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### APPLYING SOFT SYSTEMS METHODOLOGY TO IDENTIFIED FACTORS OF PARTNERSHIPS MODEL IN CONSTRUCTION PROJECT

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**Keywords:** partnerships, construction partnerships, Soft System Methodology.

#### ABSTRACT

Applying the Soft System Methodology in identifying the factors that influence the partnerships model in a construction project that is very suitable for analyzing the complexity of the partnerships problems in a construction project. The purpose of this study is to reveal the factors in compiling a partnership model in a construction project, through the SSM concept which will provide a map/demarcation of a series of thinking that is easier and clearer in analyzing, identifying and assessing influencing factors. Through various literature studies and relevant literature, this research will reveal the factors that can be implemented in the research concept based on partnerships in construction projects. The final recommendations of this paper are the factors analyzed which have a significant influence on partnerships in construction projects that can be used by owners, contractors and academics in developing further research and Focus Group Discussion (FGD).

**Keywords:** partnerships, construction partnerships, Soft System Methodology.

#### INTRODUCTION

In the economic growth of a nation, construction productivity is an important role in the industry (Naoum, 2016). The construction industry is one of the important sectors in Indonesia because it provides a variety of infrastructure that functions to support various economic activities of the community. The construction industry contributes 10.38% Gross Domestic Product (GDP) (2018) and an increase of 10.76% (2019)

(Ministry of Industry, BPS, 2019), Indonesia's state budget allocation for infrastructure is quite large, worth 415.0 T (2019) of the total APBN 22461.1T (Ministry of Finance, 2019). Indonesia is ranked the highest in ASEAN and is in the fifth position in the world with a contribution of 2.5 per cent (2018) to the international economy. The big role of the construction world in Indonesia's economy, of course, has problems and challenges, one of which is low productivity and waste in construction projects. The low productivity in a project causes the project to not be implemented in a timely, quality and efficient manner. There are many factors behind the low productivity in the project, including the occurrence of "waste" in the project which is not realized and measured, but in the long term, it can greatly affect project performance. Hamza (2019) identifies factors related to productivity through literature from various countries including the State of Indonesia, finding that in Indonesia low productivity in construction projects is caused by (1) lack of material; (2) delay in the arrival of materials; (3) unclear instructions to workers (labourer); (4) labour strikes and (5) financial difficulties experienced by the owner. Low productivity must be resolved with a solution approach that can overcome these problems. Partnering is a necessity in construction projects to overcome various problems of productivity and waste in the project. The factors in construction project partnerships must be identified, analyzed and disclosed to provide maximum value in the management of partnerships in construction projects.

Soft Systems Methodology (SSM), Strategic Choice Approach (SCA) and Strategic Options Development and Analysis (SODA) have been recently corroborated (Eden and Ackermann, 2006). Hard systems are successful when the problems and goals for achievement are well defined. However, in certain situations when the 'problem' itself is unclear, difficult, fails to provide useful insights (Checkland, 1980, 1981; Checkland and Scholes, 1990) it is necessary to use a soft system thinking approach in the problem to be solved. Soft Systems Thinking does not only seek goals but learns how problematic situations (not just problems) should be studied, and most importantly from those situations what should be discussed. 'holons' as mental constructs for conceptualizing problem situations - to learn from these and improve (not 'solving') the situation (Ackoff, 1993; Checkland and Poulter, 2006).

The result of this research is a system that is structured according to the steps developed in Soft system methodology (SSM) which is believed to be able to intervene in a more structured way of thinking. SSM applications that use systems concepts as a background can facilitate intervention and, ultimately, can help overcome the complexity of factors and variables in construction project partnerships. SSM provides directions in the form of maps/demarcations that are easier with the help of rich picture analysis to form a mindset in understanding existing situational problems. This paper to illustrate an application of SSM to make sense of a problematic situation in the context of model partnerships in a construction project, next shows an illustrative approach to evaluating the factors and variables that influence construction project partnerships. In analyzing the problem, it will be described with a rich picture, root cause analysis and CATWOE so that the SSM approach method is a very suitable method for analyzing the complexity of factors and variables in construction project partnerships.

## **RESEARCH OBJECTIVE**

The purpose of this research is to reveal the influencing factors in construction project partnerships using Soft Systems Methodology thinking. Furthermore, the results of this research can be used as a starting point in carrying out Forum Group Discussion (FGD), more advanced research in uncovering the factors that influence partnerships in construction projects.

### **LITERATURE REVIEW**

Low productivity levels are one of the biggest challenges faced by the construction sector (Jarkas and Bitar 2012). The construction industry in many countries around the world is very concerned about low levels of productivity (Lim and Alum 1995; Egan 1998; Ayele and Fayek 2019). Low productivity levels are dangerous and lead to inflationary pressures, social conflict and distrust of economic conditions (Drucker 2012; Dixit et al. 2019; Shoar and Banaitis 2019). The crucial issue facing the Indonesian nation today is the inadequate condition of infrastructure, both quantity and quality (Suripin, MA Wibowo, 2017).

Mohammed Hamza (2019) identifies factors related to productivity through literature from various countries including the State of Indonesia, finding that in Indonesia low productivity in construction projects is caused by (1) lack of material; (2) delay in the arrival of materials; (3) unclear instructions to workers (labourer); (4) labour strikes and (5) financial difficulties experienced by the owner. Apart from these factors, in general, factors that occur in almost all countries are lack of competence in supervisors in planning and management (Incompetent supervisors / poor management and planning), worker efficiency (Worker efficiency/skills training), problems with development (default payments), errors in work methods (Poor construction methods) as well as the number of accidents and the application of K3 (Safety/accidents).

Alwi et.al (2002) found a number of "waste" in construction projects in Indonesia and grouped them into several categories and then gave 5 recommendations in solving the "waste" problem, including (1) establishing a relationship long term with manufacturers and suppliers to develop shipping methods that avoid excessive inventory and delays; (2) consider the use of local materials and natural resources as much as possible; (3) conducting regular training programs for foremen and labourers, and educating them to understand the concept of "waste"; (4) transparency in the construction process, so that everyone involved in the process can identify any problems during the project; and (5) establish regular cooperation and meetings among project participants, involve all construction personnel from various levels, increase mutual trust and encourage cooperation as partners. To reduce waste and increase productivity in construction projects, it is carried out by establishing long-term relationships between producers (contractors) and suppliers (suppliers) to avoid material scarcity, delays, material effectiveness, reduce excessive material and ensure timely delivery of materials.

Soft Systems Methodology (SSM) has been in development for over thirty years by Peter Checkland and his associates at the University of Lancaster in the United Kingdom. It is mainly used in the areas of management and information systems development. This systems thinking approach is commonly described as comprising an iterative four-stage process – finding out, modelling, comparison, and taking action. For instance, Rich Pictures are often used to structure the data and impressions at the finding out stage in exploring perceptions in the ‘real-world problem situation’.

The main idea in Rich Picture building is to present structures and processes relevant to the situation under study and depict these, including relationships, within the ‘climate’ in which they exist. In modelling purposeful activity, the second stage, Checkland suggests some precise techniques – Root Definition and Activity Models – to focus and further systems thinking proficiencies. Data collection is typically inclusive, incorporating affected actors, decision-makers, worldview, process and constraints for the real world system under study (Bergvall-Kareborn, Mirijamdotter, Basden 2004). Cyclically, the outcome of the modelling stage is then compared against perceptions of the real-world situation to find issues and suggestions for improvements. In the comparison stage, participants seek accommodation of desirable and feasible changes which are then implemented, and a new cycle begins.

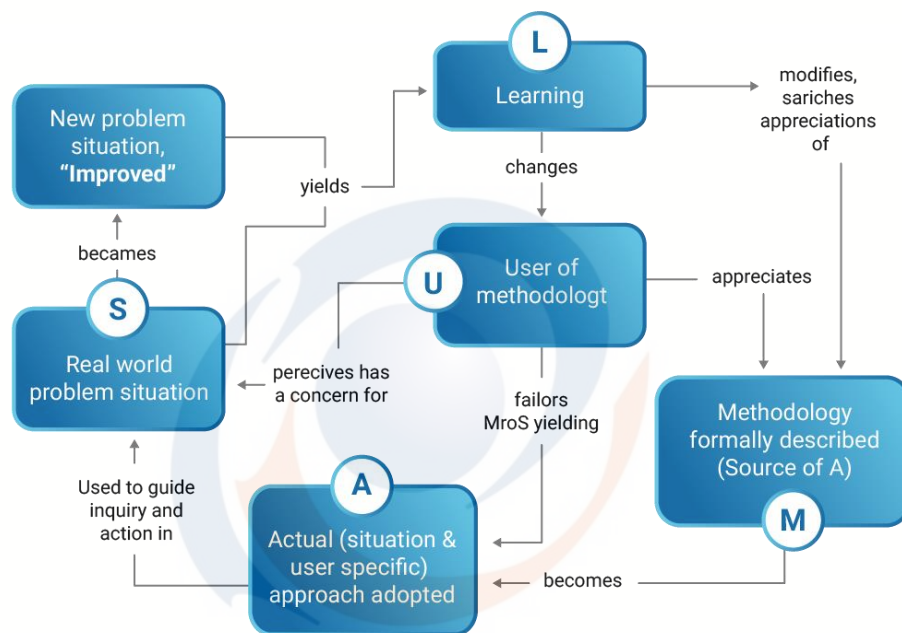


Figure 1: The LUMAS Modelling (Checkland, 1999)

**METHODOLOGY**

The methodology used in this research is a literature study from relevant literature and comparative analysis from previous research. Previous research revealed various factors that influence construction project partnerships. Problem analysis is carried out using the CATWOE analysis and LUMAS Model approaches to reveal partnerships in construction projects.

The use of the soft system methodology model aims to analyze a problem, the purpose of using the model is to make it easier to view a problem more easily and comprehensively. Describing models in partnerships that affect a construction project will make it easier to analyze influencing factors and variables so that they can be used as a starting point for researching at an advanced level. The purpose of knowing the various factors and variables that influence partnerships in construction projects are:

- a. Analyze the problem that causes low productivity in construction projects.
- b. Maximizing the factors that cause increased productivity in construction projects.
- c. Evaluating model partnerships that occur in construction projects.

- d. Referral in the implementation of Focused discussion groups (FGD) which aims to further confirm the research.

CATWOE (Customers – Actors – Transformation process – Worldview – Owners – Environmental Constraints) analysis is an analysis that aims to map and identify problem areas, see what you want to achieve, and which solutions can affect stakeholders. The analysis uses thinking solutions from multiple perspectives.

Table 1. CATWOE analysis

CATWOE	Owner
CUSTOMER	Owner,
ACTOR	Contractor and Subcontractor
TRANSFORMATION PROCESS	How can the partnership model be developed to support the implementation of "increase productivity" to reduce waste and increase/maximize good values in construction projects.
WORLD VIEW	The owner gets the project according to his expectations and the building becomes functional. The contractor gets the desired profit, the project is on time, the quality of construction is following the contract.
OWNER	Owner –contractor, contractor-subcontractor/supplier
ENVIRONMENTAL CONSTRAINTS	partnerships in the project life cycle to construction work do not include elements of operation & maintenance. Refer to the Regulation on partnerships.

The aim of CATWOE (table 1) is to ensure that the root definition is well formulated and the objective of the Formal System Model (FSM) is to ensure that the resulting Conceptual Model can be maintained. The SSM paradigm is a study that uses a methodology that focuses on root definition which is poured into the conceptual model so that it is easier to understand and analyze what causes, methods and objectives should be achieved.

Figure 2. shows that the owner wants the project to run well, on time, to have a performance that is following the feasibility of the building, cost and quality. But what happens in the construction process of low productivity and waste occurs a lot in the project. Some of the wastes that occur in the project that cause low productivity include: 1) lack of material; (2). delay in the arrival of material; (3). Unclear instructions were given to construction personnel; (4). Labour strike (5). Financial difficulties faced by the owner.

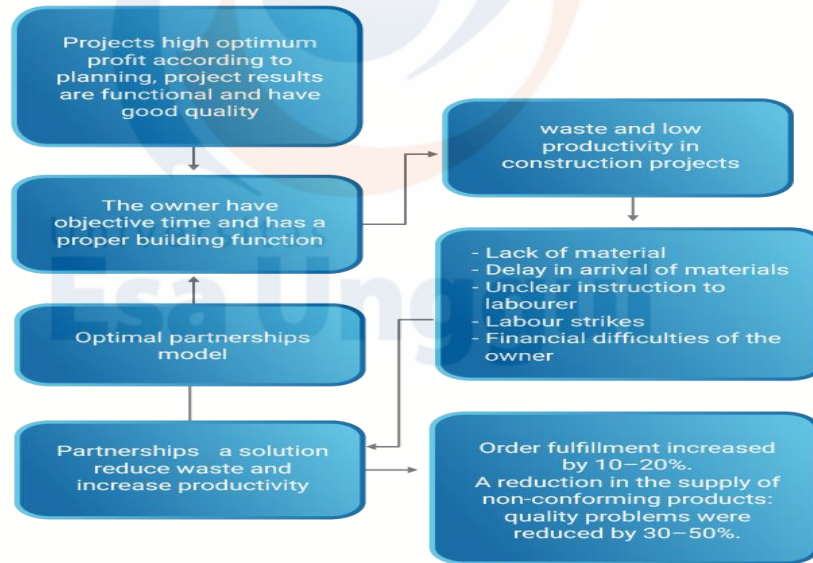


Figure 2. LUMAS Model Partnerships

The concept of partnerships in projects, especially those carried out by owner-contractors, contractors, subcontractors can overcome various problems of waste and low productivity that occur in construction projects. Partnerships ensure material planning is properly implemented and available when needed. Partnerships will reduce errors in instructions because the subcontractor prepares the working method correctly. The existence of an agreement related to the payment terms between the owner and the contractor/subcontractor will make the financial plan more controllable.

**RESULTS**

The results of CATWOE analysis and LUMAS model above, then an analysis of determining factors and co-factors in construction project partnerships is carried out when viewed from various problems that result in low productivity and the amount of waste occurs in the project, then they are grouped as follows:

Table 2. Partnerships cause and solution

N o.	Cause	Solution
1	Lack of material	Subcontractors/contractors are involved from the time the preliminary design/project initiation is carried out so that they can set a schedule for material delivery on time.
2	Delay in arrival of materials	The schedule for requiring materials can be predicted from the start, including materials that are scarce in production and require a long purchasing order.
3	Unclear instruction to labourer	Subcontractor/contractor partnering reduces unclear instructions on the job because it is carried out by a skilled and tested workforce.

4	Labour strikes	Workers do a demonstration if there is a delay in granting their rights, partnering will ensure that workers work following procedures and that their rights can be fulfilled because there is a smaller level of control in workforce management.
5	Financial difficulties of the owner	The owner experiences financial difficulties if expenses are not well planned, partnering forms cooperation in cash flow management by both the owner and the contractor/subcontractor.

Errasti (2007) found that partnerships undertaken in construction projects prove to generate order fulfilment Increased by 10-20%, a reduction in the supply of non-conforming products: quality problems were reduced by 30–50%, A reduction in the cost of supplies: supplier prices reduced by 3–5%. Factors and co-factors that influence building a good partnership must be disclosed, to maximize these factors and co-factors to achieve project objectives.

The factors that affect partnerships according to previous research, among others, according to Lettice (2010), in partnership, investment is needed from both parties to reduce costs and time, improve quality, improve coordination and change knowledge and communication in organizations. Brown et al. (2001: 195) states that the partnership relationship in the construction industry is often not long term (on-off) requires loyalty, comfort in partnering, dependence on partnering relationships is often avoided because one party feels unfairness. According to Gadde (2010), the types of partnership relationships in construction projects are longevity (long term), adaptive, dependence, interaction, atmosphere, oriented to mutually beneficial relationships. Hanna (2019) states that partnerships in construction infrastructure must be accountable, responsible, effective and efficient and legitimate. According to Cordon et. al (2005) stated that to obtain attractive partnerships, values, namely credibility; fairness; loyalty, realism and shared values, to obtain operational comfort, partnerships must be carried out based on the values of reliability, support and rescue. Other studies on factors that must be considered in partnerships include investment (Kanter (1994), Ganesan (1994)), adaptation (Wilson (1995), Dwyer and Tanner (1999), Morgan and Hunt (1994)), communication: (Anderson and Weitz, 1989), Institutionalization (focus on intra-organization) (Kanter (1994) Day (1995) Mentzer (2000)).

Figure 3. It is the factors from various literature and previous research which are clustered, there are 5 clusters based on previous research. All of these factors have been researched and proven to affect partnerships in organizations and construction projects. From the clustering, the factors are then grouped and selected to be recommended into factors that can be tested through primary data collection in the field and verification through construction management experts in a Focused Discussion Group (FGD). Matters that need to be considered in the preparation of research instruments in the field are grouped into 2 groups of data, namely the perception of partnerships according to the owner and the contractor. Because the two perceptions are very different in producing a partnerships analysis model in a construction project.

The factors that affect previous research are only a few variables and the research is still separate, this study will combine the factors that influence to achieve an optimal partnership model that supports increased productivity and reduced waste in

construction projects. Figure 4 is a description of factors that can be done to analyze the optimum partnerships model in a construction project, which is the result of a study of literature and previous research. Several new factors have been proposed as predicting factors from the author based on the experience and review of the existing literature.

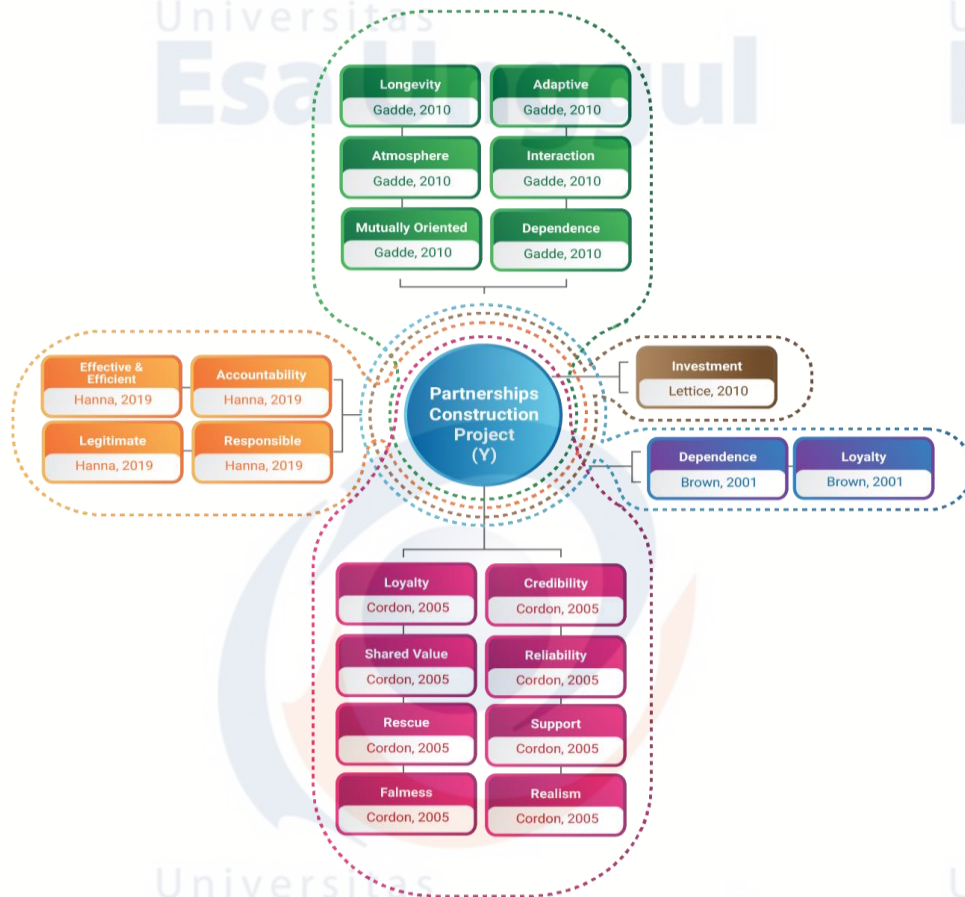


Figure 3. Clustering factors of partnerships



Figure 4. Factors of partnerships



Table 3. Factors of Partnerships

Code	Factors	References
Y	Partnerships in construction project	
X1	Credible	Ganesan (1994), Cordon (2005), Hanna (2019)
X2	Responsible	Hanna (2019), Cordon (2005)
X3	Fairness	Ganesan(1994), Dwyer, Schurr and Oh (1987), Cordon (2005), Gadde (2010)
X4	Loyalty	Walter et al. (2001), Brown (2001), Cordon (2005)
X5	Reliability	Ulaga (2003), Cordon (2005)
X6	Share Value	Lettice (2010), Gadde (2010), Hanna (2019), Cordon (2005)
X7	Support	Ulaga (2003), Cordon (2005)
X8	Adaptive	Gadde (2010), Hanna (2019), Cordon (2005)
X9	Have Alternative	Wilson (1995), Dwyer and Tanner (1999), Gadde (2010), Hanna (2019), Cordon (2005)
X10	Rescue	Walter et al. (2003), Cordon (2005)
X11	Communication	Gadde (2010), Anderson and Weitz(1989)
X12	Longevity	Gadde (2010), Brown (2001), Cordon (2005)
X13	Investment	Kanter(1994), Lettice (2010), Gadde (2010), Kanter (1994), Ganesan (1994)
X14	Comfort	Gadde (2010), Brown (2001), Cordon (2005)
X15	Interaction	Gadde (2010), Anderson and Weitz(1989)

### CONCLUSION

1. The low productivity in Construction Project and the occurrence of waste in construction projects can be overcome by partnerships between owner-contractors, contractors-subcontractors / suppliers.

2. There are 15 factors that can be analyzed in forming an optimal partnership model in a construction project. These factors can be further developed in the hard system to obtain primary data in the field.
3. It is better if the questionnaire is arranged in 2 forms, namely the perception of the partnership according to the owner and the contractor so that the factors that influence the partnership of the 2 approaches can be drawn.

## REFERENCES

- Paucar-Caceres, A., Hart, D., Roma i Verges, J., & Sierra-Lozano, D. (2016). Applying soft systems methodology to the practice of managing family businesses in Catalonia. *Systems Research and Behavioral Science*, 33(3), 312-323.
- Errasti, A., Beach, R., Oyarbide, A., & Santos, J. (2007). A process for developing partnerships with subcontractors in the construction industry: An empirical study. *International Journal of Project Management*, 25(3), 250-256.
- Mirijamdotter, A., & Somerville, M. M. (2010). SSM inspired organizational change in a North American university library: Lessons learned. In *Public Systems in the Future-Possibilities, Challenges and Pitfalls: Proceedings of the 31st Information Systems Research Seminar in Scandinavia*.
- Arsanious M. Hanna (2019), *Public and Private Partnerships in Infrastructure Construction*, California State University, Northridge
- Brian Wilson (2001), *Soft Systems Methodology "Conceptual Model Building and its Contribution"*, John Wiley & Sons Ltd.
- Cordon, C., Vollmann, T. E., & Hald, K. S. (2005). Managing attraction in customer-supplier partnerships. *IMD International Working Paper*, IMD 2005-29, pp. 1-29.
- Checkland, P., & Scholes, J. (1999). *Soft systems methodology: A 30-year retrospective*. pp. 330. Chichester: John Wiley.
- Checkland, P. (2000). *Soft systems methodology: A thirty year retrospective*. *Systems Research and Behavioral Science*, 17(S1), S11-S58.
- Wibowo, M. A. (2017). Model of Construction Waste Management Using AMOS-SEM for Indonesian Infrastructure Projects. *MATEC Web of Conferences*, 138, 05005.
- Lettice, F., Wyatt, C., & Evans, S. (2010). Buyer-supplier partnerships during product design and development in the global automotive sector: Who invests, in what and when? *International Journal of Production Economics*, 127(2), 309-319.
- Gadde, L. E., & Dubois, A. (2010). Partnering in the construction industry—Problems and opportunities. *Journal of Purchasing and Supply Management*, 16(4), 254-263.
- Hamza, M., Shahid, S., Bin Hainin, M. R., & Nashwan, M. S. (2019). Construction labour productivity: Review of factors identified. *International Journal of Construction Management*, 2019, 1-13.
- Fulford, R., & Standing, C. (2014). Construction industry productivity and the potential for collaborative practice. *International Journal of Project Management*, 32(2), 315-326.
- Alwi, S., Mohamed, S., & Hampson, K. (2002). Waste in the Indonesian construction projects. *International Conference-Creating a Sustainable Construction Industry in Developing Countries*, pp. 305-315.