

Understanding of Lean Construction Philosophy: Contractors' Perspective in Eastern Indonesia

Josefine Ernestine Latupeirissa¹, Luciana Buarlele²

^{1,2} Civil Engineering Department, Universitas Kristen Indonesia Paulus, Makassar, South Sulawesi, Indonesia

ABSTRACT: The Lean construction (LC) has proven effective helping to solve many industry problems and maximize customer value, by helping to understand, identify, and eliminate many of the causes and sources of waste in both the process and physical aspects of the design and construction process as a whole. The goal of Lean is to generate that value effectively and efficiently. Therefore, a holistic understanding of the LC philosophy is very important for stakeholders who are interested in construction projects. The aim of the current research is to analyze the understanding of LC philosophy based on the contractors' perspective in Eastern Indonesia. The survey instrument used a questionnaire format that has been systematically compiled containing questions about understanding the philosophy of LC. The respondents selected represented companies, contractors, and subcontractors/specialists, status as private and State-owned enterprises who were currently carrying out construction projects totaling 58 respondents. Empirical analysis using the Likert scale and Relative Frequency formula, states that the contractor's understanding that it is very important to respect for people in construction projects, understood that it is very important to maximize value and minimize waste, and understood that it is very important for continuous improvement in construction project.

KEYWORDS: Lean Construction, philosophy, understanding, respect for people, maximizing value while minimizing waste, continuous improvement

I. INTRODUCTION

The construction industry is an industry that is growing significantly on a global level and is a fundamental part of the economy in many parts of the world because it is a significant source of employment, providing jobs for millions of people ranging from manual labor to project management and design [1], [2]. However, construction industry has been tagged with a poor record of innovation when compared with manufacturing industry. [3]. Likewise according to Fulford and Standing [4], the construction industry has long been criticized for its poor productivity and sustainability. According Chan and Chan [5] construction industry in many countries has been criticized for inefficiencies in results such as time and cost overruns, low productivity, poor quality, and inadequate customer satisfaction. At the same time, Sarhan et al., [6] state that the construction industry is also frequently criticized for its inherent inefficiencies, confrontational relationships, and low rates of productivity and profit margins, in comparison to other industries.

These challenges in the construction industry have created a need to advance the industry towards sustainable development. Sustainable Construction (SC) is the construction sector's response to the challenges of sustainable development [7]. Lean construction (LC) has proven effective in helping to solve many industry problems and maximize customer value, by helping to understand, identify, and

eliminate many of the causes and sources of waste in both the process and physical aspects of the design and construction process as a whole [8], [9], [10]. Attention to a new philosophy in the construction industry about lean production has been growing slowly, first introduced by Koskela [11]. The philosophy promises tremendous possibilities for improvement and solution to critical construction problems, i.e. lean production and then has developed in the construction industry as LC.

According to Do [12], lean philosophy is quite simple: 1) respect for people, 2) maximizing value while minimizing waste, and 3) continuous improvement. This is the philosophy that is fought for and must not be changed. Must actively pursue the philosophy but can never be fully achieved. The philosophy exists as a North Star that guides every lean organization to make decisions and provides a path to better LC implementation.

Research on LC in Indonesia has been conducted since 2005, developed by academics and expecting comments, validation and participation from practitioners in its implementation based on the roadmap towards lean construction in Indonesia [Abduh et al. 2005] cited by Abduh and Roza [13]. Furthermore, the results of the study [13] revealed that large Indonesian contractors have implemented the principles of LC on a macro scale, are the policy of making continuous improvements and increasing

transparency. Meanwhile, on the micro principle, are reducing cycle time and reducing variability, large contractors Indonesia still lacks awareness and ability to apply these principles and techniques. It was also found that contractors lack the ability to plan a good workflow for their construction operations. The assessment model developed has not accommodated verification of results based on implementation in the field and contractor performance. Thus the level of anticipated readiness towards LC is still low. Considering the background above, construction parties should first understand the philosophy of LC. Based on the theory [12], the aim of the current research is to analyze the understanding of Lean Construction philosophy based on the contractors’ perspective in Eastern Indonesia.

II. LITERATURE REVIEW

A literature study was conducted at the beginning of this study to provide a theoretical basis for the research and identify the variables used in this study.

In 2004, the LC theory was stated as a production management tool that describes a system of delivering finished products free of defects to customers, in zero time, and with nothing left in inventory [14]. The LC concept has gained significant importance in the last decades, so several types of researches have been conducted, and a significant number of articles have been written about it throughout the world [15].

Fifteen years later, in 2019, in the new global economy, LC has become an effective way to design construction systems, aiming to reduce all forms of waste and create maximum value for customers [16]. Many researchers have studied LC over the years. Several research efforts investigated the application of lean concept and principles [17], [18]. The focus of LC is on waste reduction, customer value enhancement, and continuous improvement" [19]. According Saygili, et al [20], LC is a modern way of managing construction projects. It considers the budget of the parties in a project, saves time, and increases the quality by decreasing the waste disposal, using the resources carefully, and increasing the team performance.

The implementation of LC in Indonesia is something that is still relatively new. LC or LC management does not mean construction management by doing cost cutting here and there, nor is it a complicated and confusing improvement method. The definition of lean is eliminating activities that

have no added value, waste or losses with the aim of producing added value in a project . Based on research by several construction experts in America, it turns out that in every construction project did, there were only 40% of activities that really have added value, while the other 60% have no added value. In this case, it becomes a challenge in the process of implementing LC in Indonesia [21].

In Indonesia, LC has been studied by several researchers from academic circles spread across several regions in Western and Central Indonesia. The results of Abduh and Roza's research [13] found in Indonesia, where the readiness level of contractors in implementing lean construction is still quite low, especially in reducing cycle time and reducing variability.

Research on the application of LC by [22], [23], and [24], is based on the LC tool and technique, cited from research of [25], [26], i.e. : 1) The last planer system (LPS), is a method in the form of a workflow and maps various activities on a construction project. In the last planner, the system has a sequence of implementation of the master schedule, Reverse Phase Schedules (RPS), six-week lookahead, Weekly Work Plan (WWP), Percent Plan Complete (PPC). 2) Increased Visualization, is an effective communication tool to employees through the installation of various signs, signs, and labels around the construction site. 3) Daily Huddle Meetings, is two-way communication is the main key to daily team meetings in order to realize employee participation. This concept is similar to employee involvement in lean manufacturing, are empowering workers by observing reactions when facing problems, and opening intensive communication through toolbox meetings. 4) First-run Studies, this activity usually uses media such as videos, photos, or graphics to show the process or illustration of a construction project. A Plan Do Check Act cycle (PDCA) is recommended as a basis for improving learning. 5) 5S Process (Visual Work Place). 5S process is "the location for everything and everything is found at that location". 5S process has five stages of improvement that can help minimize waste [27], [28], i.e. : Seiri (succinct; sort), Seiton (neat; straighten), Seiso (clean; shine), Seiketsu (maintain; standardize) and Shitsuke (diligent; sustain). 6) Fail-safe for Quality and Safety Fail safe for quality relies on ideas that are aware of the potential for defects. This is the same as visual inspection (Poka-Yoke) in lean manufacturing.

Several studies of LC in Indonesia can be seen in Table 1.

Table 1. Several Studies of Lean Construction in Indonesia

Constructi on Type	Location	Research Results	References
All	Indonesia	Some companies that have implemented LC have achieved good results and can compete globally. However, it takes a long time to achieve these results, this is due to the process of changing work culture and mindset that cannot be changed directly. The cause waste factors in construction projects were : lack of worker skills, design changes during the construction process, slow decision-making, and materials that	[29]

		always do not arrive on time at the construction site and a complicated bureaucratic system.	
“Mitra Keluarga” Hospital	Bintaro-South Jakarta	Using the Pareto law and graph, there are work items for the main building structure on the basement floor with high cumulative costs, were reinforcing steel material, fresh mix concrete, and formwork. LC is a way to handle projects by minimizing waste in resources and trying to produce maximum value. Although some companies have tried to adopt this concept, there seems to be an barriers to implementing this concept. In Indonesia, construction industries had not paid more attention to the LC concept in handling projects to reduce waste on resources.	[30]
Road and Bridge	Indonesia	LC is one of the principles in implementing sustainable construction by maximizing value and minimizing waste to increase productivity. Using Certainty Index, RII, Fuzzy AHP, and Fuzzy-TOPSIS, the results of the study show that there is a gap in involvement among stakeholders such as owners, contractors, consultants, subcontractors, architects, government, local government, and NGOs. There is no gap in involvement between project suppliers and investors. The biggest barrier to implementing sustainable LC is the lack of knowledge and skills in using lean tools and principles, while the biggest driver for implementing sustainable LC is increasing time efficiency and process standardization. The best strategy to increase stakeholder involvement is to ask the government to develop regulations and standardize environmentally friendly and sustainable materials.	[31]
“Grand Dhika City Bekasi (GDCB) Tower Cempaka”	Bekasi	The increasingly advanced development of Indonesian construction has made the competitiveness between contractor services tight. Therefore, an innovation is needed in managing the construction process to be more optimal. One of these innovations is the application of the LC method with the work structuring concept. The work structuring concept is used to design a simulation of typical floor concrete structure work in order to have a more reliable and faster flow of activities. The LC innovation in this study is to use an inter-floor formwork transfer system on the PERI horizontal formwork. With the work structuring concept, the interaction between the concrete structure work cycle and the inter-floor formwork transfer cycle obtained 3 optimal simulations with a reliable flow of activities (minimum idle time), are 3-day, 5-day, and 9-day simulations. From the results of the total calculation of the project budget plan for each optimal simulation, it was concluded that the 3-day simulation was the most optimal simulation.	[32]
The Cadets Multipurpose Building of “Politeknik Ilmu Pelayaran Semarang”	Semarang	Waste is a form of inefficiency and waste caused by materials, human resources, and time. On the other hand, LC has two very fundamental goals, were increasing value and reducing waste. The results of the study showed that 1) the waste variables that occurred in the project were the time waiting for instructions, the time waiting for materials to arrive at the location, the time waiting for tools to arrive, waste of raw materials, damage to materials at the location, unemployed workers, slow/ineffective workers, rework/repair work, poor material delivery schedules, material handling is not according to standards, poor material storage, poor labor distribution, lack of tools, damage/oss, undisciplined workers, lack of labor skills and weather factors. 2) LC tools found in the project include master schedule, weekly work plan, check for quality, check for safety, sort, straighten, shine, standardize, safety chart, foreman meetings, first-run studies. Although there are already LC tools that have been applied to the construction project of the Taruna Multipurpose Building of the Politeknik Ilmu Pelayaran Semarang, several variables and waste factors still appear in the work on column structures, beams, floor slabs, and finishing.	[23]
Semarang Medical Center	Semarang	Based on previous findings, it can be concluded as follows: 1) The Toyota Way concept is in accordance with the concept of LC principles that integrate process focus and human empowerment. 2) Based on the survey results, stakeholders of Semarang Health Center are still not familiar with the Toyota Way concept. It was also found that the application of the Toyota Way principle in the project delivery system has not been fully implemented. 3) The results of the lean assessment indicate	[33]

		that the Semarang Health Center Project delivery system is less focused on the work process, and more focused on maintaining good relations between parties. The current condition of the Semarang Health Center Project tends to be in the Partnership model. To achieve a stable flow, it is necessary to adjust the work process and maintain good relations between parties. Regarding the project delivery process, it is important to change the conventional view that the implementation of the Toyota Way will require additional funds and obstacles to change the status quo of the project delivery system. However, the implementation of the Toyota Way must be carried out gradually with smaller training groups, and small efforts such as building a leadership system and fostering responsibility from workers. It is also necessary to improve the work completion system by following the established standard operating system. It is necessary to pay attention to wasteful activities that do not add value to the project delivery system and also the reflection and continuous improvement system.	
Kakap-Punggur Road	Kubu Raya Regency, West Kalimantan	The research results on the Kakap - Punggur Road Construction Project state that the factors that contribute most to waste in the project work items are worker negligence, lack of coordination of field implementers, inappropriate work plans, lack of adequate quality of human resources causing this project to experience waste that should have been minimized.	[34]
Toll Road	Balikpapan-Samarinda	LC is a construction management system with the aim of reducing waste. The purpose of this research is to determine whether the lean construction method has been applied to the Balikpapan - Samarinda Toll Road Construction Project. The results obtained are that the LC technique has been applied to the Balikpapan - Samarinda Toll Road Construction Project, where 3 variables, i.e. the last planner system, 5S process, and fail-safe for quality and safety can be categorized into the always applied group, and 3 other variables, i.e. increased visualization, daily huddle meeting, and first run study, are included in the often applied category, and there are no variables included in the not applied category.	[24]
Al Fatah Islamic Centre Building	Pekanbaru	LC presents innovative practices to maximize production value and minimize production waste during construction. A common problem in projects is schedule delays, which cause time and cost overruns. This study aims to eliminate waste that causes delays and inefficiencies. Using several LC techniques to improve project efficiency, i.e. : Value Stream Mapping (VSM) to find waste and determine the Process Efficiency Cycle (PCE), Waste Assessment Model (WAM) to identify the reciprocal relationship between waste, Fishbone (Ishikawa) diagram analysis to obtain the root cause of waste. The results of the study showed the three highest wastes: defects, excess production, unnecessary inventory. After implementing the LC technique, PCE increased from 72% to 79%. The implication of this study is to provide recommendations to project stakeholders in carrying out building construction to avoid delays and inefficiencies.	[35]
All	Palembang	This study investigates the application of LC and its benefits in construction projects in Palembang. The results show that the application of LC in Palembang is still limited, so further introduction to the concept of LC is needed, especially among architects, to support design and sustainability decision making, and of the impact of its application on carbon reduction in supporting sustainable construction. The implication of this study is the need for a more active approach in introducing lean construction to AEC industry practitioners in Palembang to support the realization of a sustainable built environment. LC is very effective in optimizing efficiency and reducing waste in the construction industry. Integration of the lean construction concept with BIM technology and the application of methods such as Just-in-Time, Last Planner System, and Value Stream Mapping are the keys to creating a more efficient and sustainable construction environment.	[36]
Building	Banda Aceh	LC is a construction implementation method to minimize waste and maximize value. In the implementation of building construction projects, especially in Banda Aceh	[37]

		City, contractors generally still use conventional implementation methods, even though the government has implemented the lean building method. Traditional methods tend to result in waste and ignore value. This study aims to determine the dominant LC factors applied to building construction projects in Banda Aceh City. The results of the study indicate that the LC factors applied to building construction projects in Banda Aceh City include 7 factors, i.e. implementation method factor, material control, supply chain, time management, documentation, teamwork, and communication with a variance (percentage of application) of 61.770%. It is recommended that building contractor companies in Aceh Province improve their readiness in implementing LC, in order to obtain maximum performance and owner satisfaction. It is recommended to the relevant agencies to require the implementation of LC in the contract documents, so that the contractor company plays a proactive role in achieving maximum performance in eliminating waste and continuous improvement.	
High Rise Building	Jakarta	Mechanical, Electrical and Plumbing (MEP) is a core segment of the architectural engineering industry. This core task plays an important role in the overall architecture or construction business with the aim of providing a safe and comfortable place for the environment. The MEP system consists of several work categories and activities that support complex pipeline management in all units, which are often encountered when there is no interface integration which results in delays in the project and reduces the quality of the product itself. The function of MEP in buildings is building support systems that require mechanical systems or machine tools and require electric power. Support systems are applied in buildings for the convenience and safety of its users. Mechanical installation is an installation that deals with piping and installations that use machines, while electrical installations are installations related to electricity supply and components that require an electricity supply. The results of the study show that the implementation of LC technique is very influential and can be used as an alternative method to increase cost efficiency in MEP work. To support this implementation, it is necessary to carry out every step in the LC method as an effort to reduce waste and provide added value to achieve a level of satisfaction and continuous improvement.	[38]
All	Denpasar	The construction project logistics process hides non-value-added activities that are difficult to avoid, adding lead time that results in delays in project completion, and increasing production costs that will reduce profits. There are seven wasteful activities that often occur: Field inspections, purchasing one type of goods from different suppliers, waiting for work instructions from the owner, late delivery of materials, the need for additional approvals or signatures, the need for clarification of actions, and waiting for work instructions from superiors.	[39]

Based on Table 1 above, it can be seen that research on understanding the philosophy of LC has never been done, what exists is a partial research. Meanwhile, an integral understanding of the LC philosophy is very important for later implementation in the construction process so that it produces output according to the objectives of its construction implementation. Therefore, the current study will examine the understanding philosophy of LC based on the philosophy conveyed by [12] which is shown in Figure 1.

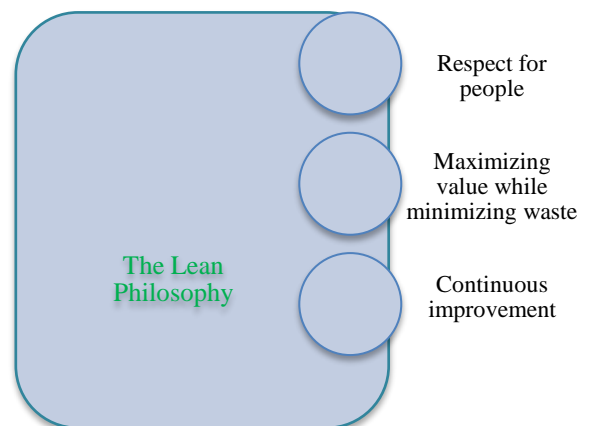


Figure 1. The Lean Philosophy (Adapted Do, 2022)

III. RESEARCH METHODOLOGY

A. Data Collection

The survey instrument used in this study is a questionnaire format that has been systematically compiled containing questions about understanding the philosophy of LC. The questionnaire distribution activity was carried out in the Eastern Indonesia region where the respondents selected represented company contractors and subcontractors/specialists, private and State-owned enterprises who were currently carrying out construction projects totaling 58 respondent. Thus, it is expected to provide high-value feedback for this study and have a good impact on the construction world in Eastern Indonesia.

The questions asked to respondents are a development of the Do theory [12], and the results of literature studies, especially literature studies on research results in Indonesia. The questions consist of three parts of questions, are : Respect for people, Maximizing value while minimizing waste and Continuous improvement.

A.1. Respect For People

Respect for people is the most important however most poorly understood Lean Philosophy. When talk about respect for people, so need to consider the whole person. The mean, can’t respect them at work while making them take months of overtime which deteriorates their personal lives and relationships outside of work. Respect for people includes suppliers, vendors, owners, architects, and the people work on a regular basis as well as the end customer and future generation. Respect for people must extends beyond the organization and extends to the environment. Thinking about the long term environment, sustainability, and impact on the planet should be part of respect for people. It is important to consider the future stakeholders [12].

In the context of the current research, "people" are stakeholders. In a construction project, stakeholders are parties who are interested in the development of the project, both the core or internal parties of the project and parties from external projects, i.e : 1) Owner, 2) Design Consultant, 3) Supervision, 4) Contractor, 5) Subcontractor, 6) Supplier/Vendor, 7) Labor, 8) Government, 9) Financial Institutions, and 10) General Public [40]. Thus, the questionnaire questions for "respect for people" shown in Table 2.

Table 2. Questionnaire Questions “Respect for People”

No.	Description
1.	Who is meant by “people” in construction project activities,
2.	How do you understand the importance of respecting people or work partners in construction project activities?

A.2. Maximizing Value while Minimizing Waste

The second Lean Philosophy is “maximizing value while minimizing waste”.The effort to achieve this ideal is through the application of lean construction principles, methods and tools. It is indeed not easy to achieve this ideal, but the effort to move every day towards perfection continues [12].

Generally, the research results shown in Table 1 state that reducing waste and maximizing value are the principles of LC. In this study, maximizing value is how the core of the project management process, i.e. time management, cost management, quality management and scope management [41] must be achieved, so that it can satisfy the client's desires. Thus there are five questions in this section, which are shown in Table 3.

Table 3. Questionnaire Questions “Maximizing Value while Minimizing Waste”

No.	Description
1.	How do you understand the importance of waste reduce?
2.	How do you understand the importance of maximizing effective and efficiency of cost?
3.	How do you understand the importance of maximizing schedule accuracy?
4.	How do you understand the importance of maximizing quality maintaining?
5.	How do you understand the importance of maximizing scope of work accuracy?

A.3. Continuous Improvement

The third Lean Philosophy is continuous improvement. Although continuous improvement is implied when considering “respect for people” and “maximizing value while minimizing waste,” it is important to make this philosophy explicit. The main reason is that most companies that implement lean experience stagnation. Perhaps the company understands the first two philosophies and implements some LC methods, but does not make measurable improvements over time after success and visible waste is eliminated, and it is easy to become complacent (12).

According Ahuja., et al [42], Over time, sustainable concerns have increasingly gained importance in the Architectural, Engineering and Construction (AEC) industry. In the last decade, there has been a growing pressure in terms of not only improving quality, productivity, efficiency and effectiveness, but also sustainable development. Further this study identifies and proposes Building Information Modelling (BIM) as an enabler for gaining lean and green project outcomes. Thus, there are four questions in this section, which are shown in Table 4.

Table 4. Questionnaire Questions “Continuous Improvement”

No.	Description
1.	As part of Continuous Improvement, how do you understand the importance of company paradigm changes?
2.	As part of Continuous improvement, how do you understand the importance of human resources development?
3.	As part of Continuous improvement, how do you understand the importance of application of technology digital such as BIM?
4.	As part of Continuous improvement, how do you understand the importance of human resources management ?

B. Data Analysis

Finding useful information, providing conclusions, and supporting decision making are the results of the process of examining, cleaning, transforming, and modeling data referred to as the data analysis process [43]. In this study, data analysis used a Likert scale to measure the questionnaire as a research instrument, and Relative Frequency.

The Likert scale is a rating scale used to measure individual (respondent) assessments of feelings, attitudes, or perceptions related to a series of statements or individual items as declarative statements [44]. In this study, the level of conformity referred to in the Likert scale consists of five scale options that have a gradation from "very important" (VI) to "very unimportant (VUI) to measure respondents' understanding of how important the LC philosophy is in construction projects implementation. The five options are shown in Table 5.

Table 5. Assessment Gradation Questionnaire Measurement

Likert Scale	Gradation
5.	Very Important (VI)
4.	Important (I)
3.	Moderate (M)
2.	Not Important (NI)
1.	Very Not important (VNI)

Furthermore, the results of the respondents' answers are calculated using the following formula [45]:

$$RF = \frac{f}{n} (100) \dots\dots\dots (1)$$

where :

RF= Relative Frequency of respondents' answers

f = Number of respondents' answers

n = Number of respondents

IV. RESULT AND DISCUSSION

A. Result

This section presents the findings of the respondent answer related to the understanding parties construction project about Philosophy LC i.e. : Respect for People, Maximizing Value while Minimizing Waste and Continuous Improvement.

A.1. Respect for People

The lean principle respect for people as respect for craftsmanship, Ljungblom, and Lennerfors [46].



Figure 1. Stakeholders (“People”) of Construction Project (Adapted : Latupeirissa, 2018)

Respondents' answers based on question No.1 in Table 2, most of them know and agree with stakeholders ("people") in construction projects, especially the core parties shown in Figure 1. Meanwhile, the answer to No. 2 in Table 2 states that respondents really understand the importance of respect for "people" or work partners in construction project activities, as shown in Figure 2. Where, 87.93% answer ‘very important’ and 12.07% answer ‘important’.

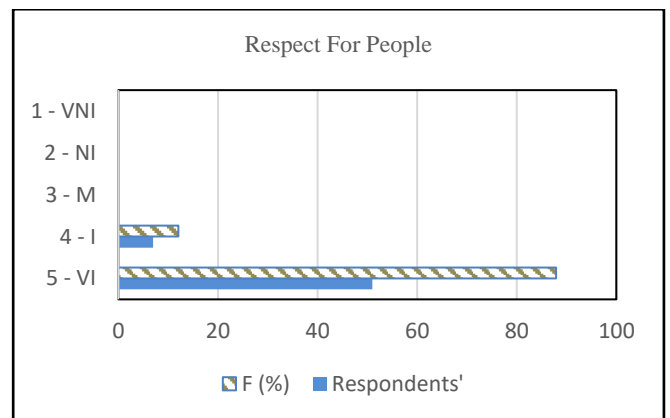


Figure 2. Understanding of Respect for People

A.2. Maximizing Value while Minimizing Waste

The core of project management is time management, cost management, quality management and scope management [41]. Thus the scope of maximizing the core value of project management is maximizing costs effectively and efficiently, maximizing schedule accuracy, maximizing quality maintaining, maximizing the accuracy of the scope of work (Figure 3).

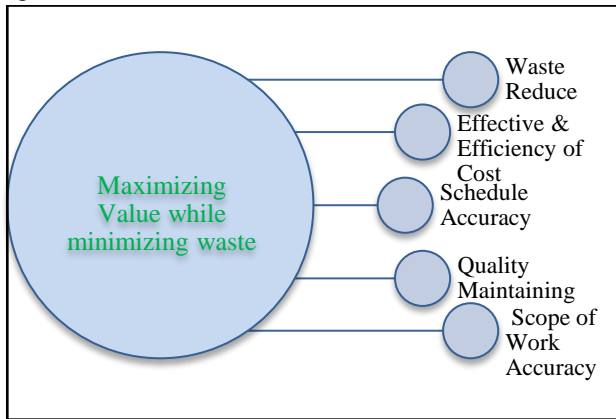


Figure 3. Maximizing Value and Minimizing Waste

The results of research regarding respondents' understanding of "maximizing value while minimizing waste" are shown in Figure 4. Respondents' answers based on question No.1 to 5 in Table 3, shown that respondents really understand the importance of maximizing value while minimizing waste, where, 94.83% answer 'very important' for Waste Reduce, 100% answer that 'very important' maximizing cost effectively and efficiently, answer that 100% 'very important' maximizing schedule accuracy, answer that 100% 'very important' maximizing quality maintaining, and answer that 100% 'very important' maximizing scope of work accuracy.

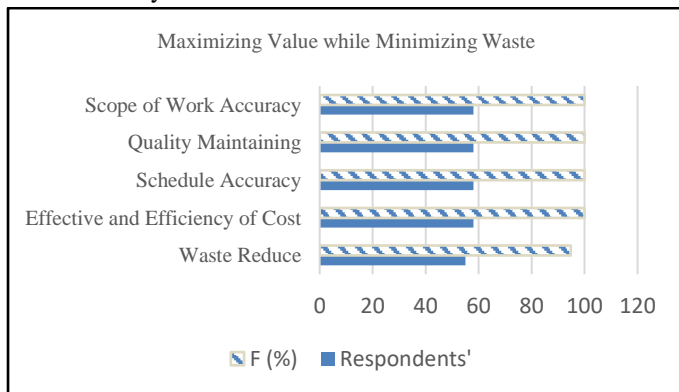


Figure 4. Understanding of Maximizing Value and Minimizing Waste

A.3. Continuous Improvement

In a Lean system, maintaining a mindset of continuous improvement is necessary and should abide for a team or organization to thrive [47]. Continuous improvement is a process aimed at consistently enhancing performance and refining methods within individuals and organizations. It involves a commitment to ongoing growth and innovation, fostering a mindset that embraces change and learns from mistakes [48]. The results of the analysis are shown in Figure 5 and Figure 6.

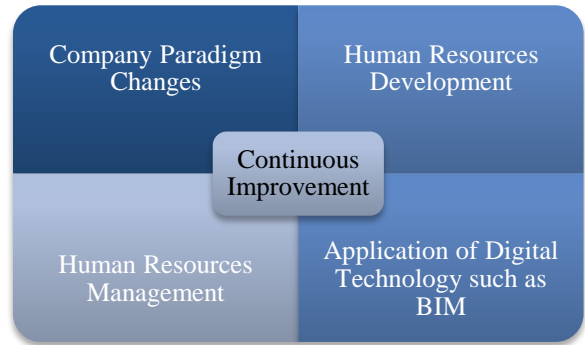


Figure 5. Continuous Improvement

The results of research regarding respondents' understanding of "continuous improvement" are shown in Figure 6. Respondents' answers based on question No.1 to 4 in Table 4, shown that respondents really understand the importance of continuous improvement, where, 100% answer 'very important' for Company Paradigm Changes, 100% answer that 'very important' Human Resources Development, answer that 100% 'very important' Application of Digital Technology such as BIM, and answer that 100% 'very important' Human Resources Management.

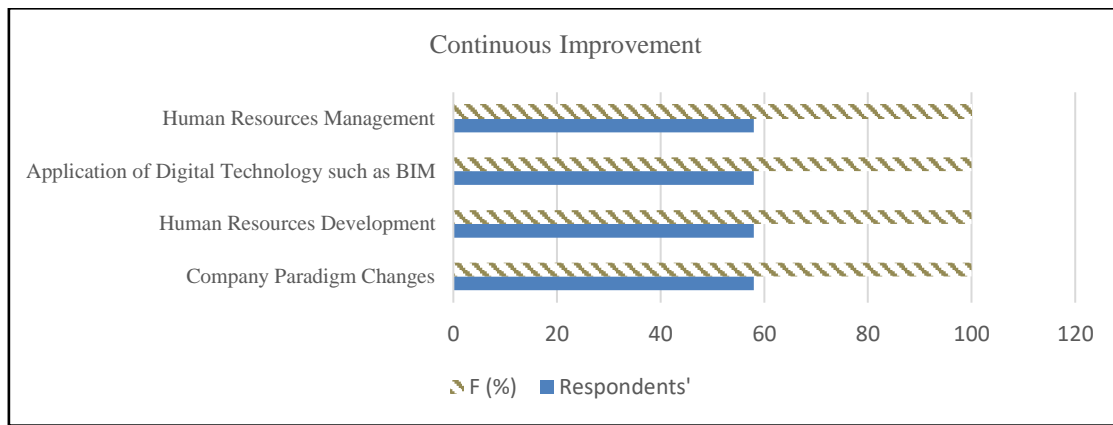


Figure 6. Understanding of Continuous Improvement

B. Discussion

The understanding of the lean construction philosophy of contractors in the Eastern Indonesia region based on research results shows high and very high score. This indicates that in terms of knowledge, contractors have understood the importance of implementing lean construction in the construction process in this region.

B.1. Respect for People

Respecting people or parties in a construction project means respecting work partners who have functions and expertise in accordance with their respective experience, knowledge and skills. The results of research [46] support this, where concept of respect is not of the emotional kind, but rather ought-respec.

This research has shown that contractors in Eastern Indonesia understand that respecting people is very important in construction project activities. Working partners are one of the important keys to achieving success. Respecting people or partners will increase trust, share knowledge, support each other, create good communication, and reduce the possibility of conflict. Thus, it will expand future opportunities for the parties.

B.2. Maximizing Value and Minimizing Waste

Waste detracts from customer and team members. Waste mucks up project timelines and causes budgets to soar, and impacts customer value while creating headaches for everyone involved in the project and for the communities affected. Waste and Value are two sides of the same coin, one is Yin and the other is Yang, where whenever there is an effort to reduce waste in a process, then on the other side there is an addition of more value. This provides value to the client/owner. This is the ultimate goal of Lean thinking [47].

This research has shown that contractors in Eastern Indonesia understand that maximizing value which cover maximizing effective and efficiency of cost, maximizing schedule accuracy, maximizing quality maintaining and maximizing scope of work accuracy while minimizing waste is very important. To generate value in a construction project, the contractor must understand what value means in the context of the project itself.

B.3. Continuous Improvement

Continuous, small improvements can lead to big gains across time, this is key to success in any business or organization, involves a commitment to ongoing growth and innovation, fostering a mindset that embraces change and learns from mistakes. Continuous improvement is a process aimed at consistently enhancing performance and refining methods within individuals and organizations. The method that can be used for continuous improvement is Kaizen or PDCA [47], [48].

This research has shown that contractors in Eastern Indonesia understand that for continuous improvement, there is a needs to be a paradigm shift in the organization and team members regarding this matter. There is a needs to be human resource development in terms of training, skill improvement. There is a need to be systematic human resource management, and the use of technology such as building information modelling (BIM). Although the future of BIM in Indonesia is full of challenges, it is very promising because the use of BIM can facilitate coordination, integration, efficiency, and control. construction implementation [49]. This sustainable improvement can only be realized if there is a commitment and consistency of the parties in the construction project.

CONCLUSIONS AND RECOMMENDATIONS

The ultimate goal of any design and construction project is to generate maximum value for stakeholders. The goal of Lean is to generate that value effectively and efficiently. Therefore, a holistic understanding of the Lean Construction philosophy is very important for stakeholders who are interested in construction projects. If the lean philosophy is not understood, there will be barriers that can disrupt the progress of the project. The solution in understanding the lean philosophy in this study is first, it is very important to respect the people who are called stakeholders in construction projects who have their respective expertise according to their fields and functions. Respect is not emotional but respect because it should be. Furthermore, contractors understand that it is very important to maximize value and minimize

waste, because waste will disrupt the project schedule and cause the budget to soar, and affect customer value while causing problems for everyone involved in the project and for the affected community. While maximizing value will open up opportunities widely in the future. Then, contractors understand that it is very important for continuous improvement in terms of changing the paradigm of the organization and team members, developing and managing human resources systematically and implementing digital technology such as BIM in the construction projects.

Further research needs to be carried out to find out and test contractors' understanding of the lean construction philosophy based on this research in the sustainability of the application of this philosophy in the real world of construction.

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