Implementation of Design and Build Contract in Government Building Construction Project Practice

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Abstract. The Development of government infrastructure projects, which has grown rapidly in recent years, require the Indonesian Government, through the Ministry of Public Work and Housing, to socialize the breakthrough of the national construction procurement system with design and build contract. This breakthrough on construction projects is expected to accelerate the achievement of government infrastructure targets, thus supporting national economic growth. The purpose of this research is to identify DB characteristics, implementation, the advantages and disadvantages in Indonesian construction projects, and to analyze the obstacles, conflicts and problems emerging on the construction project implementation. In the construction project implementation, all participants involved hopes that the project can be completed within the objectives. The expected objectives are that the project is completed in time, does not exceed the budget and meets the quality requirements.

1. Introduction
The increasing amount and volume of infrastructure developments accompanied by the demand for faster work practice brings about the need for the modernization of the national construction work procurement system and project delivery that makes it easier for the government to achieve their goals. Development trends of the Ministry of Public Works and Housing will have a significant contribution in the national economic growth. Faster fund absorption and project accomplishments determines the speed of manpower and equipment which will in turn determine the rate of national economic growth.

The design and build contract method is considered to be able to increase the speed of which projects can be accomplished. The fast track system in the design and build contract allows for a trimming of duration in the auction service provider (contractors) which does not need to be carried out separately with the selection of planning consultant services. Construction projects implemented with the design and build contract can at least reduce the time duration for contractor auctions. Other advantages of using the design and build contract include the two tasks lying under one responsible party, project cost efficiency without reducing quality, reduces project duration, increases communication, and reduces lawsuit and litigation related to project implementation since project risks and costs are under the responsibility of the selected contractor [1].

The purpose of this research is to identify design and build characteristics, implementation, the advantages and disadvantages in Indonesian construction projects, and to analyze the obstacles, conflicts and problems emerging on the construction project implementation. According to Azizan and Ibrahim [2], design and build contract is classified as the project with most risks. This is due to the combination of design activities, construction and monitoring process, and the participation of contractors and clients in the construction projects has a high level of risk. The outcome of this paper are expected to be supporting and fundamental data, which will be taken to the next level of main
2. Theoretical framework

2.1. Design and build definition
As mentioned in the Ministry of Public Works and Housing Regulation Number 12 Year 2017, Design and build Construction Works are all works related to the construction of a structure where the design process is integrated with the construction. In other words, this construction work is carried out by more than one contractor. Clause 1 chapter 1 point 13 states that a design and build contract is a written agreement between the owner and the contractor.

Design and build contract can be identified as a procurement method where one entity or consortium is contractually responsible for both the design and the construction of a project [3]. Hale and Shrestha [4] describes the design and build contract as a project delivery method in which the owner provides requirements for the specified project and awards a contract to one company who will both design and build the project [3]. The design and build procurement approach had been identified to be rapidly growing and patronized in the global construction industry. This is due to the several benefits that this procurement approach provides over the other procurement approaches, most notably the traditional procurement option, which is characterized by inherent fragmentation which leads to time and cost overruns. Gambo and Gomez [3] also mentioned that the design and build procurement approach is different from other procurement approaches due to its advantages of offering single point responsibility, inherent build ability, and risk allocation.

Design Build Institute of America (DBIA) states that the design and build method is an implementation method of project delivery where the contractor integrates a single contract with the owner to provide architectural or engineering design and construction services. The design and build contract is also known as the sole responsibility concept. Without the design and build approach, the owner’s architect or engineer commissioner prepares drawings and specifications based on the design contract, then selects a contractor with a competitive bid (or negotiation) to build the facility based on user requirements [5]. Figure 1 shows the difference between the design and build method and the conventional method.

Mentioned by Ling and Leong [6] in their journal, several studies regarding design and build project performance have been done. In the UK, a project owner declared that they have obtained above-average satisfaction with a design and build project in terms of cost, time and quality of performance [7]. Another study showed that the design and build project had greater time and cost certainty, better value for money, and 50% more likely to be completed on time and in accordance with the agreed budget compared to the design-bid-build project [8]. A study conducted in the USA by Konchar and Sanvido [9] stated that time, cost, and quality performance of design and build projects are generally better than design-bid-build projects.

Figure 1. The difference in the flow of two methods.
2.2. Design and build characteristic

Contextually, design and build provide a single responsibility point for design and construction service. This is considered correct according to the contractor’s perspective, but not from the contracted company, which may subcontract services of which they have no expertise, or join a companies’ consortium [10]. Besides a single responsibility point, this method has several other features. Park et.al. [11] mentioned that in a big and complex company this method benefits good coordination and communication.

Gambo and Gomez [3] in their journal defines the design and build characteristic as in the Table 1.

| Characteristics of D&B procurement approach | Authors |
|-------------------------------------------|---------|
| Single Point Responsibility;              | Seng & Yousof, (2006); Skitmore & Ng, (2002) |
| Complexity;                               | Abdulrashid, (2002); Oztas & Okmen, (2004) |
| Risk Allocation;                          | Hassim et., al. (2008); Muhammad, (2005); Beard et., al. (2001) |
| Compressed Delivery Schedule;             | Abdulrashid, (2002); Chan & Yu (2005) |
| Communication;                            | Chan et., al. (2001); Levy, (2006) |
| Effective Client Representation;          | Lam et., al. (2004); Peterson & Murpheree, (2004) |
| Facilitates use of latest innovative technologies. | Ling, Chong & Ee (2004); Abdulrashid, (2002) |

Table 1 shows the characteristics of the design and build contract obtained based on summaries from previous journals and literature in Gambo and Gomez’s research in 2015[3]. Design and build approach allow a client to directly contract the contractor without an intermediary consultant, and the contractual position of the project lies between the client and the contractor [12]. A single responsibility point featured in the design and build contract causes contractors to be fully responsible for the performance of completed projects, even if the problems or errors that arise are caused by the activities of subcontractors involved in the development process.

3. Findings and discussion

3.1. Design and build implementation

According to Research and Development Agency of Ministry of Public Work and Housing in 2017 Design and build contract is a construction procurement method that combines planning, execution, and monitoring process in a single service provider. Design and build contract’s advantages utilize a lump sum payment method to transfer all risks to the service provider and streamlining the process of implementing the procurement of goods or services. Extended warranty period is another advantage of this method. Moreover, a lump sum contract allows a flexibility for volume adjustment because what is specified in the contract document is the design criteria (basic design or concept design).

With the benefits, come the disadvantages. The design and build contract method have several significant disadvantages such as a higher project cost [13], less variation flexibility [14,15], and uneconomic use of resources. Projects are likely to undergo changes due to specification-related issues, long and time-consuming revision process [16], risks due to the contractors’ limitations regarding the government’s laws and sovereignty, as well as the risk that the government does not abide to the agreed contract—a risk that arises due to disasters, technical issues, and changes of political and economic scenarios [10]. Here in Table 2 is a few examples of DB implementation in Indonesian construction companies that shows that DB contracts do not always guarantee the work will be on time.
Table 2. Design and build implementation in Indonesia.

| Design and build Project                                      | Service Provider                             | Planned Implementation Period | Notes            |
|---------------------------------------------------------------|---------------------------------------------|-------------------------------|------------------|
| Renovation of the Adi Sutjipto Airport Terminal in Yogyakarta | PT. Wijaya Karya                            | 3 Months                      | On schedule work |
| Adi Soemarto Airport Terminal accomplished work              | PT. Wijaya Karya                            | 7 Months                      | 180 days extended|
| Office Room Regulation                                       | PT. Sarijadi Adhitama                       | 5 Months                      | 150 days extended|
| Hassanudin Makassar Airport Terminal accomplished work        | PT. Adhi Karya jo. PT. Tridaya jo. PT. Dedato| 6 Months                      | 120 days extended|
| Regulation of Sam Ratulangi Manado Airport Terminal          | PT. Sarana Bangun Persada                   | 6 Months                      | 60 days extended |

Besides the examples above, there are some disadvantages that can cause problems and reduce contractor accomplishments. As for some examples of problems found by the Indonesian institutional auditor and problems found in previous journals are shown below in Table 3 dan Table 4 consecutive.

Table 3. Problems arising from the implementation of design and build in Indonesia.

| Project Title                                             | Type of Contract                             | Problems                                                                                           |
|-----------------------------------------------------------|---------------------------------------------|----------------------------------------------------------------------------------------------------|
| Bogor Ring Road Highway Project                           | PT JM standard DB Contract                  | • There is no clear separator between the terms of work reference with the contractor bid proposal; |
|                                                           |                                             | • The definition of variation is not clear;                                                       |
|                                                           |                                             | • Design changes were made by both parties concurrently                                            |
| Terminal Ultimate Soekarno Hatta Airport Project          | Angkasa Pura II standard DB Contract        | • The unclear definition of variation and design process procedure (changing between basic and detail design) |
|                                                           |                                             | • Design changes were made frequently based on terms of work reference and criteria performance, causing significant volume difference between document contract and installed material. |
| MRT Project                                               | FIDIC Yellow Book 1999 standard DB Contract | • Dispute related to the late issuance of payment certificates                                      |
|                                                           |                                             | • Dispute related of the administration and VO payment                                             |

| Project Title                                             | Type of Contract                             | Problems                                                                                           |
|-----------------------------------------------------------|---------------------------------------------|----------------------------------------------------------------------------------------------------|
| Non Tol Overpass Road Project                             | Indonesian Ministry of Public Works and Housing standard DB Contract | Different measurement volume between contract document and installed work                          |
| Asian Games XVIII 2018 Project                            | Indonesian Ministry of Public Works and Housing standard DB Contract | The reasonableness of the project price value is Rp 5.3 trillion, which is caused by the initial work of the PPK Ministry of PUPR not implementing the RAB used in determining the Self Estimated Price (HPS). |
Table 4. Problems arising from the implementation of design and build based on literature review.

| Problem | Problem Identification | Reference |
|---------|------------------------|-----------|
| Construction/Technical | • Difficulties/delay in availability of materials, equipment and labor | Ibrahim Adamu, Mohammed Awal Sidik, Osei-Tutu Ernest (2017) [17]; O. E. Ogunsanmi, O. A. Salako, and O. M. Ajayi (2011) [18]; Allen Faught and Daniel Tran (2015) [19] |
| | • Coordination issues arising from design and construction concurrence | |
| | • Contract change orders | |
| Design | • Design changes | O. E. Ogunsanmi, O. A. Salako, and O. M. Ajayi (2011) [18]; Allen Faught and Daniel Tran (2015) [19]; Ilori, Babsola Olubunmi and Talukhaba, Alfred Atsango (2017) [20] |
| | • Design errors or commissions | |
| | • Detailed project information | |
| Project Risk | • Different the attitude of decision makers towards risk | O. E. Ogunsanmi, O. A. Salako, and O. M. Ajayi (2011) [18]; Titouan Plusquelleq, Nadia Lehoux, and Yan Cimon (2016) [21]; Tsung-Chieh Tsai & Min-Lan Yang (2010) [22] |
| | • Financial risk based on selected contract types | |
| Management/Organization (Administrative, Information, Risk) | • Communication system | O. E. Ogunsanmi, O. A. Salako, and O. M. Ajayi (2011) [18]; Ilori, Babsola Olubunmi and Talukhaba, Alfred Atsango (2017) [20]; Ibrahim S. Abotaleb, A.M. ASCE; Islam H. El-adaway, F. ASCE; and Mohamed B. Moussa (2019) [23] |
| | • Control over supply management | |
| | • Contracting management | |
| | • Financial failure | |
| Human Resources (Motivation, Knowledge, Skill, Culture) | • Different perspective view from owner and services provider | Jiyong Ding , Na Wang, and Leichuang Hu (2018) [24]; Titouan Plusquelleq, Nadia Lehoux, and Yan Cimon (2016) [21]; Ibrahim S. Abotaleb, A.M. ASCE; Islam H. El-adaway, F. ASCE; and Mohamed B. Moussa (2019) [23]; Ilori, Babsola Olubunmi and Talukhaba, Alfred Atsango (2017) [20]; Allen Faught and Daniel Tran (2015) [19] |
| | • Contractor’s & client’s competencies | |
| | • Gap in the body of knowledge as related to stakeholders | |
| | • A lack of understanding of the design-build | |

Based on the results of the explanation above related to the problems of implementing the design and build contract in Indonesia, then for further research the proposed conceptual framework of the development of the SMM for design and build contracts in subsequent studies begins with determining the type of contract and the type of project used as the study boundary. For a clearer picture can be seen in Figure 2 below.
4. Conclusion

Design and build contract is a procurement method that provides a single responsibility point for a contractor. In this case, the contractor is required to be responsible for meeting all the needs of the owner in terms of design, material requirements and the method of carrying out the work. In the design and build contract the owner can contract directly with the contractor without going through an intermediary party.

The advantage of implementing a DB contract is to utilize the lump sum payment method to transfer all risks to the service provider and streamline the process of procuring goods/services. Moreover, there is flexibility in adjusting the volume of work, because what is stipulated in the contract document is only the design criteria (basic design or concept design). However, in addition to the benefits provided, there are also losses arising from the implementation of a DB contract, one of which is a change in the project due to problems in the specifications, and a long revision process.

The implementation of design and build method impacts Indonesia by providing time cuts in the initial phase of project formation and by making projects faster and completion on time. But in its actuality, there are still many delays in several projects despite implementing the design and build contract. It also turns out that by applying design and build contracts in several state-owned projects, many problems arise, especially with the state institutional auditor.

Several points of shortcoming that have been mentioned become a problem in the implementation of design and build contracts. This creates obstacles in the continuity of project implementation, which is feared to not allow achievement of project objectives. These objectives are defined that the project is completed on time, does not exceed the specified budget and meets the quality requirements and later this research can help further research than this research on the development of WBS-based SMM in Indonesia.

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