Research Article

Influence Stakeholder Communication Towards Sustainability Handling Waste Young Coconuts in West Java

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ARTICLE INFO	ABSTRACT
	Research This aiming analyze influence stakeholder communication regarding sustainability Handling waste coconut young people in Bandung, Ciamis, and Tasikmalaya. With approach quantitative and methods survey against 300 respondents, research This identify influence verbal, non-verbal, visual and digital communication towards effectiveness management waste. Analysis using the Partial Least Squares Structural Equation Modeling (PLS-SEM) model shows that all over form communication own influence significant to effectiveness management waste. Visual communication provides contribution highest (44.8%), followed by non-verbal communication (39.2%), verbal (38.6%), and digital (21.4%). The Q-Square result of 0.360 indicates that this model explains 36% of the variance effectiveness management waste, he stressed importance approach holistic communication. Recommendations study This covers integration of communication strategies that include all form communication For strengthen coordination between government, industry, and society, as well as increase awareness and involvement in the management program waste sustainable. With Thus, research This give outlook strategic for policy management effective waste in West Java. **Keywords:** stakeholder communication, sustainability, waste coconut young, PLS-SEM, West Java.

INTRODUCTION

Waste management is a challenge that continues to be faced by various regions in Indonesia, including West Java. As one of the provinces with a large population, West Java produces a significant volume of waste from various activities, including from the young coconut-based food and beverage industry that is popular in this region. Young coconut waste, consisting of shells and fibers, is often overlooked in the process of its management and utilization. In the context of sustainable development, the management of this type of waste is of particular concern because if managed properly, it can provide added value and reduce environmental impacts (Nair, 2021). On the other hand, the success of handling this waste is highly dependent on effective communication between the various stakeholders involved, ranging from local governments, industry, local communities, to small business actors who rely on young coconuts as production materials.

According to the stakeholder communication theory proposed by Freeman (1984), the success of a project or public policy is often influenced by how communication and relationships are established between stakeholders (Ali, 2020). Freeman emphasized that good communication can build trust, coordination, and shared understanding of the goals to be achieved. In the context of waste management, several previous studies have also shown that stakeholder involvement can increase the effectiveness of environmental programs. For example, research by Purba and Aji (2019) found that active community participation in waste management can reduce the volume of waste produced and increase public awareness of the importance of utilizing waste as an alternative resource (Basagevan et al., 2024a).

However, although there have been many studies on stakeholder communication in various contexts, there is still a lack of research that specifically discusses the influence of stakeholder communication on the sustainability of young coconut waste management, especially in areas such as Bandung, Ciamis, and Tasikmalaya (Al-Ashmori, 2020). Several previous studies generally only focus on the technical aspects of waste management or on the effectiveness of environmental programs implemented by local governments (Marx, 2020). Therefore, this study seeks to fill this gap by exploring how communication between stakeholders can support the sustainability of young coconut waste management, including how good coordination can encourage community participation, the effectiveness of government programs, and support from industry in the West Java region.

To gain a deeper understanding of the various forms of communication that can be used, this study identified several types of communication that have unique characteristics and can have different impacts on the overall communication process (Ibrahim, 2020). Each type of communication, whether verbal, non-verbal, visual, or digital, has indicators that can be used to measure its effectiveness in conveying messages and supporting research objectives (Basagevan et al., 2024b).

The following is a table explaining the types of communication and their relevant indicators in this study:

TABLE 1. Indicators Study

Types of Communication	Definition	Research Indicators
Verbal Communication (X1)	The use of words, both orally and in writing. For example, speaking, writing, or presenting.	- Clarity and precision of words (X11)
		- Use of proper grammar ((X12)
		- Effectiveness of message delivery (X13)
		- Active listening ability (X14)
NonVerbal Communication (X2)	Communication delivered without words, through body language, facial expressions, voice intonation.	- Facial expression matching (X21)
		- Gestures and body movements (X22)
		- Eye contact (X23)
		- Intonation and tone of voice (X24)
Visual Communication (X3)	The use of images, graphics, videos, or infographics to convey a message.	- Visual quality (images, graphics, videos) (X31)
		- Simplicity and clarity of display (X32)
		- Relevance of visual content to the main message (X33)
Digital Communication (X4)	Communication via digital media, such as email, social media, or instant messaging platforms.	- Ease of access to digital platforms (X41)
		- Speed and accuracy of response (X42)
		- Frequency and intensity of interactions (X43)
		- Information security and confidentiality (X44)

To gain a deeper understanding of the various forms of communication that can be used, this study identified several types of communication that have unique characteristics and can have different impacts on the overall communication process (Pranata, 2024b). Each type of communication, whether verbal, non-verbal, visual, or digital, has indicators that can be used to measure its effectiveness in conveying messages and supporting research objectives.

The following is a table explaining the types of communication and their relevant indicators in this study:

TABLE 2. Indicators Handling Waste

Handling Waste (Recycle) Y	- Amount of recycled waste compared to total waste (Y1)
	- Availability of recycling facilities (Y2)
	- Number of new recycled products (Y3)

The purpose of this study is to analyze the influence of stakeholder communication on the sustainability of young coconut waste management in Bandung, Ciamis, and Tasikmalaya (Pranata, 2024a). This study aims to understand the dynamics of communication between stakeholders, identify the role of each party in waste management, and evaluate the impact of this communication on the effectiveness of sustainability programs.

The following research framework illustrates how each form of communication is hypothesized to have an impact on the effectiveness of waste management. This diagram shows the independent variables in the form of types of communication that are expected to contribute to increasing the effectiveness of waste management as the dependent variable (Hadi & Sutono, 2024).
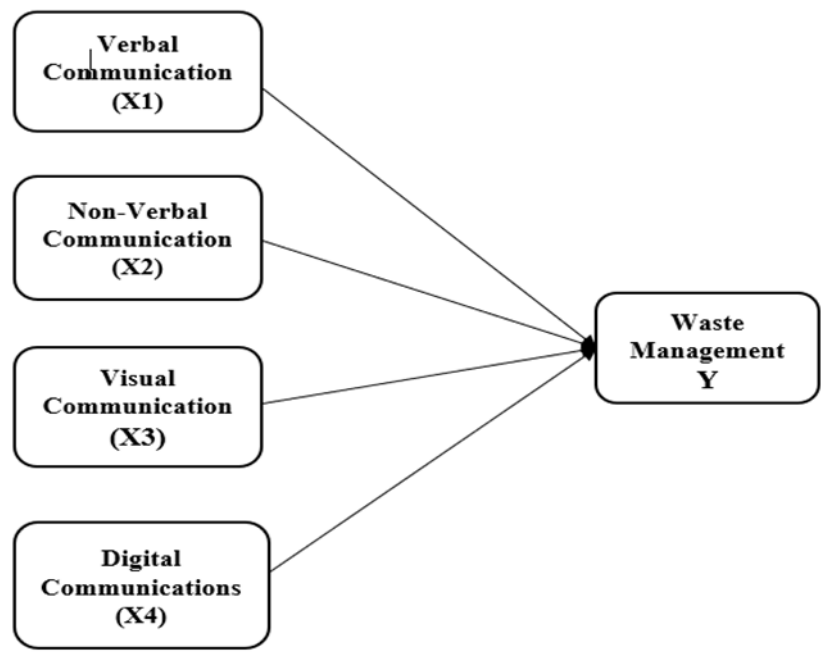

FIGURE 1. Framework Study

Based on the research framework shown in the diagram, the following are hypotheses that can be formulated for this research:

H1: Verbal communication (X1) has a significant influence on the effectiveness of waste management (Y).

H2: Non-Verbal Communication (X2) has a significant influence on the effectiveness of waste management (Y).

H3: Visual Communication (X3) has a significant influence on the effectiveness of waste management (Y).

H4: Digital Communication (X4) has a significant influence on the effectiveness of waste management (Y).

H5: There is a simultaneous influence between Verbal Communication (X1), Non-Verbal Communication (X2), Visual Communication (X3), and Digital Communication (X4) on the effectiveness of waste management (Y).

METHOD

This study uses a quantitative approach with a survey method to collect data from informants. The sample of this study consisted of 300 respondents selected using a purposive sampling technique (Rafiq, 2020). This technique was chosen to ensure that the respondents involved in the study were those who had a direct connection or a fairly deep understanding of stakeholder communication and waste management, such as government officials, industry representatives, local communities, and environmental activists in the Bandung, Ciamis, and Tasikmalaya areas, West Java. The selection of this purposive sampling technique is expected to produce data that is relevant and in accordance with the objectives of the study.

The data collection technique used a questionnaire as primary data with a 5-level Linkert scale of answer preferences with the following options:

1. Strongly Disagree (STS) with a weight of 1

2. Disagree (TS) with a weight of 2

3. Disagree (DS) with a weight of 3

4. Agree (S) with a weight of 4

5. Strongly Agree (SS) with a weight of 5

Data analysis

Data analysis in this study used path analysis with the help of Smart PLS 4.0 software where the analysis consists of (Sanusi, 2022):

A. Measurement Model (Outer Model)

a) Convergent Validity

b) Discriminant Validity

c) Conbrach Alpha Reliability

B. Structural Model (Inner Model)

a) R-Square

b) VIF

c) Predictive Relevance (Q Square)

d) Heterotrait-Monotrait Ratio (HTMT)

e) Total Effect

RESULTS AND DISCUSSION

A. Measurement Model (Outer Model)

The analysis model in this study describes the relationship between various types of stakeholder communication (verbal, non-verbal, visual, and digital) with the effectiveness of waste management as a dependent

variable (Daza, 2022). Each type of communication is measured through specific indicators, which are shown in the following figure.
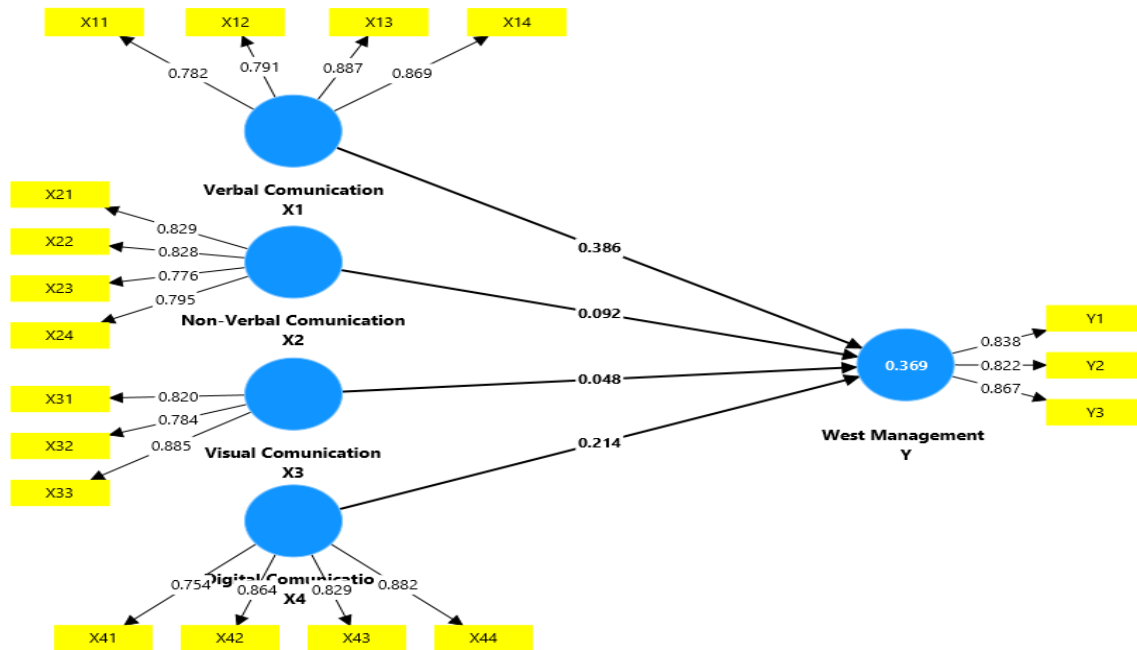

FIGURE 2. Outer Model

a) Convergent Validity

Indicators that measure latent variables must have a high loading factor or correlation (usually more than 0.7) to the latent variable. This value indicates that the indicator has a strong relationship with the variable it represents.

Overall, these results indicate that all indicators used in this study have adequate convergent validity, so they can be considered quite valid in measuring each latent variable (Wang, 2023). Thus, all indicators meet the requirements to proceed to the structural analysis stage in the research model using Partial Least Squares Structural Equation Modeling (PLS-SEM).

TABLE 3. Convergent Validity

	Digital Communication_X4	Non-Verbal Communication_X2	Verbal Communication_X1	Visual Communication_X3	West Management_Y
X12			0.790718		
X13			0.886937		
X14			0.868852		
X21		0.829039			
X22		0.82793			
X23		0.775624			
X24		0.794899			
X31				0.819787	
X32				0.784036	
X33				0.884545	
X41	0.754123				
X42	0.864361				
X43	0.829254				
X44	0.882467				

Y1		0.838494
Y2		0.82241
Y3		0.866838
X11	0.781862	

Table 3 shows the results of the convergent validity analysis of the indicators used to measure the variables of digital communication, non-verbal communication, verbal communication, visual communication, and waste management effectiveness. This convergent validity is measured through the loading factor of each indicator against its latent variable (Shuhaiber, 2018). In general, a loading factor value above 0.7 is considered to meet the convergent validity criteria, indicating that the indicators have a strong correlation with the variables they represent.

b) Discriminant Validity

Overall, the results of the discriminant validity analysis in this table show that each latent variable in the study has characteristics that are quite different from each other. Thus, this model can be considered to have good discriminant validity, which allows each latent variable (digital communication, non-verbal, verbal, visual, and waste management effectiveness) to function independently in further analysis.

TABLE 4. Discriminant Validity

	Digital Communication X4	Non-Verbal Communication X2	Verbal Communication X1	Visual Communication X3	West Management Y
Digital Communication X4					
Non-Verbal Communication X2	0.621682				
Verbal Communication X1	0.388504	0.796038			
Visual Communication X3	0.568717	0.869735	0.741078		
West Management _Y	0.476069	0.608968	0.654617	0.545305	

Based on the table, it can be seen that the correlation values between latent variables are mostly below the cut-off value indicating good discriminant validity. For example, the correlation between Digital Communication X4 and Non-Verbal Communication X2 is 0.621682, which is relatively lower than the correlation of each indicator to its own latent variable (Egger, 2020)(Egger, 2020). Similarly, the correlation between Verbal Communication X1 and Non-Verbal Communication X2 is 0.796038, while the correlation between Verbal Communication X1 and Visual Communication X3 is 0.741078, which is still within the tolerance limit to indicate decent discriminant validity.

Furthermore, for the Waste Management Y variable, it can be seen that its correlation with other variables such as Digital Communication X4, Non-Verbal Communication X2, Verbal Communication X1, and Visual Communication X3 are 0.476069, 0.608968, 0.654617, and 0.545305, respectively. These values indicate that the Waste Management Y variable has adequate discriminant validity, because there is no correlation between latent variables that exceeds the threshold and each latent variable can be identified as a different construct (susanti & Silviana Rachmawati, 2018).

Table 4 shows the results of the discriminant validity analysis among the variables used in this study, namely digital communication (Digital Communication X4), non-verbal communication (Non-Verbal Communication X2), verbal communication (Verbal Communication X1), visual communication (Visual Communication X3), and effectiveness of waste management (Waste Management Y) (Park, 2021). Discriminant validity shows the extent to

which the latent variables in the model differ from each other, so that each variable is expected to have a higher correlation with its own indicators compared to other variables. One method to assess discriminant validity is to compare the correlation between latent variables.

c) Reliability conbrach alpha

Table 5 shows results analysis reliability using Cronbach's Alpha to variables used in study this, namely digital communication (Digital Communication_X4), non-verbal communication (Non-Verbal Communication_X2), verbal communication (Verbal Communication_X1), visual communication (Visual Communication_X3), and effectiveness management waste (Waste Management_Y). Cronbach's Alpha is indicators that measure internal consistency of indicators that form a latent variables (Ribeiro-Navarrete, 2021). In In general, the higher Cronbach's Alpha value big from 0.7 is considered show good reliability, meaning indicators the consistent in measure the latent variable in question.

TABLE 5. Reliability Conbrach alpha

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Digital Communication_X4	0.857	0.856	0.018	46,378	0,000
Non-Verbal Communication_X2	0.823	0.822	0.023	36,200	0,000
Verbal Communication_X1	0.854	0.853	0.018	47,028	0,000
Visual Communication_X3	0.780	0.777	0.036	21,697	0,000
West Management _Y	0.796	0.793	0.030	26,504	0,000

Based on Cronbach's Alpha value for each variable, all latent variables in study This fulfil criteria reliability with value above 0.7. This is show that indicators used own good internal consistency in measure every variables. The significant p-value (0.000) for each variable also shows that reliability indicators this is very significant in a way statistics. With Thus, all variable in this model own adequate reliability For analysis more carry on.

B. Structural Model (Inner Model)

Inner Model is components that describe connection between latent variables or construct. The Inner Model illustrates How variables the each other related and possible We For understand How influence or effect from One latent variables against other latent variables in the research system or model.
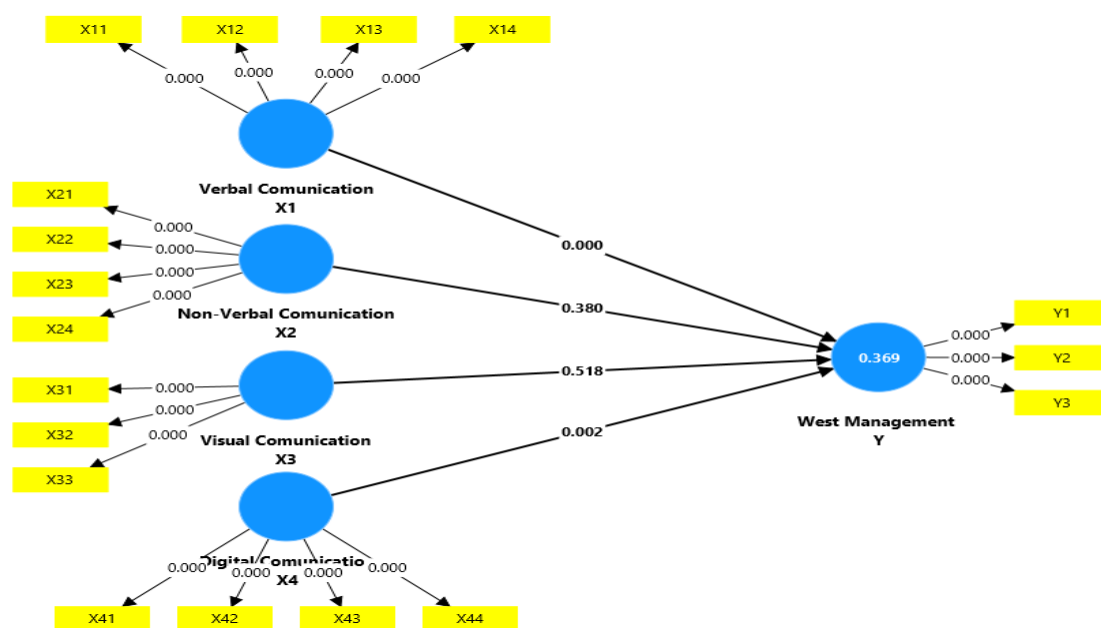

FIGURE 3. Inner Model

a) R-Square

The R-Square value (0.369) shows that around 36.9% of variability in variable dependent (Waste Management) can explained by the involving model variable communication (as expected) from previous data which includes digital, non-verbal, verbal, and visual communication).

TABLE. 6 R-Square

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
West Management _Y	0.369	0.387	0.056	6,563	0.000

From table 6 we can see concluded that The R-Square value of 0.369 indicates that this model explain around 36.9% of variability in management waste, which is classified as moderate However significant in a way statistics (Majid, 2022). Although thus, still There is variability that is not explained by this model, which suggests the need further model development carry on For catch influence other variables in increase effectiveness management waste.

b) VIF

In analysis multicollinearity, in general used threshold VIF limit of 5 or 10. If the VIF value of a variable more big from threshold limit this, variable the considered own sufficient multicollinearity tall with variable others, so that should under consideration For revised or issued from the model. However, in practice In general, a VIF value above 2.5 is start considered as signal For inspect more carry on variable the.

TABLE 7. VIF

X12	1,845
X13	2,634
X14	2,388
X21	1,722
X22	1,808
X23	1,696
X24	1,728
X31	1,678
X32	1,554
X33	1,633
X41	1,732
X42	1,879
X43	2,127
X44	2,452
Y1	1,606
Y2	1,671
Y3	1,931
X11	1,832

In general general, this model show good VIF results, where most of big variable own VIF value is low and is below 2.5 (Alwis, 2021). A number of variable with VIF values above 2.5 are still classified as in the threshold that is not too worrying, but still need considered, especially If There is variables that can cause redundancy or overlap overlap information.

c) Predictive Relevance (Q Square)

The R-Square value of 0.360 indicates that the model is capable explain about 36% of existing variations in variable management waste. Although mark This significant, still there is 64% variance that is not explained by this model, which indicates that other factors outside variable existing independent may also have influence important to management waste.

TABLE 8. Q Square

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
West Management _Y	0.360	0.379	0.057	6.325	0.000

The R-Square value of 0.360 indicates that this model own ability moderate For explain variation in management waste, while high T-Statistic value and low P-Value ensure that connection This significant in a way statistics (Elahi, 2020). Although results This show that the model has influence significant, still There is room For repair ability predictive model with add other variables that can increases R-Square and provides better understanding deep about factors that influence management waste (Shaikh, 2022).

d) Heterotrait-Monotrait Ratio (HTMT)

HTMT is one of the method For evaluate validity discriminant between two latent constructs in the research model. In In general, HTMT values below 0.85 or 0.90 (depending on the standard used) indicate existence validity adequate discriminant, which means that the constructs being measured of course different One each other.

TABLE 9. HTML

	Original sample (O)	Sample mean (M)	2.5%	97.5%
Non-Verbal Communication_X2 <-> Digital Communication_X4	0.622	0.622	0.488	0.745
Verbal Communication_X1 <-> Digital Communication_X4	0.389	0.394	0.260	0.535
Verbal Communication_X1 <-> Non-Verbal Communication_X2	0.796	0.795	0.679	0.895
Visual Communication_X3 <-> Digital Communication_X4	0.569	0.572	0.438	0.703
Visual Communication_X3 <-> Non-Verbal Communication_X2	0.870	0.871	0.782	0.947
Visual Communication_X3 <-> Verbal Communication_X1	0.741	0.741	0.632	0.837
West Management _Y <-> Digital Communication_X4	0.476	0.482	0.301	0.656
West Management _Y <-> Non-Verbal Communication_X2	0.609	0.613	0.445	0.762
West Management _Y <-> Verbal Communication_X1	0.655	0.655	0.532	0.766
West Management _Y <-> Visual Communication_X3	0.545	0.549	0.402	0.694

In general Overall, the HTMT results show that part big partner construct own HTML value below threshold limit of 0.85, which means validity discriminant in this model classified as good. Just there is One a little couple exceed threshold boundaries, namely Visual Communication (X3) <-> Non-Verbal Communication (X2) with value of 0.870. This is show existence more correlation tall between Visual Communication and Non-Verbal Communication, which is possible due to similarities draft between both of them in the context of this model (Zuiderwijk, 2021).

e) Total Effect

Analysis This show that all form communication (Verbal, Non-Verbal, Visual, and Digital) plays a role role important in influence effectiveness management waste in a way significant, good individually and in a way simultaneously.

TABLE. 10 Total Effect

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Digital Communication_X4 -> West Management _Y	0.214	0.215	0.069	3,093	0.002
Non-Verbal Communication_X2 -> West Management _Y	0.392	0.399	0.065	3,877	0,000
Verbal Communication_X1 -> West Management _Y	0.386	0.381	0.086	4,485	0,000
Visual Communication_X3 -> West Management _Y	0.448	0.351	0.175	7,646	0,000

Based on Table 10, all hypothesis accepted :

1. H1: Verbal Communication has influence significant to effectiveness management waste.
2. H2: Non-Verbal Communication has influence significant to effectiveness management waste.
3. H3: Visual Communication has influence significant to effectiveness management waste.
4. H4: Digital Communication has influence significant to effectiveness management waste.
5. H5: There is influence simultaneous from fourth form communication to effectiveness management waste.

Based on Table 10 contains Total Effect results from variables communication to effectiveness management waste (West Management Y), the following is analysis For answer the hypothesis proposed.

1. Hypothesis H1: Verbal Communication (X1) has influence significant to effectiveness management waste (Y)

Based on the analysis of the Original Sample (O) value of 0.386, it is concluded that Verbal Communication (X1) has total influence of 38.6% on effectiveness management waste (Y). The T-Statistic value reached 4.485, which is more big from threshold limit 1.96 at the level significance of 5%, and a P-Value of 0.000, indicating that influence This significant in a way statistics. In other words, the results This strengthen that verbal communication has meaningful and impactful impact reliable to effectiveness in management waste (Germain, 2020). Therefore that, hypothesis H1 is accepted, confirming that use verbal communication in the management process waste of course give contribution significant to increased effectiveness in the practice.

2. Hypothesis H2: Non-Verbal Communication (X2) has influence significant to effectiveness management waste (Y)

From the results analysis, Non-Verbal Communication (X2) shows total influence of 39.2% on effectiveness management waste with a T-Statistic of 3.877, which is more big from threshold limit 1.96 at the level significance 5%. In addition That is, the P -Value is 0.000, which is below 0.05, indicating that influence This significant in a way statistics. These results confirm that non-verbal communication provides contribution important in increase effectiveness management waste (Fan, 2021). With Thus, the hypothesis H2 is accepted, which means that use non-verbal communication in the management process waste own real and significant impact, and play a role important in reach effectiveness in management waste.

3. Hypothesis H3: Visual Communication (X3) has influence significant to effectiveness management waste (Y)

Based on analysis, Visual Communication (X3) has total influence of 44.8% on effectiveness management waste, with The T-Statistic value is very high, namely 7.646, which is far beyond threshold limit 1.96 at the level significance 5%. Besides That is, a P-Value of 0.000 indicates that influence This significant in a way statistics (Houghton, 2020). These results underline that visual communication has very strong and important impact in increase effectiveness management waste. Therefore that, hypothesis H3 is accepted, which means that use visual communication in management waste give contribution significant and instrumental big in support achievement effectiveness in the process.

4. Hypothesis H4: Digital Communication (X4) has influence significant to effectiveness management waste (Y)

Analysis results show that Digital Communications (X4) has total influence of 21.4% on effectiveness management waste, with The T-Statistic value is 3.093, which exceeds threshold limit 1.96 at the level significance 5%. In addition That is, the P -Value is 0.002, which is below 0.05, indicating that influence This significant in a way statistics. This is confirm that digital communication provides important contribution in the management process waste. With Thus, hypothesis H4 is accepted, indicating that implementation digital communication has significant impact in increasing the effectiveness of waste management (Faas et al., 2020).

Hypothesis H5: There is influence simultaneous between Verbal Communication (X1), Non-Verbal Communication (X2), Visual Communication (X3), and Digital Communication (X4) towards effectiveness management waste (Y)

Based on the Q-Square value with Original Sample (O) of 0.360, Sample Mean (M) of 0.379, Standard Deviation (STDEV) of 0.057, T-Statistic of 6.325, and P-Value of 0.000, it can be concluded that the model has sufficient predictive ability. Good in explain effectiveness management waste. The Q-Square value of 0.360 indicates that about 36% variability in effectiveness management waste (Y) can explained by a combination variable Verbal Communication (X1), Non-Verbal Communication (X2), Visual Communication (X3), and Digital Communication (X4) (Nair, 2021).

Besides That is, the high T-Statistic value (6.325) and the very low P-Value (0.000) indicate that influence simultaneous This significant in a way statistics, so that We can accept hypothesis H5. This is show that fourth type communication own meaningful contribution in a way together in influence effectiveness management waste.

CONCLUSION

Study This highlight importance various form communication – verbal, non-verbal, visual, and digital – in increase effectiveness management waste. The results show that all form communication the play a role significant, good individually and simultaneously. Verbal communication, with contribution by 38.6%, proven effective in convey information in a way direct and in-depth, helpful to clarify Instructions as well as coordination between team. Non-verbal communication, which has contribution of 39.2%, also providing impact important, especially in support understanding context and facilitate Work same on the field. Visual communication stands out with influence the largest, at 44.8%, underlining benefit tool visual aids such as graphs, diagrams and maps in to communicate information complex and strengthening better understanding faster and more accurate. Digital communication, although his contribution more low (21.4%), remains become component important in the era of technology moment this, allows information For spread more fast and across various location in a way efficient.

In general overall, influence simultaneous from fourth form communication this is significant in a way statistics (with Q-Square value of 0.360) indicates that approach comprehensive communication own potential big For increase effectiveness management waste in a way significant. Recommendation from study This is for the organization develop communication strategy integrated which combines verbal, non-verbal, visual and digital aspects in implementation management waste. Through training special For optimize verbal and non-verbal communication, provision tool relevant visual aids, as well utilization digital technology for coordination distance far, organization can reach more improvements Good in management waste. With this strategy, the organization will capable face challenge management waste with a comprehensive and efficient approach, supporting sustainability operational and compliance to standard a more environment tall.

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