

Structural Equation Modelling for Infrastructure Project Team Collaboration with Design and Build Contract in Indonesia

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Abstract: Non Toll Flyover construction Capt. Tendean - Blok M - Cileduk package Adam Malik is one of the infrastructure projects in Indonesia are carried out by the Provincial Government of DKI Jakarta with Design and Build contract system and its funding comes from the Expenditure and Revenue Budget (APBD). However, in the implementation of the project, there are several obstacles that one of them is Team internal and external collaboration is not maximized, causing the occurrence of construction waste. In this research conducted a survey to identify the influence and interests of each team that has influence in construction waste, from these survey results analyzed by Structural Equation Modelling. Then compiled a pattern of relationships successful team collaboration in reducing construction waste in construction projects Non Toll Flyover Capt. Tendean - Blok M - Cileduk package Adam Malik. Based on the results of the study are that a team of external influence on the project of construction waste.

Keywords: Structural Equation Modelling, Collaboration Team, Design and Build Project, construction waste

I. INTRODUCTION

Infrastructure is an important sector in economic growth and development in a country. Handling infrastructure construction projects, we understand together that good construction handling has the greatest contribution to the completion of infrastructure projects. According to ITB Professor Rizal Z. Tamin at the panel discussion entitled "Accountability and Regulation of Construction Work Contract Integrated Design" October 26, 2016 in Bandung, said that the increasingly open competition climate due to the implementation of free market, representation and composition of large and small contractors Which is not ideal, the competence is still low, until the application of job-based design bid build scheme that lowers the level of private participation, needs to be the government's attention in making improvements in this sector. The government is expected to improve the competitiveness of the national construction services sector through the implementation of design and build integrated work and construction of the ecosystem of the construction industry in Indonesia.

Jakarta as the capital of the Republic of Indonesia is the center of various activities including the central government, economy, trade, industry and so forth. Transportation becomes an important thing for the life of citizens of Jakarta. The large volume of vehicles in Jakarta causes various problems, one of which is traffic congestion. The Government of DKI Jakarta continues to make solutions to overcome the congestion problem. One solution is to build infrastructure to support public transportation. In connection with this matter, the DKI Jakarta Provincial Government will soon start physical construction of flyover for corridor XIII (Ciledug - Blok M). But with the end of the implementation has not been completed. This happens because there are still obstacles to land acquisition so that the progress of the project is slowing down.

According to (Sasitharan Nagapan, 2012) in his research concluded that CW consists of physical waste (Physical waste) and non physical waste (Non Physical Waste) [1]. Physical goods, arising from the existence of a mismatch between the design with the existing product standards, examples of goods made not aligned with the design module, such as ceramics, iron concrete, and others. Non Physical Waste (NPW), which consists of time overrun and cost overrun. It should be understood that the notion of time overrun is related to the time available to conduct activities, where stakeholders are unable to utilize the time available to complete the work so that construction activities can not be completed in accordance with the planned time. While the cost overrun is related to the utilization of funds or costs for construction activities where to complete the work beyond the planned budget. As shown in Figure 1 following.

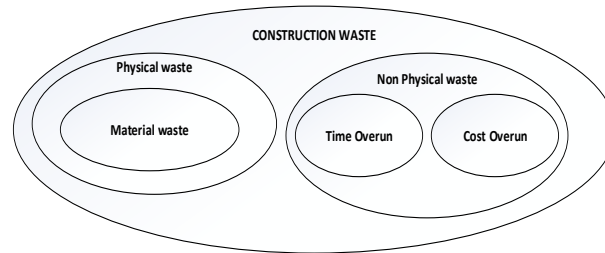


Figure 1. Classification of Construction Waste (Sasitharan Nagapan, 2012)

In general, the problems faced in project implementation are motivated by the number of stakeholder / stakeholder involvement. On the other hand, field circumstances that do not fit into the design often trigger bad relationships among owners, contractors and consultants. In fact, collaboration and cooperation is needed in infrastructure a positive climate in the successful completion of project implementation that meets the elements of timely, quality and cost. In line with this Hu (Hu, 2008) has studied the improvement of collaboration performance in construction is very important to improve the performance of construction management, effective collaboration overcome the fragmentation that arises to characterize the design and implementation [2].

Design and Build contracts are contractual arrangements whereby a design and construction contract is a unit [3]. Some of these reasons are chosen because they have systems that provide a good communication advantage between the design team and the construction team so that the duration can be shorter because the design concept can be transformed more effectively to the construction team and for the owner can simplify the line of obligations and responsibilities.

II. METHODOLOGY

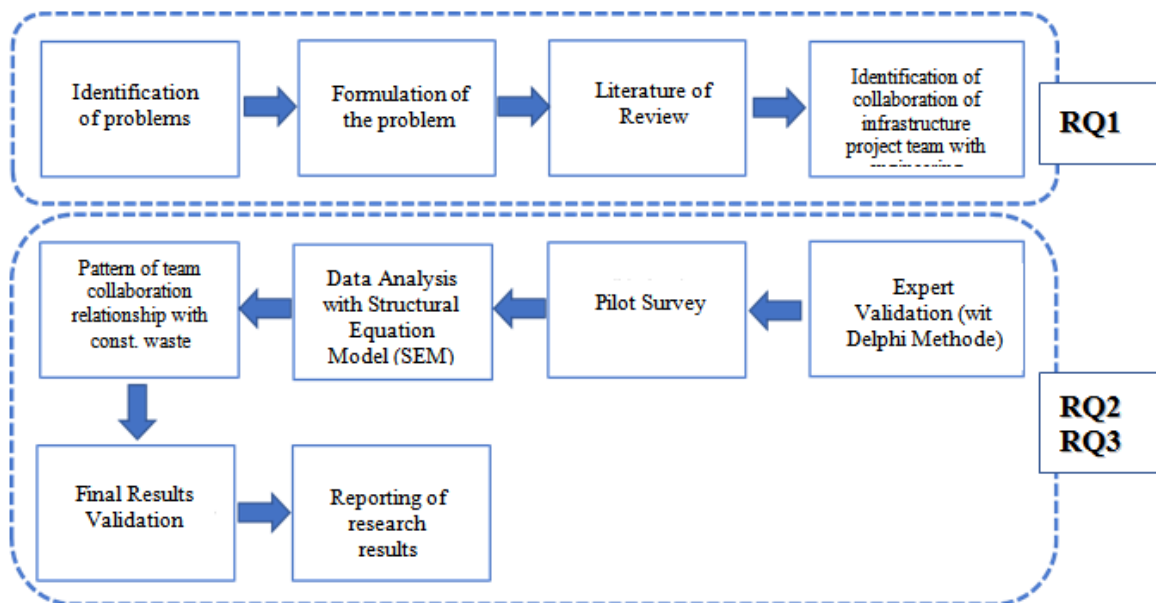


Figure 1: Research Methodology

Research is one way that is used to find answers to a problem that produkt. In a study, to obtain optimal results and relevant and as expected requires a method that must be done carefully and systematically. Methods for carrying out information with a specific purpose and usefulness for obtaining information with specific objectives and uses through clarity on this method. This research is conducted to find out what variables and indicators reduce construction waste on the project of Non Kapt Fly Highway Construction. Tendean - Blok M - Cileduk with Work Design under Team Collaboration. Once the variables and indicators are identified, it will create a pattern of relationships between the relevant teams / stakeholders to improve project performance in reducing waste.

The objective of this study is to develop collaboration among stakeholders by mapping the most effective relationship patterns in a infrastructure construction project team with DB contracts, by conducting thorough literature reviews and information from site works. Hence, the suitable form of collaboration could be proposed and developed in integrated projects.

The problem and research question for this study is: How the stakeholder management can develop the collaboration between the relevant stakeholders in the infrastructure construction project with design and build contracts in Indonesia?

III. PERFORMANCE EVALUATION

PMBOK (2013) [4] states that Stakeholder Management includes the processes necessary to identify the people, groups, or organizations that may be affecting or affected by the project, analyze stakeholder expectations that may impact the project, and to develop management strategies for stakeholders who are effectively involved in project decisions and execution.

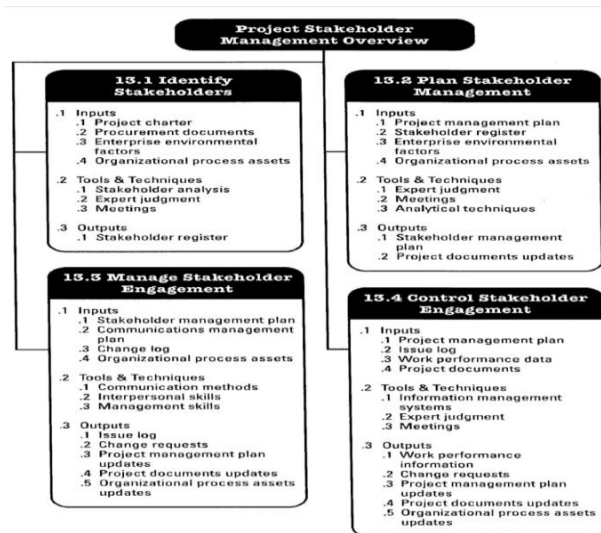


Figure 3: Project Stakeholder Management, Body of Knowledge (PMBOK 5th)

The stakeholder analysis (PMBOK 5th edition, 2013) follows the steps outlined below:

1. Identify all potential project stakeholders and relevant information, such as roles, departments, interests, levels of knowledge, expectations, and their influence. The main stakeholders are usually easy to identify.
2. Analyze the potential impact or support of each stakeholder can produce, and classify them so they can determine strategy approach. In large stakeholders, it is important to prioritize stakeholders to ensure efficient use from attempting to communicate and manage their expectations.
3. Assess how key stakeholders are likely to react or respond in various situations, to plan how it affects to increase their support and reduce potential negative impact.

There are several classification models used for stakeholder analysis, such as:

1. Power - Interest grid, grouping of stakeholders based on authority level ("strength") and level of interest (interest) on project outcome;
2. Power - Influence grid, grouping stakeholders based on authority level ("strength") and their active involvement ("influence") in the project;
3. Influence - Impact grid, grouping stakeholders based on their active involvement ("influence") in the project and their ability to make changes to project planning or implementation ("impact"); and
4. Salience Model, describes a class of stakeholders based on their power (ability to impose their will), urgency (the need for immediate attention), and legitimacy (their involvement is appropriate).

In line with the dynamic implementation process, collaboration is needed between all partners and as provided by Casinelli [5]. Collaboration is an activity that involves people / groups / organizations with different interests working together to achieve mutually satisfying outcomes. Collaboration is known and known by many terms, some popular terms include "problem solving", "consensus", "desire-based negotiation", "winning", "mutual benefit", and "principled negotiation" [6][7].

The purpose of collaboration is essentially to manage disputes so that the results are more constructive than the critical ones are dropped. A destructive and harmful result that involves exploitation and coercion. A good collaborative outcome will foster constructive communication, solve every problem, and improve

relationships [8]. Collaboration is everywhere its presence in our lives and the permanent features of modern society; Work is always social in the sense that objects and subjects, end and understandable, reason and need, apply and ability, are social mediation.

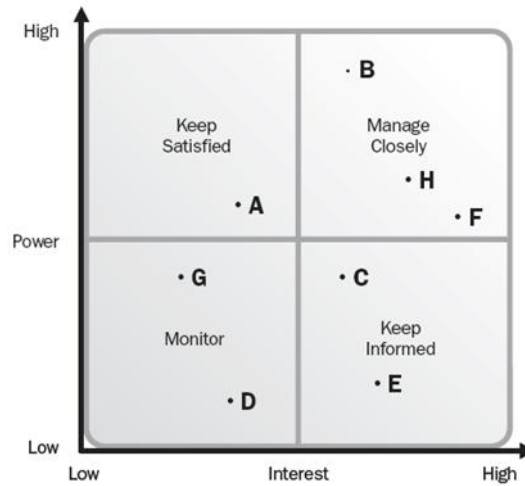


Figure 4. Example for Power - Interest Grid Model of Stakeholder Analysis (PMBOK 5th)

The benefits gained from good collaborative results will vary according to the type of business or company, but the benefits may include: increasing profits through sharing skills across business units or companies; Cost reduction through best practice; Enhance decision making through knowledge sharing and deep understanding; Innovation through sharing ideas; Improving the ability to pursue goals that include the distribution of units or companies. To achieve these successes and benefits, organizations must be mindfully aware of the potential losses, constraints and barriers to collaboration, in order to manage. Owners control the full collaboration through sharing information at the beginning of the project process most likely to achieve the desired results: fast, efficient, effective, and related building cost and time. The goal of all parties in the construction industry is to be better, faster, project delivery more capable of creating a collaborative, thorough and integrated team. Owners must make people who drive these changes, by leading collaborative creation, cross-functional teams composed of design, construction, and professional management facilities.

There are several collaboration models that has been identified by The Lodestar Foundation, published by ASU Lodestar Center, which are as follows [9]. In details, the collaboration characteristics that are suitable for integrated projects are described in Table 1.

Table 1: Collaboration Model, Condition, Challenge, and Benefit

Collaboration model	Condition	Challenge	Benefit
<i>Fully Integrated Model</i>	<ul style="list-style-type: none"> • Collaborator needs the same mission and complement each other • An overlap in service which is delivered efficiently • Competition for funding and client • Pressure from public is addressed with service duplication 	<ul style="list-style-type: none"> • Overcoming the competition with cooperation • Organization integration with different culture and history • Determining new leadership structure without position duplication • Determining new structure and leadership 	<ul style="list-style-type: none"> • Improving efficiency in project delivery • Reducing service overlaps in public level • More economic from the leading scale for easier resource access • Adopting each strengths from each party that collaborates will create larger strength in general

In creating a collaborative relationship, every stakeholder in the industry should be involved in trust-infrastructure and in a well-defined union. Based on the organization behavior theory, trust is a mutual agreement between social agent (people) to have an open communication and information to build a value creation through various disclosure approaches [8]. The Design and Build project accelerates delivery through simultaneous design and construction activities. Most design and construction functions are performed or

managed by one organization. This model, however, is used primarily for industrial projects that emphasize engineering design, as opposed to architectural design [9].

Based on the data collected through questionnaires that have been spread, stakeholders in the infrastructure construction project with design and build contract can be grouped as follows:

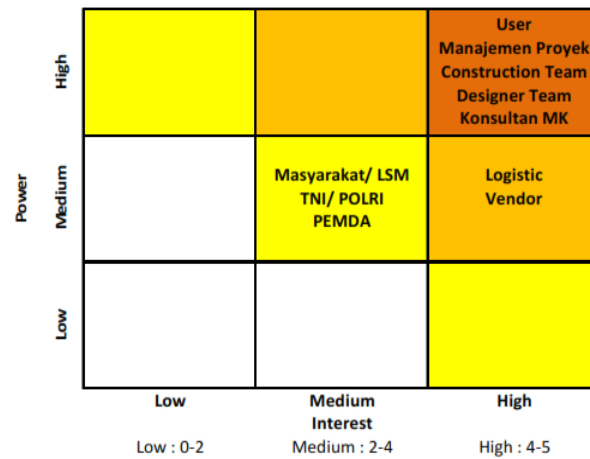


Figure 5. Stakeholder Mapping

Then we apply the results of stakeholder analysis in positive and negative interestas shown in the picture below:

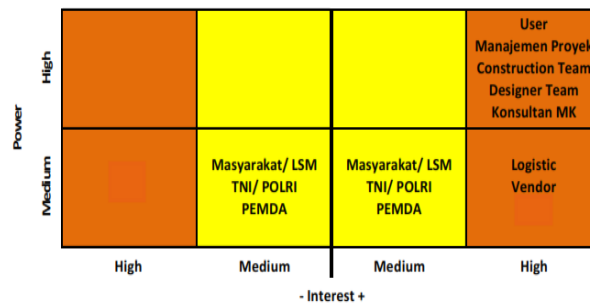


Figure 6. Stakeholder matrix for development of management strategies

- A. High-High-Positive:
User, Project Management, Construction Team, Planner Team and Construction Management Consultant
- B. High-Medium-Positive:
Logistics Team, Vendor/Supplier, DJU
- C. Medium-Positive:
NGO & Community, TNI / Polri, Local Government
- D. Medium-Negative:
NGO & Community, Armed Forces / Police, Local Government

Stakeholder Management also focuses on ongoing communication with stakeholders to understand their needs and expectations, issues that occur, manage conflict of interest and encourage appropriate stakeholder engagement in project decisions and activities. The satisfaction of the stakeholders should be managed as the main objective of the project.

IV. CONCLUSION

Identify the influential Stakeholders in the Contract of Design of the Non-Tol Kite Floating Construction Project. Tendean - Blok M - Cileduk organized by DKI Jakarta Provincial Highways (Bina Marga) is divided into two parts: internal / external team / stakeholder. Where the Internal Stakeholders consist of Project Manager, Project Designer, Engineering Team, Logistic Team, Project Builder, Subcontractor and Vendor and the Eksternal Stakeholders consist of Owner / User, MK Consultant / Supervisor Consultant, Government / Local / Private Institution, Community / NGO and TNI / Polri.

The relationship pattern and work plan in the relationship between stakeholders are made based on the concept of the 5th edition of PMBOK, 2013 in Knowledge Area stakeholder Management

REFERENCES

- [1]. Sasitharan Nagapan, I. A. (2012). Factors Contributing to Physical and Non-Physical Waste Generation in Construction Industry. *International Journal of Advances in Applied Sciences (IJAAS)* Vol.1, No.1, 1-10.
- [2]. Hu, W. (2008). Improving construction collaboration performance through supply chain control and management.
- [3]. Bynum, Stanley D., "Construction Management and Design-Build/Fast Track Construction from the Perspective of a General Contractor", *Journal of Law and Contemporary Problems*, 25-38, 1983.
- [4]. "A Guide to the Project Management Body of Knowledge (5th Edition)". Pennsylvania, USA: Project management Institute, 2013.
- [5]. Casinelli, M. (2005). AACE, International Transaction. Morgantown. Project schedule delay vs strategic planning, 191.
- [6]. Burgess, G. (1997). *Encyclopedia of Conflict Resolution*. Santa Barbara, California: ABC-CLIO, Inc.
- [7]. Fisher, R. (1991). *Getting to Yes: Negotiating Agreement without giving in* second edition. New York, NY: Penguin Books.
- [8]. Coser, L. (1956). *The Functions of Social Conflict*. New York: The Free Press.
- [9]. Harshada Patel, "Factors of collaborative working: A framework for collaboration model," *Elsevier*, p. 5, 2011.

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