

Development of civil engineers' certification system evaluation model

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Abstract. Certification is an official acknowledgment of a person in accordance with legislation through testing by a third party against its competence. However, in practice there are several constraints in the certification system, among which the quality of certification isn't correlated with competence and sceptical opinion related to the impact of certification. In view of this condition, it is deemed necessary to evaluate the civil engineers' certification system (CECS). This research aims to develop evaluation model of CECS. The research was conducted descriptively by using secondary data, covering among others, legislation, book, articles, reports. The data used comes from the principles CECS in Indonesia synthesized with CECS in Malaysia, Singapore and the Philippines. To support the data, interviews were conducted with resource persons and stakeholders related to the civil engineers' certification. The resulting data is described descriptively analytical, that is describing the existing facts, then analyzed based on positive law and theories that exist. This research produces evaluation model of CECS consisting of 5 (five) main aspects, namely 1) value and principle system, 2) mandate and purpose, 3) business process, 4) regulation framework, 5) institutional framework. The evaluation model of the CECS will be used to study the CECS in Indonesia.

1. Preface

Certification is the process of official recognition (validity) of persons, products, processes, ownership, or information, and is usually governed by applicable law. Certification for people is given because they have knowledge, skills and / or competence in their profession [1][2].

Certification is performed by a third party, to ensure in writing that the certificate holder may provide services that meet the specifications required by the user [3][4]. Certification is obtained based on documented evidence of educational background, work experience, appropriate technical references, through testing [5].

In practice, however, the civil engineers' certification system (CECS) has several constraints. There are skeptical opinions about the impact of certification [6]. Another research states that certification is not entirely correlated with the competence of the owner [7, 8, 9]. Certificate of experts in addition to low in quality, also low in quantity [10].



In view of this condition, it is deemed necessary to evaluate the CECS. This study aims to develop an evaluation model of the CECS.

2. Method

The research was conducted descriptively by using secondary data, covering among others, legislation, books, articles, reports. The data used are derived from the principles of CECS in Indonesia that are synthesized with engineer certification systems in Malaysia, Singapore and the Philippines. To support the secondary data, interviews with resource persons and stakeholders related to CECS were conducted. The resulting data is described descriptively analytical, that is describing the facts that exist, then done the analysis based on positive law and theories that exist. Descriptive analysis is focused on solving existing problems.

The purpose of this research is to develop an evaluation model to the CECS. Evaluation needs to be done to assess or measure the benefits derived from the application to a system [11]. If the user's evaluation of the technology matches the demands in the user's task, it will give the user the boost of using the technology [12]. Therefore, evaluation will be used as a measuring tool for the implementation and quality of the system [13].

Preparation of the evaluation model done in 2 (two) stages, namely:

- Identification of main aspects of the model evaluation CECS.
- Development parameter's model evaluation CECS

2.1. Main aspect of evaluation

The evaluation model of the CECS in this study is conceptually using a good governance model. Good governance model is used as a conceptual model (basic model) of research because construction service is a system with many stakeholders.

The concept of constructing construction services means building the capabilities of all stakeholders, rather than relying on building government forces alone [14]. In the CECS using the same concept.

The design on the CECS evaluation model for this study, based on the concept of good governance. The concept of good governance (UNDP, 1977) developed on good governance of community services [15] and good governance in infrastructure management in Indonesia [16]. The three concepts of good governance are then synthesized with the concept of certification according to Hoyle (2013). The next step is to collaborate with the concept of certification in the field of civil engineering according to previous studies for other countries [17, 18, 19, 20] synthesized with engineer certification systems in Indonesia [21]. This process is schematically shown in Figure 1. The variables from the design study of this evaluation model design are synthesized (Table 1).

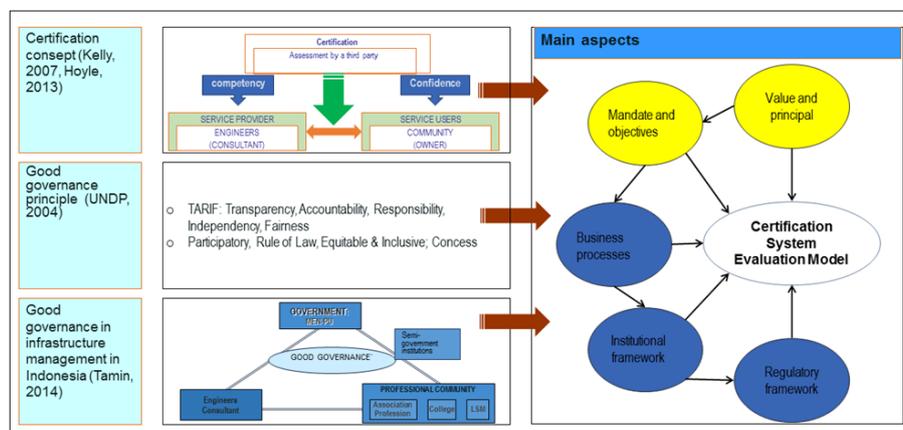


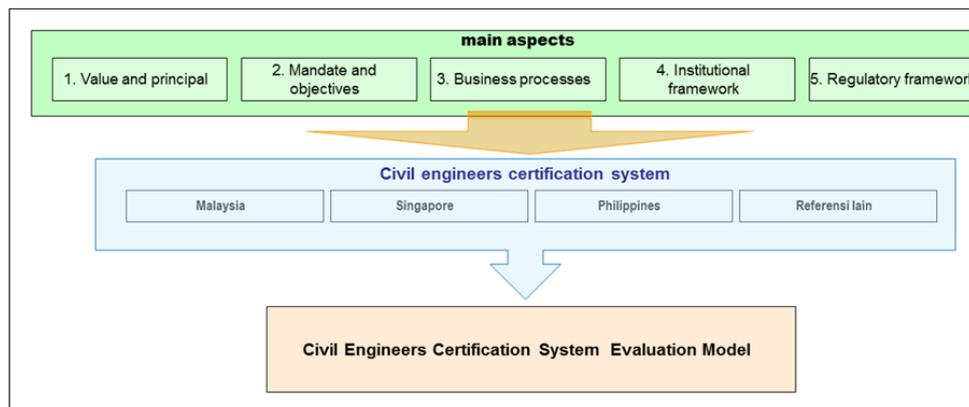
Figure 1. Identification of the main aspects of the model evaluation.

Table 1. Reference identification of the main variables of the certification system.

No	Langlands, 2004	Blair and Salzberg, 2007	Kelly, 2007	de los Ríos-Carmenado et al, 2011	Hoyle, 2013	Killgore, 2013	Tamin, 2014a	Main aspects
1	Value					Value	Value	Value & principal
2			Principal	Principal		Principal	Principal	
3				Mandate			Mandate	Mandate & objectives
4	Objectives	Objectives	Objectives	Objectives	Objectives	Objectives	Objectives	
5	Processes	Processes	Processes	Processes	Processes	Processes	Processes	Processes
6	Institutional	Institutional	Institutional	Institutional	Institutional	Institutional	Institutional	Institutional
7						Regulatory	Regulatory	Regulatory

2.2. Evaluation model parameters

The next step towards the preparation of the CECS evaluation model is the development of the main aspects into model parameters. Development is done through the process of desk evaluation of CECS in Malaysia, Singapore, and Philippines. The CECS in these three countries is taken on the assumption of representing the ASEAN country CECS which has already had the regulation of professional construction engineers. Regulations for professional engineers in each country are Malaysia with Act 138 registration of Engineers, rev 2007, Singapore with the Professional Engineers Act - Chapters 253, 1991, and the Philippines with Act no. 544, Civil Engineering Law, 1956. The process of developing the main aspects into schematic model parameters can be seen in Figure 2.

**Figure 2.** Development of evaluation model parameters.

3. Result and discussion

The analysis of each main aspect produces the following parameters:

- Parameters of value and principal.
Contains the concepts underlying the certification process, including the value of certification and professionalism
- Parameters of mandate and objectives
Mandate of certification is for ensure public safety in the utilization of engineers and Guarantee competence of engineers.
- Parameters of business processes
Includes requirements to apply for certification, ie formal education and work experience in accordance with the certificate to be obtained. The certification process begins with a competency

test with national standards. After passing the competency test, a professional engineer is registered to the Board of Engineers

- Parameters of Institutional framework.

Includes institutions involved in the certification process, from registration, testing and registration process.

- Parameters of regulatory framework

Covers to legislation regulating certification with the scope of only organizing special engineers and consultants in the field of civil engineering

The overall parameters for each aspect as the evaluation model to the CECS are shown in Figure 3.

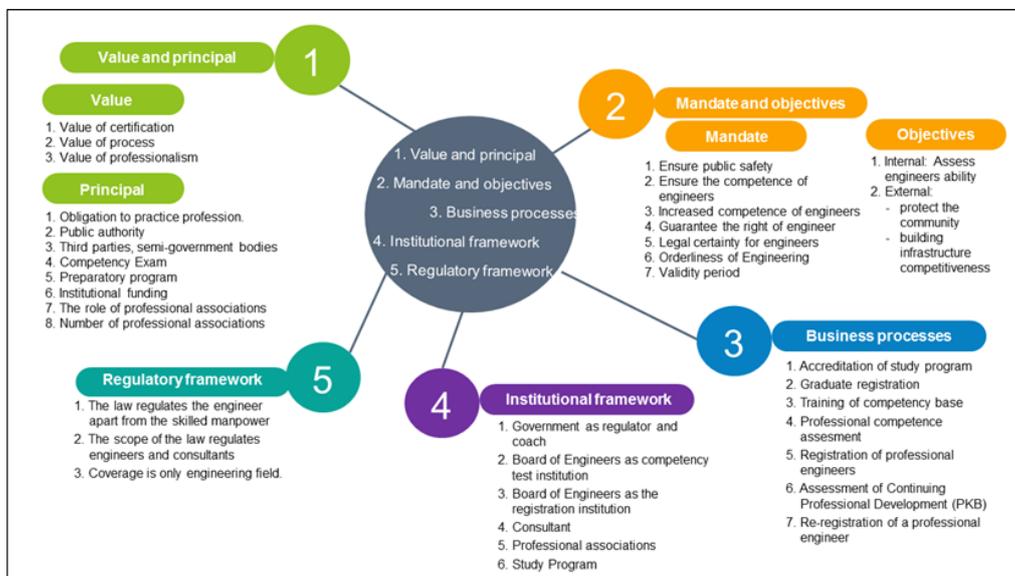


Figure 3. Civil engineers' certification system evaluation model.

4. Conclusion

The research produced an evaluation model of the CECS consisting of 5 (five) main aspects, namely 1) value and principal systems, 2) mandate and objectives, 3) business processes, 4) regulatory framework, 5). institutional framework; which is each spelled out in parameters. The evaluation model to the certification system of the construction experts will be used later to study the CECS in Indonesia.

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