A Survey Of Collaboration Model For Design And Build Projects In Indonesia

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Abstract. The present study identified the collaboration model of the stakeholders and analyze the main factors that support creating collaboration on design and build projects. A survey method was employed to identify variables affecting collaboration in the design and build project. In addition, direct observation and semi-structured interviews were also conducted on three randomly selected large-scale building projects to clarify The Main Foundation of Creating Collaboration Between Parties. Participants involved in the study were the project manager and owner of each selected project. Data for the study were analyzed using the SEM-PLS 3.0 program to determine the right collaboration model for the design and build project in Indonesia. Findings suggest that the conditions where stakeholders are very influential on culture so that it is possible to facilitate in building collaboration. Stakeholders involved in the design project are influenced by communication and conflict. Therefore, the design and project need to be aware on conflicts and communication. The main foundations for collaboration on design projects consist of how to manage stakeholders, know and understand the existing cultural dimensions of both ethnic culture and corporate culture, understand conflict management and resolve conflicts when they occur, and manage communication effectively customized to the design project.

Keywords: Collaboration, Conflict, Communication, Design and Build.

INTRODUCTION

Recently, a number of studies have revealed that effective communication management plan encourages a collaborative culture that develops a cohesive project team (Livesey, 2016) and effective collaboration is the one factors that influence of managing of construction project (Venkataraman & Cheng, 2018). The collaboration and communication are the most important aspect and to be the main root causes of design-construction problems (Liu, Xie, Xia, & Bridge, 2017). In addition, the collaboration in construction projects is marred by constraints, i.e., regionalism, opportunism, breach of trust, lack of commitment, and reliability (Deep, Gajendran, & Jefferies, 2020).

Theoretically speaking, the networks of project-based collaborative relationships evolve as complex adaptive systems whose dynamics are determined by a set of microlevel structure and attribute-based effects (Li et al., 2019). Moreover, the team collaboration resulted in reduced project cost growth, increasing owner ratings for building system quality and the turnover experience (Franz, Leicht, Molenaar, & Messner, 2017), thus the communication in planning and bargaining is the essential process to manage. This is a support system in team collaboration in Indonesia's design and build projects, and
the improvement process can be done by involving the communication early since the procurement process (Nursin, Latief, & Raditya, 2018).

Geared by research on project procurement, unexpected events frequently occur, and procurement methods in design and build projects are very promising for collaboration and the achievement of the goal of the projects (Fermé, Zuo, & Rameezdeen, 2018). Integrative and collaborative practices in the construction industry can be exclusively attributed to project-based design teams (Koolwijk, van Oel, Wamelink, & Vrijhoef, 2018). The development of a collaborative model can manage design changes using effective communication and project learning approaches. The importance of effective communication and project learning can improve the level of competency and cohesiveness of the project team in managing future projects (Yap, Abdul-Rahman, & Chen, 2017). Poor communication between project team members is a major cause of project overruns, rework, and disputes, while effective communication is the driver of the project change (Yap et al., 2017) (Ceric, 2014) (Simpeh, Ndihokubwayo, Love, & Thwala, 2015). It is caused collaboration in construction projects are temporary inter-organizational. Meanwhile, the construction company will continuously establish new project-based collaborative relationships. Consequently, the project-based industry-level collaborative networks generally are more dynamic than those project-level networks that characterize collaborative relationships within individual projects (Li et al., 2019); (Cao et al., 2017); (Tang, Wang, Li, & Cao, 2018).

Empirically speaking, the preliminary research on three cases of collaboration failure on three design and build projects in Indonesia shows that all three projects experienced delays with detailed time on project 1 with an initial working time of 18 months completed for 42 months, project 2 with an initial working time of 25 months completed for 49 months, and project 3 with an initial working time of 18 months, completed for 24 months. Anchored by the aforementioned complexities above, this paper reports on a survey study of stakeholders’ collaboration model and analyze the main factors that support creating collaboration on design and build projects. Findings from this study are expected to maintain the collaboration between stakeholders in the design and build projects by considering factors as the main indicators to determine a collaboration team. Thus, the barrier factors that interrupt the collaboration can be avoided.

LITERATURE REVIEW

Collaboration model

In a theoretical basis, collaboration concerns with the interpersonal processes and reflects the level of trust and commitment between people (Kache & Seuring, 2014). Some organizations find many difficulties in creating value for mutually beneficial collaboration, so collaboration strategies often fail to meet expectations (Koolwijk et al., 2018). There are several collaboration models identified by The Lodestar Foundation as published by ASU Lodestar Center, among others: Fully Integrated Model, Partially Integrated Merger, Joint Program Office, Joint Partnership with Affiliated Programming, Joint Partnership for Issue Advocacy, Joint Partnership with the Birth of a New Formal Organization, Joint Administrative Office and Back Office Operation, and Confederation (Foundation, 2018).

Harvard Business Review explains four forms of collaboration. First, Innovation Mall is where companies can place problems, everyone can deliver solutions, and companies choose the best solutions such as InnoCentive.com website, where companies can solve skills problems. Second, The Innovation Community, a network where everyone can communicate concerns, often solutions, and solutions to use such as open Linux software community. Third, The Consortium, a private group of participants who join
the selected issue, decides how to work on and chooses the solution such as IBM's cooperation with certain companies who work together to develop semi-conductor technology. The last form of collaboration is The Elite Circle, a group with selected companies explaining the problem and making decisions such as Alessi group set from more than 200 design experts, who developed a new Concepts for home production (Verganti, 2008).

**Key elements for creating collaboration on design projects**

The conditions of collaboration in construction relate to various aspects of collaboration, i.e. collaboration mechanisms, stakeholders, culture, parameters, communication, conflict resolution, construction waste, index of collaboration maturity, and identification of waste improvement in life cycle projects (Nursin et al., 2018).

The project management is closely related to time, cost, and resources. Significantly, the maturity level of collaboration is very influential in determining the success of construction projects (Nursin et al., 2018). The level of collaboration capability is determined by maturity in collaborating, namely: (1) while (ad-hoc), planned, (3) aware and (4) reflexive, as seen in Figure 1 (Magdaleno, Araujo, & Werner, 2011).

![Collaboration Maturity Model](image)

**Figure 1.** Collaboration Maturity Model Overview (Magdaleno et al., 2011)

**Collaboration and conflict management**

Stakeholder engagement control is the process of monitoring the relationship of stakeholders of the project designed thoroughly by adjusting the strategy and plan of stakeholder engagement and handling of emerging conflicts (Leung, Yu, & Liang, 2013). Parties involved in conflicts may occur between external or internal stakeholders or a combination of the two. It is likely that the most difficult conflict is resolved if it occurs among external stakeholders. This can be due to the diversity of stakeholders and the unavailable conflict resolution procedures. Conflict resolution is a resolution package containing a series of stakeholder approaches to all initiatives and authorizations and is heavily intervened by third parties (L. E. R. Gloria Febriani, 2017).

Given the scarcity of survey research on the collaboration model of design and build projects in Indonesia for the past decades, the present study was enacted to fill the gap by exploring three Indonesian large projects that were randomly selected. The study’s findings are likely to shed light on the importance of maintaining the collaboration between stakeholders in the design and build projects.
by considering factors as the main indicators to determine a collaboration team, thus avoiding hindrance during the collaboration model enactment.

**METHOD**

To identify variables affecting collaboration in the Design and Build project, a survey design was employed. The variables were broken down into indicators and sub-indicators to be further transformed into questions. In addition, direct observation was carried out on three large projects that were randomly selected to ensure that the questionnaire responses were in accordance with the empirical evidence. Semi-structured interviews were also conducted toward three project managers and owners to clarify The Main Foundation of Creating Collaboration Between Parties. Furthermore, the data were analyzed using the SEM-PLS 3.0 Professional program to determine the right collaboration model for the Design and Build project in Indonesia.

![Figure 2. Reflective indicator analysis procedure with SEM-PLS 3.0 professional (Ghozali, 2012)](image)

All indicators in the present study reflect the latent contract, where each latent contract can be seen in Table 1.

**Table 1. Identification of Research Variables**

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<thead>
<tr>
<th>Aspect</th>
<th>Indicator</th>
<th>References</th>
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<tbody>
<tr>
<td>Stakeholder</td>
<td>Stakeholder Analysis</td>
<td>(Jepsen &amp; Eskerod, 2009); (Antonioni, 2009); (Rajeev &amp; Kothai, 2014)</td>
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<td>Stakeholder Mapping</td>
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<td>Stakeholder Management</td>
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<td>Internal Stakeholder</td>
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<td></td>
<td>External Stakeholder</td>
<td>(Vogwell, 2003); (Olander &amp; Landin, 2005); (Doloi, 2011)</td>
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<td>Culture</td>
<td>Company Culture</td>
<td>(Gea, 2014); (Gultom, 2014); (Terje Karlsen, 2011)</td>
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<td></td>
<td>Ethnic Culture</td>
<td>(Terje Karlsen, 2011); (An-Shuen Nir, 2012)</td>
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<td>Conflict</td>
<td>Work Organization</td>
<td>(Vaaland, 2004); (Alazemi &amp; Mohiuddin, 2019); (Iyiola &amp; RJoub, 2020)</td>
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<td>Resources</td>
<td>(Vaaland, 2004); (Alazemi &amp; Mohiuddin, 2019); (Iyiola &amp; RJoub, 2020)</td>
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<tr>
<td>Communication</td>
<td>Communication Planning</td>
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<td></td>
<td>Information Distribution</td>
<td>(Jubaedah, 2019); (Rajkumar, 2010)</td>
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<td>Identification of Component</td>
<td>(Jubaedah, 2019); (Rajkumar, 2010)</td>
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<td>Communication Approach</td>
<td>(Jubaedah, 2019); (Rajkumar, 2010); (Zhu et al., 2017)</td>
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<td>(Camarinha-matos &amp; Afsarmanesh, 2008); (Camarinha-matos, 2010)</td>
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<td>Collaboration Strategy</td>
<td>(Camarinha-matos &amp; Afsarmanesh, 2008); (Camarinha-matos, 2010)</td>
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<td>Leadership Style</td>
<td>(Xu, Bower, &amp; Smith, 2005); (Mazzetto, 2017)</td>
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<td>Collaboration Pattern</td>
<td>(Verganti, 2008); (Palmer et al., 2009); (Schadewitz, 2009); (Schadewitz, 2009)</td>
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<td>Range of Collaboration Limit</td>
<td>(Karrbom Gustavsson &amp; Gohary, 2012); (Saukko,</td>
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FINDINGS AND DISCUSSION

Collaboration model in Indonesia’s design and build project
Based on the analysis, Figure 3 portrays collaboration model in the Indonesia’s design and build projects. Communication development in the design project is based on the needs posed by stakeholder collaboration. The involvement of various stakeholders requires mapping a clear communication flow among stakeholders.

![Figure 3. Collaboration Model in Design and Build Project](http://www.webology.org)
Figure 3 showcases the collaboration process in design and build, which refers to involving stakeholders and communication relation between stakeholders. The relationship requires the management of communication with various communication and maintaining active consultation and relationships between stakeholders. Based on the survey, it can be explained that the design project building construction projects and infrastructure projects have the same process. From the observations, the intensity of communication between stakeholders is consequently high, so it should be managed properly to avoid the potential for conflict in the future.

The discussion on the collaboration model used in the design project indicates that this model begins by preparing the main foundation of collaboration implementation. This stage needs to be considered as it is a fundamental factor to support the success of the collaboration. Efforts to build collaboration need to be done through the stages of planning and operational collaboration so that conflict and communication always react and respond well to the dynamics in the collaboration process. This result is also supported by previous research which explains that in a project, the owner and contractor often have different or conflicting perspectives, for example related to costs (Moon et al., 2020). This often happens because communication in the construction domain is quite complex, where effective communication is very important (Soliman, 2008). Communication in construction projects places more emphasis on matters related to the project environment with extraordinary difficulties (Kwofie, Aigbavboa, & Thwala, 2020). At the evaluation stage, the structural model was analyzed by looking at the significance of the relationship between constructs indicated by the T-statistical value resulting from the output of the options calculate PLS--- Bootstrapping. The path coefficient measures the magnitude of the influence between constructs and the effect of their interaction (moderation). Path coefficients that have a T-statistic ≥ 1.96 or have a P-value ≤ 0.05 are declared significant.

**Table 2. Path Coefficient**

| Construct Relation                      | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | T Statistics (|O/STDEV|) | P Values |
|-----------------------------------------|---------------------|-----------------|-----------------------------|-------------------------|----------|
| Culture -> Collaboration                | 0.55                | 0.53            | 0.07                        | 8.42                    | 0.00     |
| Culture -> Communication               | 0.55                | 0.56            | 0.07                        | 7.90                    | 0.00     |
| Culture -> Conflict                    | 0.23                | 0.24            | 0.11                        | 2.02                    | 0.04     |
| Communication -> Collaboration          | 0.18                | 0.18            | 0.07                        | 2.59                    | 0.01     |
| Conflict -> Collaboration              | 0.08                | 0.09            | 0.05                        | 1.65                    | 0.10     |
| Stakeholder -> Culture                 | 0.50                | 0.52            | 0.05                        | 9.31                    | 0.00     |
| Stakeholder -> Collaboration           | 0.26                | 0.26            | 0.04                        | 6.01                    | 0.00     |
| Stakeholder -> Communication           | 0.30                | 0.30            | 0.07                        | 4.52                    | 0.00     |
| Stakeholder -> Conflict                | 0.46                | 0.47            | 0.08                        | 5.86                    | 0.00     |

Based on Table 2, it can be explained that stakeholders positively influence culture, and culture has a positive influence on collaboration. This is also in line with the results of previous research which explains that organizational culture has a positive effect on trust and knowledge. Knowledge sharing
has a positive effect on collaboration, and collaboration has a positive effect on performance (An-Shuen Nir, 2012). In addition, communication also has a significant influence on collaboration, while conflict does not directly affect collaboration. During the implementation of collaboration, there are conditions where the possibility of conflict and communication can eliminate conflict. This is supported by the opinion of several previous studies which explain that handling good communication and conflict will have a positive effect on a collaboration (Iyiola & Rjoub, 2020); (Alazemi & Mohiuddin, 2019); (Yap et al., 2017). Thus, conflict and collaboration become a motor that will move the collaboration with the expected trajectory. Both conflict and communication factors are important to understand as the strategy is used to maintain the collaboration process's turnaround. Thus, conflict and communication always dynamically react and respond to the dynamics that occur in the collaboration process.

The main foundation of creating collaboration between parties

The observation and interviews depict that the collaboration process carried out on the design project should consider several aspects: preparation, collaboration strategy, leadership style, the form of collaboration, collaboration boundary range, and collaboration success rate. Each of these stages is detailed below:

In the preparation stage, the process of implementing collaboration begins with finding agreements (determining problems, making choices) after the agreement (ratification of the agreement, integrate of the agreement, implementing the agreement, opening negotiations, and building solid teamwork). The collaboration strategy covers several aspects, among others: bringing the parties to collaborate (gathering teams, providing explanations of cooperation methods), providing understanding (explanation of project scope, project work methods, and expected project implementation process), desired success (setting project goals, determining acceptability requirements, preparing indications of success), building cooperation in the project (leadership, role/responsibility issues, communication, decision making, time management/priorities, defined milestones, awards and recognition, and evaluation plans), Identification of possible obstacles (identification of barriers, analyzing obstacles, developing alternative solutions), identification of non-collaborative components (identification of components, establishing collaboration work criteria, selecting the level of importance), and collaborative commitment from members (explaining collaboration process, collaboration work patterns, and member commitment to collaboration).

In the leadership style, several aspects are worth noting, among others: organizational structure (spread across organizations, and networking across organizations), relevant information (employees at all levels, employees on-site, employees on stakeholders), decision-making authority (collaboration leaders, vice-appointed leaders), the basis of accountability and industry (performance of each stakeholder, performance of common goals), the best way of working (working well for groups, working well across work units, working well across companies, working with innovation, working creatively).

Forms of collaboration to be implemented including collaboration processes/projects (more structured projects or activities involving many parties), a collaboration of task dependency (explicit task dependency, expected good lead outcomes, time limits, and goals of activities), full integrate collaboration (the same mission of member, complementary tasks, no overlap in services, services efficiency, competence for funding, competition by clients, pressure from the community, and no duplication of services), consortium collaboration (group participants, joining selected issues,
deciding how to work on them, choosing solutions), information democracy collaboration (clear goals, well-formulated responsibilities, harmonious team relations, having aggressive business goals, and avoiding conflicts), and multi-organizational project collaboration (high coherent degrees, unity of goals and projects, avoid of confusion, management of conflict, and clear of purpose). This type of collaboration can be selected one or combined between one form with another. The range of collaboration boundaries is required when collaborating so that each stakeholder’s tasks are collaborated or integrated with this boundary range includes geographical boundary range (providing co-working space, providing shared social space), stakeholder boundary range (conducting joint field studies, taking joint responsibility towards project achievement, forming a team of internal and external stakeholder collaborators, managing dynamic and non-rigid organizational structures), professional boundary range (forming cross-profession focus groups).

The success rate of collaboration is a successful collaboration process that include successful team collaboration (getting to know the project team members well, willing to trust and gain the trust of project team members, able to communicate well and smoothly with fellow project team members, get the encouragement to contribute to solving problems in project team meetings, have a solid and well-connected project team, have a high flexibility space in the dynamics of project implementation, produce innovative products or methods from a high innovation drive in the team, feel the atmosphere of sharing knowledge (knowledge sharing) thick and eager to contribute experience based on the expertise owned. These results are also supported by several studies which explain that the challenges associated with leadership and team building efforts are key components for successful collaboration (Kereri & Turner, 2017); (Tsai & Chi, 2015). Several relationships between stakeholders in a construction project must be managed properly because they have quite complex relationships, including the construction team and sub-contractors; consultant with owner, construction team with logistics team, project manager with design team, and design team with Engineering team (Nursin et al., 2018). Prerequisite forms or frameworks for collaboration within the organization also need to be identified to convince investors of existing team collaboration (Saukko et al., 2020). The selection of the right form of collaboration will also support project performance and become a strategic alliance (Moradi, Kähkönen, Klakegg, & Aaltonen, 2021). Collaboration between design and construction from the outset allows design and build projects to have generally better cost performance than conventional methods (Sun, 2019).

Conclusion

The present study has revealed the collaboration model of the stakeholders and analyze the main factors that support creating collaboration on design and build projects in Indonesia. The collaboration model shows the importance of stakeholders in design projects, seen from the conditions where stakeholders are very influential on culture so that it is possible to facilitate in building collaboration. Stakeholders involved in the design and build project are influenced by communication and conflict. Communication management related to the design project is helpful in smoothing the flow of communication between the parties so that communication errors can be minimized. The potential for conflict from stakeholders in the design project is significant. Therefore, the design project needs to be aware of the existence of conflicts. Thus, stakeholders are critical in the design and build project. The main foundations for creating successful stakeholder collaboration on design projects consist of how to manage stakeholders, know and understand the existing cultural dimensions of both ethnic
culture and corporate culture, conflict management, and resolve conflicts when they occur, and manage communication effectively customized to the needs of the design project. From the discussion, it is construed that each of these main foundations requires adjustment to the phases that occur in the design process. This means that the level of importance is adjusted to the design process.

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