eduvest

Eduvest – Journal of Universal Studies
Volume 2 Number 6, June, 2022
p- ISSN 2775-3735- e-ISSN 2775-3727

IDEAL FACTOR ANALYSIS OF IMPLEMENTATION MANAGEMENT DUE TO WASTE MATERIAL OF BUILDING CONSTRUCTION MATERIALS ON CONTRACTOR PROJECTS IN INDONESIA

James Thoengsal[1], Miswar Tumpu[2]
[1]Assistant Professor Department Civil Engineering, University of TechnologySulawesi, Indonesia
[2]Assistant Professor Disaster Management Graduate School Hasanuddin University, Indonesia
Email: Architect_james@yahoo.com, tumpumiswar@gmail.com

ARTICLE INFO	ABSTRACT
Received: **May, 26th 2022** Revised: **June, 8th 2022** Approved: **June, 11st 2022**	*The implementation of building construction projects cannot be separated from the problem of wasting costs, which is one of the contributing factors due to the emergence of residual materials during the construction process. The purpose of this study is to identify and analyze the ideal indicators in the application of construction material waste management in an effort to reduce the impact of cost inefficiency due to the of waste material so far, which in this study is viewed from the point of view of the parties involved in the building project. The results obtained from this study are that the ideal factor for implementing the ideal construction material waste management. Where at the planning/design stage, the most priority variable category is the Selection of Low Waste Materials, then at the procurement stage, namely the Estimation and Ordering of Material Volume and at the construction stage, namely the category Management Commitment category variables. The direction of research development is in the form of developing the concept of an ideal building construction material waste management model that can be applied by the construction operator, in this case addressed to the contractor, planning consultant and material supplier in an effort to reduce the impact of*

How to cite:	James Thoengsal, Miswar Tumpu. (2022). Ideal Factor Analysis of Implementation Management Due to Waste Material of Building Construction Materials on Contractor Projects In Indonesia. Journal Eduvest. *Vol 2*(6): 1.081-1.088
E-ISSN:	2775-3727
Published by:	https://greenpublisher.id/

	inefficiency in material costs during the construction process in Indonesia.
KEYWORDS	Management, waste, materials, building, Contractor

INTRODUCTION

The process of increasing construction development activities in Indonesia, especially in the City of Indonesia, is increasing from year to year, of course, it requires a lot of resources in the form of money, labor, equipment, methods and, most importantly, material resources. Seeing the reality of the problems in building projects in the field, namely the management of waste material management that is not optimal by each stakeholder which in the end often results in residual material if traced throughout the life cycle of a building and its impact on environmental, cost and social aspects. The State of Indonesia is a developing country in recent years, especially in the City of Indonesia which is located in the eastern part of Indonesia, so that in carrying out economic, trade, business and government activities it is necessary to provide supporting facilities and infrastructure such as the construction of buildings. The current construction of the building leads to the development of vertical and horizontal wide spans, this is due to the need for human activities that continue to increase so that it requires a lot of building facilities. The increase in building construction in Indonesia, especially in big cities such as Indonesia, is increasing from year to year. The reality so far is that most of the implementation of construction material waste management at the planning stage to implementation is still low and not optimal, especially for private contractors compared to contractors [5,8].). Previous studies have generally focused more on the identification phase of construction material waste, but there are still very few research references in Indonesia that examine the potential for implementing building material waste management in reducing the impact of cost inefficiency during construction. The existence of data sources from previous studies that show the impact of cost inefficiency due to the emergence of residual materials during the building construction process due to the lack of application of waste management. The proportion of material costs is around 40-60% of the total project cost [10,12]. Where the proportion of overuncost contributions due to the emergence of residual materials during the construction of buildings ranges from 3 to 135) %. The purpose of this research is to identify the ideal material waste management concept in an effort to reduce the cost inefficiency of building construction projects [1,3].

Management of waste material management is the responsibility of each construction operator, starting from planners, implementers, suppliers, supervisors and building owners. Poor management certainly has an effect on the generation of material waste. The occurrence of construction material waste can be caused by one or a combination of several sources and causes. Distinguish sources of construction material waste into six categories: design-planning; procurement of materials; material handling; implementation; residuals; others. The results of the research [3,7,8] in the Netherlands, concluded the sources and causes of construction material waste based on the categories of causes of waste material that have been made [7], construction waste management encompasses the collection, transportation, storage, treatment, recovery and disposal of waste and is defined as a comprehensive, integrated, and rational systems approach to achieving and maintaining environmental quality and supporting sustainable development [4,7,8].

The European Environment Information and Observation Network (EIONET) [2,6] defines waste management as 'a strategic document designed to achieve the objectives of waste management and waste prevention and recovery' in addition to health and environmental impacts. Some significant effects on stakeholders and the project life cycle in generating construction material waste according to the European Commission Join Research Center Institute of Environment and Sustainability. Impact of Residual Construction Materials The impact of the resulting waste material has an effect on several aspects. From several literature studies, 3 (three) categories of waste material impacts have been identified, including environmental, social and cost aspects [1]. Several references to factors that cause a negative impact on the cost aspect of the results of construction material waste.

Positive Potential Implementation of Construction Material Waste Management The implementation of construction material waste management has become a standard that must be applied by every stakeholder in an effort to reduce the impact. The potential application of construction material waste management will have a significant positive impact if it is carried out simultaneously and sustainably, especially in the type of building project. The positive potential in implementation will certainly have an effect on environmental, social and cost aspects. Several references to factors that have the potential to be positive in reducing the impact on the cost spec. Construction Material Waste Management Lifecycle Management The design and planning phases of planning provide the best opportunity to prevent the generation of construction material waste [4,11], as shown in the opportunity curve to minimize the impact of construction waste generation. Opportunities still exist during the procurement, construction, operational and end-use stages but the greatest impacts are generally made during the early planning stages. The level of potential reduction of construction material waste has been investigated by Innes [9], who suggested that 33% of all material waste on construction sites is due to failure to implement measures [2, 5,9].

RESEARCH METHOD

Types of research conducted in the form of survey research with a descriptive method by conducting a study by making a study of the identification of variables from the ideal/effective model concept so that it can be used in predicting the effect of waste management management in an effort to reduce the impact of cost inefficiency due to the emergence of residual material during the process of building construction in Indonesia. Respondents in this study were contractors as main contractors, planning consultants/supervisors, sub-contractors, several material suppliers involved in the building construction process and several academics/associations who are experts in the field of construction waste.

Time the research was carried out for 3 (three) months after this research was approved to be carried out) and then the research location was planned to be carried out on several ongoing building projects and buildings that have been completed and those that are in progress which in this case is carried out by the contractor and research case studies were conducted in an Indonesian city.

Data types and sources the types and sources of data used in this study consisted of primary data and secondary data with the following explanation primary data In this study, it was obtained in the field through questionnaires, observations, documentation and interviews with parties who understand the topic under study, including planning consultants, implementing contractors, material suppliers and academics/associations, as well as observation data obtained from periodic independent observations on all project locations that have been determined during the research survey. Secondary data In this study, it was obtained through the results of library research in the form of journals, reference books, journals, internet sites and other supporting documents that were accurate and relevant to the study material [5,9,11].

Population and sample the type of population in this study is purposive / saturated population or in other words the number of population is limited consisting of contractors as main contractors, sub contractors, planning consultants and supervisors as well as several material suppliers involved in the project. The research sample is architects and engineers from the planning consultant, implementing supervision, both project managers, quantity surveyors and quality surveyors at contracting companies who understand the problem being researched at the project study location that has been determined and several academics/associations who are experts in the field of construction waste. The sample was selected using a purposive sampling technique, namely the selection of a sample that was tailored to the needs. The sample technique used is the Slovin method with the following equation:

$$n = \frac{N}{1 + Ne^2} \quad \text{..................................} \ (1)$$

Where:
N: Number of samples
e: 95% precision level sig= 0.05 1.5.

Research Measure Variables The concept of the research model consists of measuring variables consisting of 20 categorical variables and 133 sub-categories of measuring variables. Where the main variables consist of the Design Phase consisting of: Design Process, Modern Design Concepts, Design Standards, Material Selection, Design Feasibility, Consultant Competence, Procurement Phase consists of: Budget, Purchase of Materials and Contracts and Construction Phase consists of: Application of reused materials, Fabrication Materials, Worker Competence, Management, Supervision, Policy, Storage, Methods, Field Handling and Shipping Handling. Meanwhile, the cost impact variable consists of construction financial costs and construction material waste management implementation cost.

RESULT AND DISCUSSION

Population and Sample From the results of the sample recapitulation in Figure 1. it is shown that the type of population in this study is purposive / saturated population or in other words the population is limited consisting of contractors as main contractors, sub-contractors, planning consultants and supervisors, several material suppliers who involved in the project as well as several academics/associations who are experts in the field of construction waste. From the results of the analysis, the minimum number of samples allowed is ~ 95 samples.

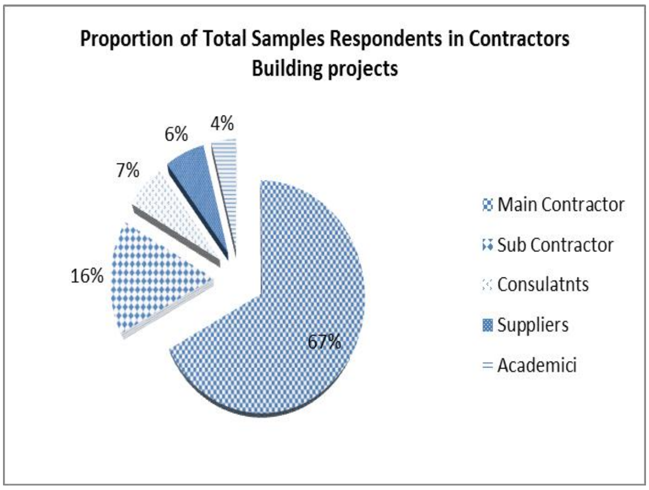

Figure 1. Proportion of the number of samples of research respondents

So that based on the type of population that is limited, the number of samples in this study was taken in total based on the number of research in the field which amounted to 125 samples of respondents. Where in detail can be described as follows, where the total proportion of contractors is 67%, sub-contractors 16%, consultants 7%, material suppliers 6% and academics 4%:

Analysis of Implementation Level Design Phase From the results of the initial data processing of the questionnaire results, it was found that the level of participation of respondents' opinions on the priority/importance level of the implementation of the sub-variables showed a fairly optimistic level where the average rage ranged from 4.2 to 4.8. Where the lowest level is 1 = with a scale of very unimportant to apply, a scale of 2 = not important, a scale of 3 = not too important, a scale of 4 = important and a scale of 5 = very important.

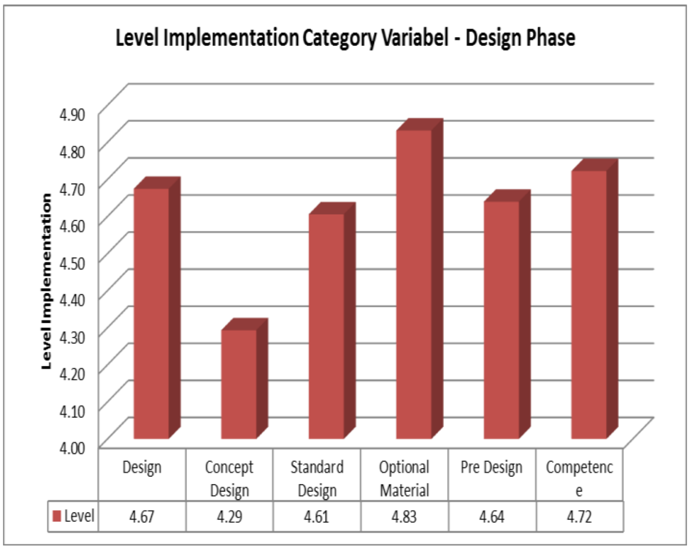

Figure 2. Level of Implementation of Category Variables – Planning Stage

From the results of data processing in Figure 2. it is obtained that the level of implementation level on the variables. The research category in the Design Phase includes the Low Waste Material Selection Category which has an implementation level that is quite important to be applied with a level of 4.83 in reducing the impact of cost inefficiency. due to the emergence of residual building construction materials, then Planner Competence with level 4.72, Pre-Design with level 4.64, Design & Regulatory Standards with level 4.61, Design Planning with level 4.58 and Sustainable Design Concepts with level 4, 29. The results of the analysis also provide a fairly logical perspective on the part of planning practitioners/consultants at the planning stage where with good planner/consultant competence it can be the main reference in producing optimal and accurate planning designs in the implementation process later so as to avoid (Preventive) the emergence of wastage of costs/cost inefficiencies resulting from the emergence of residual materials during the building construction process.

Analysis of the Implementation Level of the Procurement Phase From the results of the initial data processing of the questionnaire results, it was found that the level of participation of respondents' opinions on the priority/importance level of the implementation of the sub-variables showed a fairly optimistic level where the average rage ranged from 4.2 to 4.8. Where the lowest level is 1 = with a scale of very unimportant to apply, a scale of 2 = not important, a scale of 3 = not too important, a scale of 4 = important and a scale of 5 = very important. From the results of data processing in Figure 3. it is obtained that the level of implementation level on the variable.

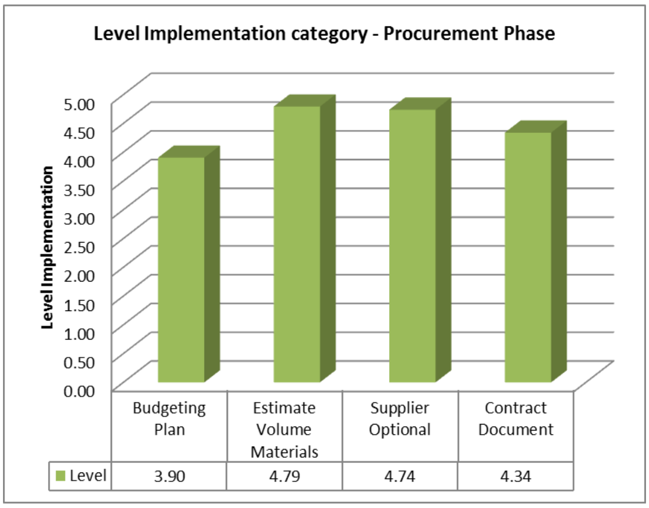

Figure 3. Level of Category Variable Implementation – Procurement Stage

The research category in the Procurement Phase includes the Estimation and Ordering of Material Volume categories which have an implementation level that is quite important to be applied with a level of 4.79 in reducing the impact of deficiency. costs due to the emergence of residual building construction materials, then Supplier Selection with a level of 4.74, Contract Planning with a level of 4.64, and Budget Planning with a level of 3.9. This shows that in the actual field, the aspects of calculating the volume and ordering materials at the procurement stage have a significant influence on the emergence of residual materials in the field during the construction period. Therefore, the construction operator, in this case specifically the implementing contractor, must pay more attention to the aspect of calculating the volume of the planned work accurately in order to avoid and reduce the impact of the emergence of residual materials during construction.

Analysis of Implementation Level Implementation Phase (Construction Phase) From the results of the initial data processing of the questionnaire results, it was found that the level of participation of respondents' opinions on the priority/importance level of the implementation of the sub-variables showed a fairly optimistic level where the average rage ranged from 4.2 to 4.8. Where the lowest level is 1 = with a scale of very unimportant to apply, a scale of 2 = not important, a scale of 3 = not too important, a scale of 4 = important and a scale of 5 = very important. From the results of data processing in Figure 4. it is obtained that the level of implementation priority level is the highest variable in the research category in the Construction Phase, namely the Management Commitment Category with level 4.8 in reducing the impact of cost deficiency due to the emergence of residual building construction materials, then Work Methods and Material Handling in the Field (On Site Handling) with level 4.76, Material Storage Handling (Storage Handling) with level 4.74, Delivery Handling with level 4.64, Regulations with level 4, 66, Supervision with a level of 4.65, Worker Competence with a level of 4.5, Material Reuse with a level of 4.48 and Application of Fabricated Materials with a level of 4.27. This is empirically proven in the field where it shows that the implementation of a comprehensive waste management implementation begins with a management commitment by the construction operator, especially the contractor, this is because the consistency of management commitment by the implementer is believed to have been able to reduce the impact of cost inefficiency due to the emergence of waste material. at the construction stage and can be a good synergy in other management strategies at the construction stage.

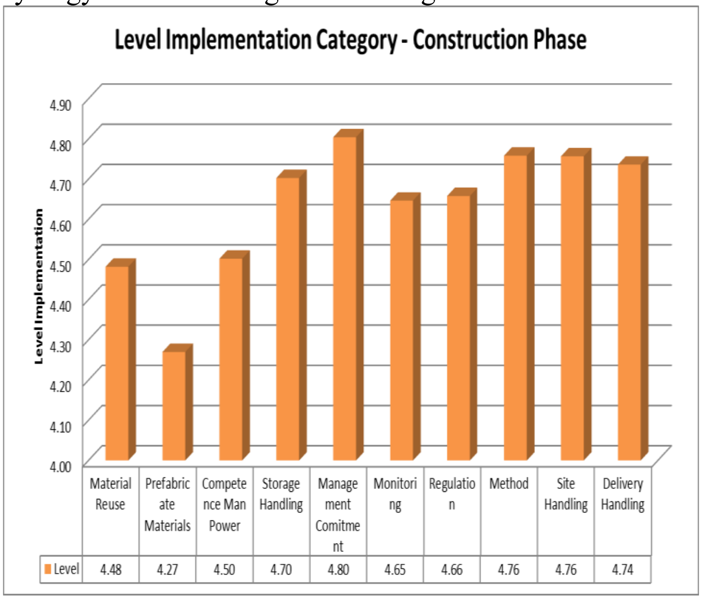

Figure 4. Level of Category Variable Implementation – Implementation Stage

The results of the data analysis test were also carried out using a validity test using SPSS-22 software, where the r-count level > r-Product Pearson Moment was > 0.176 with N=125 and the reliability test results were at a level > 0.7 (Cronbach's Aplha). From the results of the data analysis above, it can be concluded that the data variables from the results of the research questionnaire can be used for the next research process to determine the relationship in the model concept to the impact of the cost of building construction materials. The results of the analysis also resulted in a reduction in the number of sub-variables from 133 sub-variables to 113 sub-variables through the process of testing the validity and feasibility tests of research variables.

CONCLUSION

The results obtained from this study are that the ideal/effective factor for implementing the ideal construction material waste management is 113 sub-variables from the initial total of 133 sub-variable factors. Where in the planning/design stage the most priority variable category is obtained, namely the Selection of Low Waste Materials with a level of 4.83, then at the procurement stage, namely the Estimation and Ordering of Material Volume with a level of 4.79 and at the construction stage, namely the Management Commitment variable category. in the Field with level 4.8. The direction of the development of this research is expected to be in the form of developing the concept of an ideal building construction material waste management model that can be applied by the construction operator in this case addressed to the implementer/contractor, planning consultant and material supplier in an effort to reduce the impact of inefficiency in material costs during the process. building construction in Indonesia.

REFERENCES

1. Begum, R A, Siwar, C, Pereira, J J and Jafar, A H A. (2006). Benefit–cost analysis on the economic feasibility of construction waste minimization: The case of Malaysia. Resources, Conservation and Recycling.
2. Bilitewski, B., Hardtle, G. and Marek, K. (1994), Waste Management Springer, New York, NY.
3. Bossink, B. A. G. and Browers, H. J. H. (1996). Construction Waste : Quantification and Source Evaluation. Journal of Construction Engineering and Management, No. 122, pp. 55-60.
4. British Standards Institution. (1998) BS5678-9.8: Structural use of timber: ceiling binders. Available at: http://www.standardsuk.com/ (Accessed: 5 June 2014).
5. Ervianto, W.I. (2015), Green Construction Achievements in Building Projects, Proceedings of the 9th National Conference on Civil Engineering (KoNTekS 9) Komda VI BMPTTSSI - Makassar, 7-8 October 2015.
6. European Environment Information and Observation Network (EIONET), (2006). https://www.eionet.europa.eu/.
7. Gavilan, R. M., & Bernold, L. E. (1994). Source Evaluation of Solid Waste in Building Construction. Journal of Construction Engineering and Management, 536-552.
8. Gilpin, A. (1996), Dictionary of Environment and Sustainable Development, John Wiley & Sons, Chichester and New York, NY.
9. Innes, S. (2004). Developing Tools for Designing Out Waste Pre-Site and Onsite. In Proceedings of Minimizing Construction Waste Conference: Developing Resource Efficiency and Waste Minimization in Design and Construction, New Civil Engineer, London, UK.
10. Intan, I., Alifen, R. S. and Arijanto, L. (2005). Analysis and Evaluation of Construction Material Waste: Sources of Cause, Quantity, and Cost. Civil Engineering Dimensions, Vol. 7, No.1, pp. 36-45.
11. Minks W R (1994). The construction contractor's waste management plan: Optimizing control and cost Proc. of the 1st Int. Conf.of CIB-TG16 Sustainable Construction(Tampa, Florida, USA) pp765-774.
12. Mokhtar, S.N., Mahmood, N.Z., Hassan, C.R.C., Masudi, A.F., Sulaiman, N.M. (2011). Factors that contribute to the generation of construction waste at sites, Advances in Materials Research 163-167, 4501-450.