

Analysis of contractor company requirements on the competence of construction project management for graduates of civil engineering degree

Soepriyono¹, S Azizah² and M Huda^{1*}

¹Engineering Faculty, Civil Engineering Department, University of Wijaya Kusuma Surabaya, Indonesia

²Language and Science Department, University of Wijaya Kusuma Surabaya, Indonesia

miftahul@uwks.ac.id

Abstract. This study aims at analyzing the level of needs of contractor companies to the competence of construction project management for graduates of civil engineering scholars. The research variables consisted of a group management process and a construction project management knowledge area consisting of 53 indicators adopted from the Project Management Body of Knowledge 5th standard. The research data were collected from 130 contractor companies in East Java-Indonesia using Likert Scale (1-5). Respondents were contractor directors and contractor managers. The sampling technique used combination of purposive sampling and simple random sampling method. Methods of data analysis used Customer Satisfaction Index (CSI) and Importance Performance Analysis (IPA). The result of this research concluded that the requirement index of contractor to the competence of construction project management graduate of civil engineering graduates was obtained 61.92% or in the category of graduates was quite competent in the field of construction project management. There were 23.81% of contractors answered very competent, 40.48% was competent, 21.43% was competent enough, 9.52% was incompetent and 4.76% was very incompetent. There were 14 main priority factors that needed to be improved by the civil engineering bachelor's education provider to improve the competence of graduates in the construction project management.

1. Introduction

At present the number of contractor companies in Indonesia reaches around 145 companies consisting of small, medium and large qualification companies. In fact, contractor companies have contributed about 7-8% of GDP per year, absorbing the national budget (APBN) of IDR 750 trillion per year, involving a workforce of about 15-20 million people and a multiple effect in the economy. The existence of Indonesian contractor companies becomes quite strategic in the absorption of national workforce, especially to realize the Master plan of Acceleration and Expansion of Indonesian Economic Development (MP3EI) [1]. Therefore, contractor companies in Indonesia must have high performance and competitiveness in order to operate sustainably [2] [3] [4].

Some important factors that need to be considered by contractor companies to have high performance and competitiveness include: companies must have competent human resources in



construction project management [5] [6]. The internationally recognized competence standards for construction project management are the standards of competence of a global construction project management such as the Project Management Body of Knowledge^{5th} (PMBOK) [7], International Standards Organization (ISO) [8] or PRINCE 2. The construction project management standards are now widely used by some countries than some other management project standards.

The PMBOK^{5th} Standard [7] is essentially a standard of construction project management competency consisting of two main managements, namely; 1) Project management process is a document of systematic stages of project management consisting of 5 (five) stages: project initiating, project planning, project executing stage, project monitoring & controlling stage, and closing project, 2) project management knowledge area, is a document that describes the knowledge area that is within the scope of the project management profession, consists of 10 (ten) knowledge areas of management, namely: integration, scope, time, cost, quality, human resource, communication, risk, procurement and stakeholder [7][9].

The need of contractor companies to the competence of construction project management in Indonesia is very important and necessary [10] [11] [12]. There is an indication that the competence of project management taught in private or public universities is still inadequate and not yet compatible with the competencies required in the workplace [13] [14] [15]. This study aims at analyzing in depth about the needs of contractor companies to competence in construction project management graduates of civil engineering in Indonesia. The expected output is to provide useful information for higher education of civil engineering major related to construction project management competencies required in the world of work.

2. Material and method

The research data were collected by a survey based on user-approach using a quantitative descriptive approach [16] [17]. Primary data collection is done by distributing Likert scale questionnaires (1-5) to contractor companies operating and having business certification office in East Java- Province, Indonesia. The sampling technique used a combination of purposive and proportional sampling methods. The study respondents were the owners or managers of small, medium and large qualified contractor companies of 130 contractor companies consisting of 72 small qualification firms, 36 secondary qualifications and 22 large qualifications. The research covered 53 variables consisting of 53 indicators adopted from PMBOK^{5th} standard [7], including: 1) project initiating stage, 2) project planning stage, 3) project executing stage, 4) project monitoring & controlling stage, 5) closing stage and 6) project knowledge management area [7]. Validity and reliability test carried out through preliminary research with questionnaires distributed to 25 respondents.

This research was a SERVQUA model, generally using methods of Customer Satisfaction Index (CSI) and Importance Performance Analysis (IPA) [18] [19]. The method of Customer Satisfaction Index (CSI) consisted of process stages including: (1) Determining Mean Importance Score (MIS) and Mean Satisfaction Score (MSS), (2). Create a weight factor (WF), (3). Creating Weighting Score (WS), and (4) Determining CSI. Criteria for competency index of graduates of civil engineering are categorized based on the following index values: I). The index values were; 81% - 100% (very competent), II). 66% -80.99% (competent), III). 51% -65.99% (competent enough), IV) 35% -50.99% (incompetent) and V). 0% -34.99% (very incompetent). While the method of Importance Performance Analysis (IPA) [20] [21], consisted of the process of stages: (1) Calculating the level of respondent's suitability needed to the level of performance and importance, (2) Calculating the level of implementation, (3) Calculating the attributes of importance and performance, and (4) Mapping in Cartesian diagram. CSI and IPA calculation formulas are used empirical formulas that have been commonly used by previous researchers [16]

3. Result and discussion

The result of T-test test using SPSS showed that the research instrument was valid and reliable, so the instrument could be used for further research. Based on the answer of 130 respondents, calculated

Mean Importance Score (MIS) and Mean Satisfaction Score (MSS) using SPSS. Then evaluating the gap between the needs of the contractor to the competence of the field of project management graduate of civil engineering graduate. Result of gap analysis and requirement index on graduate competence can be seen in Table 1.

Table 1. Gap score and competency need index of construction project management.

| Var | MIS | MSS | WS | GAP | Index | Var | MIS | MSS | WS | GAP | Index |
|-----|-------|-------|-------|-----|-------|-------|-------|--------|-------|-----|-------|
| 1 | 3.323 | 3.930 | 6.833 | 13 | I | 28 | 3.538 | 3.905 | 7.294 | 27 | III |
| 2 | 3.385 | 4.100 | 7.254 | 32 | IV | 29 | 3.638 | 3.881 | 7.003 | 28 | III |
| 3 | 3.700 | 4.120 | 7.976 | 33 | IV | 30 | 3.546 | 3.929 | 7.783 | 28 | II |
| 4 | 4.123 | 4.120 | 8.888 | 12 | I | 31 | 3.438 | 3.952 | 6.966 | 10 | I |
| 5 | 4.138 | 4.140 | 8.973 | 20 | II | 32 | 3.400 | 3.810 | 7.231 | 29 | III |
| 6 | 4.085 | 4.120 | 8.806 | 33 | IV | 33 | 3.631 | 3.976 | 7.390 | 16 | II |
| 7 | 3.931 | 3.930 | 8.082 | 14 | I | 34 | 3.592 | 4.000 | 7.291 | 17 | II |
| 8 | 3.923 | 4.071 | 8.360 | 14 | I | 35 | 3.346 | 3.690 | 7.113 | 11 | I |
| 9 | 3.754 | 3.857 | 7.578 | 13 | I | 36 | 3.462 | 3.810 | 6.779 | 11 | I |
| 10 | 3.485 | 4.071 | 7.425 | 12 | I | 37 | 3.469 | 3.714 | 7.556 | 16 | II |
| 11 | 3.531 | 4.024 | 7.436 | 19 | II | 38 | 3.692 | 3.976 | 7.520 | 17 | II |
| 12 | 3.569 | 4.071 | 7.606 | 12 | I | 39 | 3.562 | 3.738 | 6.463 | 26 | III |
| 13 | 3.577 | 4.238 | 8.309 | 10 | I | 40 | 3.600 | 3.833 | 6.902 | 17 | II |
| 14 | 3.577 | 4.048 | 7.577 | 15 | II | 41 | 3.646 | 3.857 | 6.744 | 17 | II |
| 15 | 3.715 | 4.119 | 7.711 | 26 | III | 42 | 3.600 | 3.833 | 7.684 | 18 | II |
| 16 | 3.592 | 4.048 | 7.871 | 26 | III | 43 | 3.600 | 3.833 | 6.968 | 18 | II |
| 17 | 3.577 | 3.587 | 7.252 | 29 | III | 44 | 3.623 | 4.048 | 7.223 | 34 | IV |
| 18 | 3.400 | 3.976 | 7.444 | 30 | III | 45 | 3.631 | 4.119 | 7.361 | 34 | IV |
| 19 | 3.585 | 4.286 | 7.075 | 29 | III | 46 | 3.592 | 3.952 | 7.223 | 19 | II |
| 20 | 3.662 | 4.095 | 8.040 | 28 | III | 47 | 3.662 | 3.905 | 7.675 | 20 | II |
| 21 | 3.623 | 3.952 | 7.848 | 27 | III | 48 | 3.692 | 3.929 | 7.827 | 20 | II |
| 22 | 3.508 | 3.952 | 7.495 | 9 | I | 49 | 3.546 | 3.952 | 7.431 | 19 | II |
| 23 | 3.538 | 3.833 | 7.256 | 9 | I | 50 | 3.538 | 3.929 | 7.483 | 43 | V |
| 24 | 3.569 | 3.905 | 7.099 | 17 | II | 51 | 3.562 | 3.976 | 7.592 | 45 | V |
| 25 | 3.469 | 3.857 | 6.833 | 18 | II | 52 | 3.508 | 3.587 | 7.335 | 20 | II |
| 26 | 3.569 | 4.167 | 7.254 | 18 | II | 53 | 3.592 | 3.952 | 7.275 | 39 | V |
| 27 | 3.308 | 4.024 | 7.976 | 17 | II | Total | | 309.62 | | | |

From Table 1, it could be calculated Customer Satisfaction Index (CSI) = $309.62 / 5 = 61.92\%$. This suggested that the contractor felt the graduates of civil engineering were competent enough. The gap analysis was calculated to evaluate the contractor's need for the graduate competency of civil engineering by calculating the gap between the competency level score and the need-level score for all indicators. The results of the calculation of the gap analysis could be seen in Table 1. It showed that the contractor's answers consisting of 23.81% was very competent, 40.48% was competent, 21.43% was competent enough, 9.52% was incompetent and 4.76% was very incompetent.

The results of the analysis of Importance Performance Analysis (IPA) were described in the diagram of the Cartesian divided into four quadrants, namely quadrants A, B, C and D. Each quadrant had criteria: quadrant A (top priority), quadrant B (important priority), quadrant C (less important for contractors) and quadrant D (not important, but excessive implementation). The results were as shown in Figure 1 below.

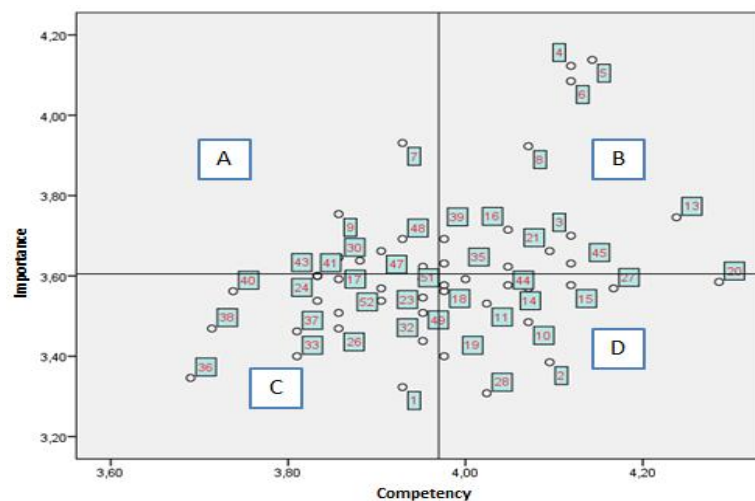


Figure 1. Cartesian importance performance analysis diagram.

The IPA results as shown in Figure 1 and it could be explained as follows:

Quadrant A: Indicators in this quadrant were a high priority for increasing competence in construction project management of civil engineering graduates as they had a major impact on the needs of contractor companies. After analyzing with IPA, there were 14 indicators in this quadrant: 1) defining project activity, 2) estimating project activity resources, 3) planning risk management, 4) preparing material procurement specifications, 5) managing procurement, 6) closing project activities, 7) project closing meetings, 8) cost management, 9) quality management, 10) risk management, 11) integration management, 12) stakeholder management, 13) communication management, and 14) planning quality management.

Quadrant B: Indicators of contractor company's need for construction project management competencies of civil engineering graduates residing in this quadrant needed to be maintained. There were 15 indicators including in this quadrant: 1) planning project management, 2) creating work breakdown structure (WBS), 3) defining project activities 4) preparing project activities, 5) estimating the duration of activities, 6) calculating project budget, 7) planning a project communication system, 8) conducting quantitative risk analysis, 9) planning risk response, 10) managing project team, 11) controlling project schedule, 12) monitoring and control risk; 13) closing procurement; 14) project scope management and 15) time management.

Quadrant C: Contractor's needs indicators for the competence of construction project management of civil engineering graduates residing in this quadrant were deemed not to be important for the contractor to be required whereas the level of competence was normal or sufficient. There were 13 indicators including in this quadrant: 1) collect project documents, 2) prepare project implementation guidance, 3) develop quality assurance, 4) develop project team, 5) create integrated change control, 6) verify project scope, 7) controls project costs, 8) develops quality control, 9) produces quality performance reports 10) human resource management, 11) procurement management, 12) controls the scope of the project, and 13) estimating costs.

Quadrant D: Indicators of contractor company's need for construction project management competence of civil engineering graduates residing in this quadrant were overestimated in their implementation, this was mainly due to the fact that the contractor considered the implementation of these indicators to be less important, but the implementation was very needed both by college so it was very satisfying. There were 11 indicators including in this quadrant, among others; 1) identify stakeholders, 2) estimate the duration of activities, 3) develop project schedule, 4) plan procurement, 5) prepare project teams, 6) develop human resources, 7) close procurement (purchasing), 8) manage stakeholder needs, 9) monitor and supervise the work, 10) make security procurement, and 11) prepare the project team.

4. Conclusion

Based on the results of the Customer Satisfaction Index (CSI) or the contractor's corporate interest index of competence needed in construction project management for civil engineering graduates, the competency index was obtained as much as 61.92 % or it was in sufficient competent categories. There were 23.81% of contractors certifying that civil engineering graduates were highly competent, 40.48% was competent, 21.43% was competent enough, 9.52% was incompetent and 4.76% was very incompetent in construction project management. Total of 53 factors, there were 14 factors that became the main priority to be increased the competence by public / private universities because it was very influential for the needs of contractors. There were 15 factors that had been well implemented to improve graduate competence in construction project management by public / private universities, therefore these 14 factors had to be maintained.

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