



CHALLENGES OF DESIGN-BUILD METHOD IMPLEMENTATION IN PUBLIC WORKS PROJECT DELIVERY

PUTI FARIDA MARZUKI and RIZAL ZAINUDDIN TAMIN

Faculty of Civil & Environmental Engineering, ITB, Bandung, Indonesia

Infrastructure, including public works, plays a very important role in supporting a nation's effort for a better condition of life through economic growth and, in this regard, the Indonesian government is striving to accelerate the execution of a vast number of construction projects. A total budget of around USD 420 billion is made available to realize the program. Meanwhile, public works project delivery in Indonesia still have problems hampering the achievement of its ultimate objective, i.e. producing high quality facilities on time and without cost overruns. A breakthrough in project delivery is needed to ameliorate the condition. This paper describes Indonesia's struggle to shift from a traditional Design-Bid-Build to a Design-Build delivery system for big public works construction projects. The research consists of a desk study of related existing literature and planning as well as evaluation documents to identify and analyze the challenges and strategic issues of this undertaking to create better value for money. A critical review of a recently issued Indonesian public works' ministerial regulation on design-build project delivery system is also carried out. Finally, the paper offers important suggestions for a thrust forward to improve the quality of Indonesia's public works' construction project delivery and construction industry as a whole in supporting infrastructure development.

Keywords: Alternative delivery methods, Large projects, Project delay, Owner's capacity, Design/builder quality, Contract administration.

1 INTRODUCTION

Currently Indonesia is facing the challenge of infrastructure development acceleration to support its economic activities, to improve its competitiveness, and, most of all, to achieve the target to ameliorate its people's welfare. As a very big archipelago, Indonesia's country area has a length of 5,200 km and a width of 1,870 km that still lacks connectivity. The country also needs equal economic development to solve welfare gaps among its regions through better public infrastructure provision. Besides accelerating important transportation and communication infrastructure development, the government recently launched a program to expedite a 35,000 MW electricity provision for industry and household needs that consequently require a significant raise in dams, and power distribution facilities construction.

Meanwhile, large scale public works projects, which mostly adopt Design-Bid-Build (DBB) project delivery method, often have to experience performance problems due to constraints that result in delays of detailed engineering design and construction execution completion. Therefore, a strategic construction services regulation and its implementation thrust are needed to promote creativity and innovation to accelerate infrastructure project life cycle in producing construction

with more value for money. A shift to Design-Build (DB) project delivery method in public works projects is now deemed necessary. Moreover, the Indonesian construction industry, as one of the main player in this program, still has to enhance efforts to improve its productivity and capacity to produce high quality facilities.

This paper describes Indonesia's struggle to shift from a traditional DBB to a DB delivery system in large public works construction projects. Although this system has already been widely adopted in other countries, it is still very new for Indonesia's public works construction projects. Challenges related to Indonesian construction industry's specific situation are faced and public works projects' owner as well as design/builders' capacity improvement is needed.

2 METHODOLOGY

A desk study is conducted to identify and analyze the challenges and strategic issues of public works' project delivery method's shift from DB to DBB. Secondary data and information are collected from existing planning and project implementation documents. Based on the data and information, the specific situation of the Indonesian construction industry and public works projects' management are first described. The need to shift from DB to DBB method and specific challenges due to the situation are put forward. Lessons learned from previous project implementations are also identified and analyzed. Further on, a critical review of a recently issued Indonesian public works' ministerial regulation on DB project delivery system is carried out. The study serves as basis to formulate suggestions for specific improvements of project management capacity and design/builders' quality to achieve the objective of public works development acceleration through a good DB project delivery method implementation in Indonesia.

3 PUBLIC WORKS PROJECT NEEDS: ROLE OF THE INDONESIAN CONSTRUCTION INDUSTRY

The real history of the Indonesian construction industry was started in 1960 when state-owned companies were directly appointed by the government to handle high profile construction projects such as the national monument and various major infrastructures. Competitive bidding process in construction projects was first introduced in 1970 after these companies became state-owned legal entities (Department of Public Works – Indonesia 2005). Since then, state-owned companies have been dominating most of the big construction projects. Most of these projects adopt the DBB project delivery method. Currently, with a growth of 6.58%, the construction industry supports other sectors' development and it is expected to represent the nation's social, economic, and cultural pillar.

A significant number of infrastructure, including public works, is still required to boost Indonesia's economic growth and people welfare. Therefore, in 2015 the government launched an infrastructure development acceleration program which will continue until 2019. A total budget of around USD 420 billion is made available to realize the program (Bappenas 2014).

The construction industry is expected to play an important role in this undertaking. It has been contributing around 10% to GNP (Central Bureau of Statistics – Indonesia 2014). Despite this fact, the industry's capacity still needs to be enhanced to fulfil the need of public works provision acceleration. Its quality and productivity performance have to be seriously improved. Low quality construction resulting in problems such as early damaged roads and building failures is an example of the industry's lack of competitiveness. Besides, safety on construction site and number of skilled labor as well as professional engineers are also still to be improved. Better proportion of general and specialist contractors also has to be addressed. As a matter of fact, real

specialist contractors are practically non-existent at present. As a consequence of the whole situation, good design/builders are rarely available in Indonesia.

4 A SHIFT OF PROJECT DELIVERY METHOD: AN INDONESIAN STUDY

Public works project life cycle starts from project needs formulation up to demolition. As part of this project life cycle, a project delivery method is chosen among several alternatives. A project delivery method is a process of designing and constructing any facility. It is a method for owners/clients “to deliver and finance constructed facilities” (Miller 1999). According to Molenaar *et al.* (1999), the adoption of DB as an alternative project delivery method to DBB has rapidly grown in the 1990s and a prominent component of this explosion is in the public sector. With regards to Indonesia, this is not the case. DB has only started to be seriously considered as an alternative to DBB in public works projects since 2014. In this early stage of DB implementation in Indonesia, specific challenges due to this country’s specific project environment have arisen.

Since the very beginning, most public works projects in Indonesia has been adopting DBB delivery method which customarily involves three sequential project phases: design, procurement, and construction. The process is linear, where one phase is completed before another phase is begun. Project completion delays caused by problems encountered in either of the phases have often been experienced. The actual need for public works provision acceleration which involves project delivery of large constructions has led the government as owner to promote a shift to the DB method. DB assigns the design and construction to one entity, and where possible, allows construction to begin before design is complete. With the actual condition of the Indonesian construction industry the shift to this method is not without problems. The challenges of its implementation are described in the following sections.

4.1 Traditional Project Delivery Method in Indonesian Public Infrastructure Development

Around 99% of public works projects in Indonesia adopt the DBB delivery method. The process is deemed simpler to manage than in other project delivery method. It is also mainly preferred because the owner has more control, particularly, on design, and on all of the involved parties in general to execute each job in an accountable manner. Accountability is one of the main concerns in public infrastructure projects because government funding is involved where strict regulations are imposed.

The contracting agency of these projects is the Ministry of Public Works and Housing. As this method has been applied in public works projects since a long time ago the staff is already very familiar with related contract management requirements and has more experience and skill in administering the whole projects’ management. Auditors are also more familiar with the process and the actual audit system is more tailored to this method where the owner engages a designer to prepare the design of the project, including construction drawings, and specifications and then, once completed, the owner will select a contractor through competitive bidding, usually based on the lump sum lowest responsible bid. As the designer and the contractor are separately assigned, delivery process is usually longer and the whole project needs a longer time to complete. Meanwhile, in extreme circumstances, lack of coordination could exist among owner, designer, and contractor that would create an adversarial relationship. Efforts to increase work productivity then might be hampered.

Moreover, according to Yuniyanto *et al.* (2014), one of the disadvantages of the DBB method experienced in Indonesia is the lack of constructability analysis during the design process of public works projects as the engineers’ expertise is lacking and construction contractors are not

involved in this stage. The consequences of this situation include design changes during the construction phase, which lead to more change orders, cost increase, reworks, extra-works, and eventually delay of project completion. The owners then usually face the risk of more claims of the contractor.

4.2 A Shift to Design-Build Project Delivery Method: Analysis of Implementation Challenges in Indonesian Public Works Projects

Until recently, in Indonesia, the DB project delivery method has been mostly adopted in oil and gas, petrochemical, and power plant projects while for public works projects the traditional DBB method is preferred as described in the previous section. The need for public infrastructure development acceleration have actually led to a gradual shift from DBB to DB public works project delivery method. With this shift, delays due to a lengthy separate design and construction execution phases are expected to be minimized.

According to the Florida Department of Transportation (2004), there are three main objectives to DB, i.e.: 1) Time: Compared to traditional contract procurement, time is saved when the project construction begins during design; 2) Responsibility: DB provides a single point of responsibility for quality, cost and schedule from design through construction. This reduces change orders and claims due to errors and omissions; 3) Innovation: DB allows the contractor maximum flexibility to choose innovative designs, materials, and construction techniques. With regards to time, Molenaar *et al.* (1998) mentioned that schedule driven projects are appropriate for DB.

Better value for money is the ultimate objective of implementing DB method in public works projects, but significant capacity improvement effort has yet to be made by the stakeholders of the Indonesian construction industry to be able to achieve it. Since 2014, several important public infrastructure projects that include: 1) Jakarta MRT; 2) Jakarta Airport-Terminal 3; 3) 2018 Asian Games Infrastructure Project, have started to adopt the DB method. The complexities encountered during project execution have provided important lessons learned that would hopefully help, mainly the government as owner in public infrastructure projects and other stakeholders of the industry, to further improve DB implementation in upcoming projects. The followings are the challenges that are identified based on those lessons learned and on studies of the Indonesian construction industry's actual condition.

First of all, DB relies on good collaboration between designer, contractor, as well as owner. This collaboration should be based on strong ethics as it is susceptible to corrupt practices which represent currently a dominant problem in establishing a strong and competitive Indonesian construction industry. Auditors also have to be familiar with this method to be able to promote project management accountability.

Secondly, the design-build capacity of the national construction community is still to be enhanced to produce innovative and creative solutions to construction problems. In this regard, the number of competent designers and professional engineers should be increased. Meanwhile, on the construction companies' side, strong general and specialist contractors are lacking. Their strength would be much determined by their financial and managerial capacity, as well as by knowledge and their capacity to implement construction methods. Besides, with single point responsibility in a design-build environment, contractors' or design/builders' capability in risk management is essential. Moreover, a solid construction supply chain is also to be established.

Thirdly, a DB project delivery requires the owner to have a good skill in coordinating the procurement of DB services and overseeing the engineering/inspection and construction of the project. The importance of owner's experience to the success of DB is stated by Molenaar *et al.*

(1999). Moreover, as mentioned by Molenaar *et al.* (1998), owners must front-end load their involvement in the project's design to make them successful. Besides, a solid contract administration capacity is needed. A good contract manager on the owner's as well as Design-Builder's side will mitigate the risk of disputes. With regards to a contract, an international standard General Conditions such as FIDIC-Yellow Book is suggested to be used. A Dispute Adjudication Board would also be preferably established.

Finally, previous projects' experiences show that one of the main problems encountered is mediocre quality of feasibility study, including basic design, engineering estimate, and environmental assessment documents, which caused change orders during design-build process. This challenge is related to the statement made by Songer and Molenaar (1996) that scope definition is thought to be the most critical element of DB success. In Indonesia, the problem is deemed to be partly caused by lack of competent designers and professional engineers.

4.3 Regulation on Public Works Design-Build Project Delivery Method Implementation in Indonesia

The DB delivery method for public works projects is now applied in Indonesia based on a specific Ministerial Decree No. 19 (2015) on the Standard and Guidelines for Procurement of Public Works Infrastructure with Design-Build which is issued by the Ministry of Public Works and Housing. From the DB objectives' point of view (time saving, promotion of innovation, and, ultimately, better value for money), this new regulation has a number of implications and complexities to be addressed.

First of all, public works project delivery under this regulation involves a very bureaucratic role of the government that has a three-tiered organization structure of officials with regard to state budget spending and decision-making responsibility. This bureaucracy would hamper the achievement of DB's time saving objective. Secondly, this regulation stipulates a process of guiding the bidders to have an equal perception of technical data and criteria that serve as design basis so that there would be no big differences among the proposed infrastructure design. This process tends to constrain design and construction creativity promoted by DB method. Thirdly, this regulation restricted the application of DB method to complex infrastructure project delivery while other simpler projects also would benefit from collaboration among involved parties. Finally, this regulation encourages the use of a mixed lump sum and unit price contract which would complicate its administration. Considering the owner (government) staff's actual lack of project management and contract administration capacity as well as their limited experience with DB application, it is highly recommended for the owner to hire a Construction Management (CM) consultant.

5 CONCLUSIONS

The shift from the traditional DBB to DB project delivery method is a very important decision made by the Indonesian Ministry of Public Works and Housing as owner in the process of fulfilling infrastructure, including public works, development acceleration need. Time saving and, ultimately, better value for money is the objective of this shift. Although there are high expectations with regard to the benefits of DB method, many challenges have to be faced. The owner has to be ready to assume responsibility of managing the process that includes coordinating the procurement of DB services and overseeing the engineering, inspection, and construction of the project in an accountable manner based on professional ethics. A solid feasibility study, including basic design, has to be available before embarking on the design-build process. With the actual capacity of the ministry's officials to administer the process, it is highly

recommended for the owner to hire a Construction Management (CM) consultant. Meanwhile, the capacity and competence of Professional Engineers, general contractors, specialist contractors, and the whole construction supply chain must be enhanced to come up with innovative designs and construction methods. A successful implementation of DB method in delivering the Indonesian public works also depends on an appropriate regulation as basis of stakeholders' interactions, contract administration, and project management.

References

- Bappenas, *National Mid-Term Development Plan 2015-2019* (in Indonesian language), Ministry of National Development Planning – Indonesia, Jakarta, 2014.
- Central Bureau of Statistics – Indonesia (BPS), *Statistik Indonesia 2014* (in Indonesian language), 2014.
- Department of Public Works - Indonesia, *Framework of Public Infrastructure Organization System* (in Indonesian language), Jakarta, 2005.
- Florida Department of Transportation, Design Build Program Evaluation, November 2004. Retrieved from [www.fdot.gov/construction/AltContract/General/PDF/DB Program Eval.pdf](http://www.fdot.gov/construction/AltContract/General/PDF/DB%20Program%20Eval.pdf) on December 15, 2016.
- Miller, J. B., *Construction Project Delivery Systems: Public/Private Infrastructure*, Aspen Law and Business, New York, 1999.
- Ministerial Decree No. 19 on Standard and Guidelines for Procurement of Public Works Infrastructure with Design-Build (in Indonesian language), Ministry of Public Works and Housing – Indonesia, 2015.
- Molenaar, K. R., and Songer, A.D., Model for Public Sector Design-Build Project Selection, *Journal of Construction Engineering and Management*, ASCE, 124(6), 467-479, 1998.
- Molenaar, K. R., Songer, A.D., and Barash, M., Public-Sector Design/Build Evolution and Performance, *Journal of Management in Engineering*, ASCE, 15(2), 54-62, 1999.
- Songer, A. D., and Molenaar, K. R., Selecting Design-Build: Public and Private Sector Owner Attitudes, *Journal of Management in Engineering*, ASCE, 12(6), 47-53, 1996.
- Yunianto, D., Hatmoko, J. U. D., and Hidayat, A., Constructability Application Evaluation for Building Construction (in Indonesian language), *Journal MKTS*, PII-BMPTTSSI, 20(2), 135-144, December 2014.