 350                   | 132       | 62.9       |
| - 351 - 400                   | 27        | 12.9       |
| - 401 - 500                   | 10        | 4.8        |
| - More than 500               | 0         | 0.0        |
| Project location              |           |            |
| - Roi Et                      | 50        | 23.8       |
| - Khon Kaen                   | 50        | 23.8       |
| - Maha Sarakham               | 60        | 28.6       |
| - Kalasin                     | 50        | 23.8       |
| Project value (Baht)          |           |            |
| - Less than 10 M              | 60        | 28.6       |
| - 10 - 100 M                  | 30        | 14.3       |
| - More than 100 M             | 120       | 57.1       |
| Project Duration (years)      |           |            |
| - Less than 1                 | 91        | 43.3       |
| - 1 - 2                       | 119       | 56.7       |
| - More than 2                 | 0         | 0.0        |

4. Results

4.1. Descriptive results
The 210 questionnaires completed by construction project workers in the study area were analyzed. Descriptive results are shown in Table 2.

4.2. Exploratory factor analysis
Exploratory factor analysis (EFA) is a statistical method for uncovering the underlying structure of a relatively large set of variables [12]. EFA is used to reduce the number of variables to a smaller set of underlying summary variables called factors. In this research, EFA was implemented to determine the underlying structure of factors related to the worker engagement and implemented with varimax rotation using computer statistical software. The output showed the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy at .647 (KMO>0.6) [13]. Bartlett’s test of sphericity recorded a significant value of .000 (less than .05) with an approximate chi-square of 760.898, df = 171. Factor loading values less than 0.4 were eliminated. The extraction of EFA was based on initial eigenvalues greater than 1 [14] (Table 3), and the output analysis indicated six components as the number of factors in this EFA. The percentage of explained variance was 67.06%.

| Item | Factor | Cronbach’s alpha |
|------|--------|------------------|
| WE20 | 789.0  | -100.0 139.0 047.0 122.0 -120.0 | 0.720 |
| WE22 | 721.0  | 031.0 018.0 123.0 -110.0 177.0 |
| WE19 | 665.0  | 361.0 109.0 -118.0 -028.0 035.0 |
| WE15 | 592.0  | 048.0 100.0 -025.0 160.0 323.0 |
| WE13 | 528.0  | 287.0 -174.0 122.0 114.0 -229.0 |
| WE11 | 091.0  | 792.0 074.0 132.0 099.0 003.0 |
| WE12 | 089.0  | 690.0 104.0 080.0 010.0 237.0 |
| WE16 | -072.0 | 101.0 753.0 041.0 042.0 107.0 |
| WE18 | 029.0  | 276.0 726.0 -057.0 086.0 -334.0 |
| WE21 | 371.0  | -229.0 577.0 097.0 -090.0 187.0 |
| WE14 | 342.0  | -003.0 415.0 -016.0 077.0 069.0 |
| WE3  | 041.0  | 042.0 -006.0 788.0 -016.0 -159.0 |
| WE10 | 063.0  | 422.0 028.0 628.0 -150.0 057.0 |
| WE4  | 016.0  | -023.0 119.0 597.0 341.0 361.0 |
| WE1  | 118.0  | 061.0 072.0 -122.0 738.0 036.0 |
| WE7  | -010.0 | -059.0 064.0 052.0 735.0 055.0 |
| WE2  | 066.0  | 304.0 -145.0 368.0 513.0 -076.0 |
| WE5  | 097.0  | 069.0 110.0 -161.0 194.0 699.0 |
| WE6  | 060.0  | 283.0 -107.0 222.0 -208.0 538.0 |

The output from EFA indicated 19 remaining items after WE8 and WE17 were removed from the analysis. The items were categorized into six groups as factor 1 (WE20, WE22, WE19, WE15 and WE13), factor 2 (WE11 and WE12), factor 3 (WE16, WE18, WE21 and WE14), factor 4 (WE3, WE10 and WE4), factor 5 (WE1, WE7 and WE2), and factor 6 (WE5 and WE6). For these factors, the average values of Cronbach’s alpha were 0.720, 0.706, 0.764, 0.744, 0.715 and 0.726, respectively. Nunnally [11] considered that a Cronbach’s alpha value greater than 0.7 could be deemed acceptable. Therefore, these factors were acceptable with overall Cronbach’s alpha value for the six factors at 0.722.

5. Conclusions
Exploratory factor analysis was conducted in the context of engagement among Thai construction workers. A total of 210 sample questionnaires were completed by respondents who worked on construction projects in the study area of the northeastern central region of Thailand consisting of Roi Et, Khon Kaen, Maha Sarakham and Kalasin Provinces. Data were analyzed to confirm the relevant
factors. Demographic profiles of the participants are shown in Table 2. EFA was used to identify and confirm the relevant factors that influenced the engagement of Thai construction workers. Six factors were identified by EFA as 5 items of factor 1, 2 items of factor 2, 4 items of factor 3, 3 items of factor 4, 3 items of factor 5 and 2 items of factor 6. These were used to make recommendations concerning worker engagement in construction projects in Thailand. The two highest (1st and 2nd items) from the factor loading values (shown in Table 3) were chosen to develop the guidelines. Each factor was named by implication of their measurement items. The six factors of worker engagement in construction projects in Thailand are presented in Table 4.

| Worker Engagement | Relationship and dedication | Workplace | Part of the company | Expertise | Pride in work | Relationship with supervisors |
|-------------------|-----------------------------|-----------|---------------------|----------|---------------|-------------------------------|
|                   | • You and your colleagues have good relations with each other, there is regular cooperation and assistance | • The workplace is clean and tidy | • The problem of the company/contractor is like your problem | • Being entrusted to take responsibility for duties that match knowledge and expertise | • Pride in the profession | • Able to work with supervisors and understand each other well |
|                   | • Ready to dedicate and sacrifice to the company/contractor | • Modern work tools | • Higher wages cannot make you decide to change jobs | • Having the opportunity to be promoted | • Able to work well with colleagues | • Supervisors always advise and give you support |

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