JOB PERFORMANCE FACTORS OF CIVIL ENGINEERS IN VIETNAM

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Abstract

Human resources are the most precious asset of society and any civil engineering and construction firms. Experience shows that successful construction companies always focus on recruitment and human resources training. Thus, ranking main factors in measuring the performance of construction engineers is one of the most critical determinations in the success of civil engineering and construction projects. However, traditional methods of evaluating key factors performance of construction engineers are usually based on subjective opinions, resulting in irrational and inappropriate outcomes. Therefore, this paper presents a fuzzy model for ranking critical factors in measuring the performance of construction engineers. The results show that there are five essential factors in measuring the performance of construction engineers in Vietnam: (1) Ability to perform work in accordance with project procedures and accept overtime work; (2) Ability to improve knowledge and skills; and (3) Ability to meet and make a decision with the consensus of a project team; and (4) Ability to communicate exchange and persuade and build good relationships with project members; (5) Planning and scheduling ability.

Keywords: Construction projects; civil engineers; fuzzy logic; Job performance

I. Introduction

Construction industry is characterized by a great work pressure coming from high requirements on progress, cost, and quality\([I]\). A construction engineer is a construction production organizer who takes responsibility for organizing the worker teams, mobilizing and utilizing machines and equipment, operating technologies to
convert construction materials into construction products for the owner [VI, VIII]. A construction engineer assumes a wide range of tasks as specific as follows:
(i) Urging the progress of those construction works under one’s management;
(ii) Meeting the employer, supervision consultants, and project stakeholders;
(iii) Reporting on the monthly progress or weekly progress;
(iv) Controlling subcontractors (if any) observing the schedule;
(v) Periodically reporting to the superiors on the construction progress;
(vi) Controlling in-charge technical staff at ordinary or extra-ordinary internal meetings;
(vii) Meeting direct construction teams and technical staff to immediately solve problems as arising on site or to disseminate information;
(viii) Checking and signing the volume of work performed with workers and employer;
(ix) Discussing any special construction methods or terms of payment with field technical staff and paid staff;
(x) Organizing the living for all members of staff on site; and
(xi) Communicating with the local authorities, local security and bodies of civil affairs in the course of construction.

Among all these activities, a question to be raised is how construction engineers know which are critical factors of their job performance factors? In an attempt to answer this, this paper proposes a new fuzzy quantitative model for ranking critical factors in measuring the performance of construction engineers.

III. Research Methodology

AHP, a modern structural analysis technique based on psychology and mathematics and developed by Saaty in 1980, is used to identify the criteria weights [V, VII]. In this study, a fuzzy logic approach based on AHP method is employed to rank factors in measuring the performance of construction engineers in Vietnam. The following section presents the mathematical process of this model [IV, IX]:

Step 1. In this study, a semi-qualitative method with experts’ interviews using fuzzy pairwise approach was conducted to evaluate and extend the literature review on the performance of construction engineers in Vietnam.

Step 2. The synthetic pairwise comparison matrix developed by Buckley [II, III]:

\[ \bar{a}_{ij} = (\bar{a}_{ij} \otimes \bar{a}_{ij} \otimes \bar{a}_{ij} \otimes ... \otimes \bar{a}_{ij}) \]  

(1)
Step 3. To calculate the fuzzy weights of performance of civil engineers indicators, we need to calculate:

$$\tilde{r}_i = (\tilde{a}_{i1} \otimes \tilde{a}_{i2} \otimes \tilde{a}_{i3} \otimes \ldots \otimes \tilde{a}_{in})^{1/n}$$  \hspace{1cm} (2)

Moreover, for the weight of each criterion:

$$\tilde{w}_i = \tilde{r}_i \otimes (\tilde{r}_1 \oplus \tilde{r}_2 \oplus \tilde{r}_3 \oplus \ldots \oplus \tilde{r}_n)^{-1}$$  \hspace{1cm} (3)

Step 4. The fuzzy weights are defuzzified by any defuzzification method (i.e., CoA method)

$$BNP_{w_i} = [(U_{w_i} - L_{w_i}) + (M_{w_i} - L_{w_i})]/3 + L_{w_i}$$  \hspace{1cm} (4)

where $BNP_{w_i}$ is the Best Nonfuzzy Performance value.

III. Results and Discussion

Among those factors, the ability to perform work following project procedures and accept overtime work were the most critical elements in the career path of each employee. The construction engineer has to work with nearly all project stakeholders, namely employers, supervision consultants, directors of the contractors, subcontractors, and state authorities. This position requires continual communications and resolution of problems, especially when the contractors are under progress urge. Therefore the construction engineer should be available to work overtime and make quick and definitive decisions under high pressure.

Construction project sites have their own conditions such as different designs, construction methods, characteristics of the involved parties, etc. Such differences form the requirements of a dynamic and changing job. Therefore, ability to improve knowledge and skills are essential for every civil engineer in construction environment. Next, communication skills - effective communication means clear information is communicated at the right place, time, and to the proper recipient. The construction engineer must provide necessary, brief and understandable information to help recipients understand information accurately. Effective communication in the project helps construction engineers communicate information to employees, help them get information and decide on what they need to do, how to avoid mistakes and how to handle them while maintaining effective work. In addition, as there are more and more stakeholders in the project, it is important to communicate and update information at each point of the project and to minimize conflicts in the interaction among concerned stakeholders. Conversely, if the construction engineer has poor communication skills, information may be misleading and unclear, resulting in the project being delayed, and in the extreme cases, re-work. Construction engineers that communicate inconsistent information can lead to delay for confirmation of
information, wasting personnel resources, and wasting time that seriously affects project performance.

Moreover, planning and scheduling ability is ranked as the fifth important factor. Planning is the most crucial task in the management and operation of a project. A plan is built in detail, in accordance with the actual implementation, thereby helps construction engineer to control the implementation of the project. Estimates of resources, funding, and risks are estimated based on the implementation plan. In addition, project participants can understand the status of the project, and be aware of their roles and responsibilities in each project phase as reflected in the plan. The project plan creates a rhythmic collaboration for teams to reduce downtimes and to improve overall performance. Construction engineer with good planning capabilities are able to plan out the work that needs to be done clearly with a minimum overlapping of resources, saving project execution time, avoiding rework, and contributing to improving work performance. In contrast, improper planning can lead to defects that have to be repaired, products failing to meet desired quality, and wasteful costs, time, and human resources, and may even impair labor safety.

V. Conclusion

The fuzzy logic approach method is a powerful method for measuring the performance of construction engineers. In this research, data were collected through group interviews with experienced experts based on the fuzzy pairwise method. The results show that there are five essential factors in measuring the performance of construction engineers in Vietnam: (1) Ability to perform work in accordance with project procedures and accept overtime work; (2) Ability to improve knowledge and skills; and (3) Ability to meet and make a decision with the consensus of a project team; and (4) Ability to communicate exchange and persuade and build good relationships with project members; (5) Planning and scheduling ability. These results are helpful to civil engineering and construction companies that want to evaluate the performance of their civil engineers and as indicators in recruitment of the most qualified candidates.

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