

Statistical Analysis of Factors for Changes in Student Behavior in Solo Raya as a Catalyst for Empowerment of Waste Banks: The Role of Agents of Change

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Abstract

Overcoming the substantial waste issue in Indonesia poses a significant challenge. The establishment of waste banks is identified as a potential solution, yet there needs to be more active community engagement in becoming waste bank patrons. Hence, this study aims to identify factors influencing individuals' behaviors in supporting waste bank empowerment. The research adopts the Theory of Planned Behavior, encompassing six variables: attitudes, subjective norms, knowledge, financial motives, intentions, and behavior. Questionnaires were distributed via social media for data collection, with 200 respondents selected through purposive sampling, primarily active students at the University in Solo Raya the analysis employed multiple linear analysis to assess the significance of the regression model, coefficient of determination, and the partial influence of each variable. Findings indicate that subjective norms and financial motives positively influence intentions, though not significantly. Conversely, attitude and knowledge variables significantly and positively impact intentions. Additionally, the intention variable demonstrates a significant positive effect on behavior supporting waste bank empowerment.

Keywords: *waste bank, theory of planned behavior, waste management, environmental engineering, community participation, sustainability environmental*



A. INTRODUCTION

A healthy and clean environment is the dream of every living creature. One way to protect the environment is for humans to be responsible for waste. As the population increases, likely, the waste produced will also increase. Indonesia is in 2nd place as the country that collects plastic waste in the world.(Purwanto & Hakim, 2021) In 1980-1997, countries included in the Organization for Economic Co-operation and Development (OECD), namely Canada, the United States, the United Kingdom (UK), and Denmark, experienced an increase in the amount of waste by 40%.(King et al., 2006) The European Union compared several alternative strategies, namely repairing, reconditioning, and remanufacturing or recycling. The following is waste data in Indonesia for 2022.

Table 1. Waste Data by 309 Regencies/Cities throughout Indonesia in 2022

	Total (Ton/Year)
Waste Generation	36.218.012,28
Waste Reduction	5.390.999,15
Waste Handling	17.791.815,35

Managed Waste	23.182.814,50
Unmanaged Waste	13.035.197,78

Source: SIPSN (2022)

The data shows that the total amount of waste in Indonesia is 35.953.862,11 tons and unmanaged waste is 13.480.665,34 tons. This shows that there is still a lot of waste that must be managed well, namely by mobilizing human concern first. The following is data on the types of waste that exist.

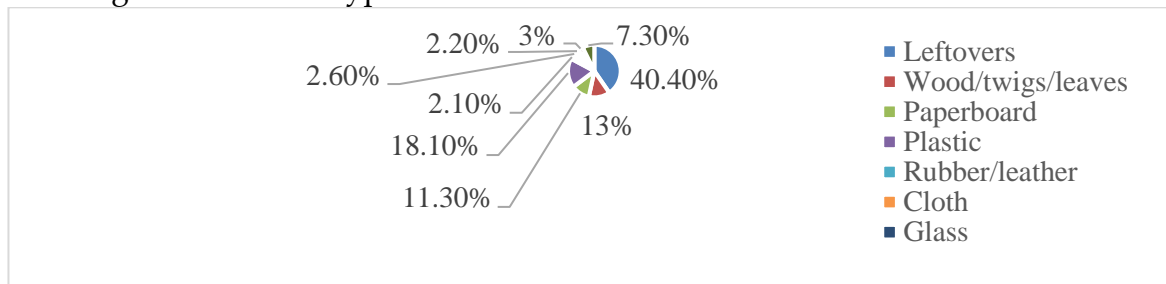


Figure 1 Waste Composition Based on Type of Waste

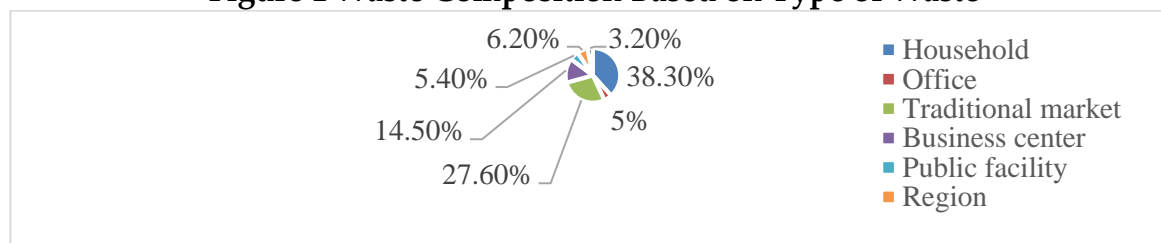


Figure 2 Waste Composition Based on Waste Source

The results show that recycling is the best and most appropriate strategy for dealing with waste problems. Recycling will increase the intrinsic value of the product, which allows the recycling results to be sold again.(King et al., 2006) Cultivating a sense of human care is very important, especially caring for the environment. So the community must handle waste and then create a strategy and program.(Mujahidin et al., 2020)

Recycling is carried out to reprocess something that has been wasted, idle, and not used, which can create environmental pollution and other social problems. The benefits of waste processing will have an impact on saving existing natural resources.(Kumar et al., 2017) Recycling of household waste is more efficient than landfilling.(Letelier et al., 2021) Strategies and programs are designed to systemize humans so they can create behavior that is beneficial to the environment. Human behavior can be studied using the Theory of Planned Behavior (TPB). In this theory, it studies a person’s intentions, predictive validity, emotions, past behavior, habits, and rationality.(Ajzen, 2011) TPB adds one variable, namely perception of control (perceived behavioral control). The addition of these variables resulted in three factors influencing individual intentions, namely attitudes toward behavior, subjective norms, and perceived behavioral control.

Using TPB theory in this research is because TPB is appropriate to use to determine someone’s intentions in empowering waste banks. This is supported by previous research which examined individual intentions in carrying out the waste

bank movement which also used the TPB in their research in other countries. Tonglet et al. (2004) Bortoleto et al. (2012) Astuti et al. (2021) Setiawan et al. (2021) If existing waste can be processed properly, it will produce large profits and benefits. One way is to use waste banks as the right mediator for managing waste. Research conducted in California shows that waste products can produce chemical contents that are harmful to the environment. (Saphores et al., 2006) Other research was also carried out on recycled poly (ethylene terephthalate) bottle waste, the results of which can be used to design environmentally friendly industrial prototype environments. (Shafique et al., 2011) From several studies conducted in various countries, it can be concluded that recycling waste is very important for the environment and other living creatures.

This research is social marketing research which focuses on a person's attitude of responsibility, empathy, and sympathy (Pudjiastuti, 2016). In recent years, social marketing has developed more broadly in social policies that seek to influence society to contribute to social responsibility. (French, 2015) States that social marketing can be used to achieve the economic targets and mission of a business or company. Apart from that, social marketing can create behavioral changes that are beneficial to society (Kennedy & Parsons, 2014). This research aims to determine changes in the behavior of University in Solo Raya students toward empowering waste banks.

B. METHOD

This research was conducted in Indonesia on active students at a university in Solo Raya. The research sample was determined based on the following criteria: (1) respondents were active students at university in Solo Raya; (2) aged 18 to 26 years; (3) know what a waste bank is. The variables used include attitude, subjective norms, knowledge, financial motives, intentions, and behavior.

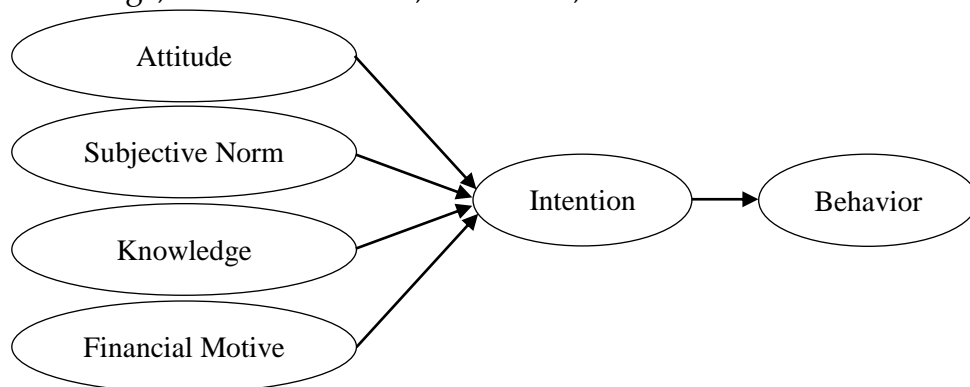


Figure 3. Conceptual Model

Six variables were included in the conceptual model (Figure 3). The data collection technique is a random sampling method and uses an online survey by distributing questionnaires online via social media platforms. The results obtained were 200 respondents. The data analysis technique used is Partial Least Square-Structural Equation Modelling (PLS-SEM) using Smart PLS software.

In this case, the researcher aims to examine the extent to which the final intention motivates residents to participate in the waste bank program. The proposed conceptual model can be found in the illustration in Figure 3. Data collection was carried out using a questionnaire for active students at university in Solo Raya. The minimum number of respondents is five times the number of questionnaire statement items. In this study, the number of statement items was 33 items. So, the minimum number of respondents is $33 \times 5 = 165$ students.

The research hypothesis is as follows:

- H1 : attitudes towards waste banks have a positive and significant impact on the intention of student's participation in waste bank activities.
- H2 : subjective norm have a positive and significant effect on the intention of students participation in waste bank activities
- H3 : knowledge of the consequences has a positive and significant impact on the intention of student's participation in waste bank activities
- H4 : financial motive have a positive and significant effect on the intention of students participation in waste bank activities
- H5 : intention has a positive and significant effect on the behavior of student's participation in waste bank activities

C. RESULT AND DISCUSSION

Based on the results of the questionnaire, a total of 200 students of university in Solo Raya participated in this survey. There are 69 male students and 131 female students. There were 124 respondents aged 17-20 years, 70 respondents aged 21-24 years, and 6 respondents aged 25-28 years. In this research, the results show that the Cronbach's alpha value is above 0.7, indicating good consistency. The AVE value is higher than 0.5, which means the measurement model has good construct reliability. (Hair et al., 2017) Discriminant validity is verified by following the Fornell Larker criteria, namely the AVE value exceeds the correlation between constructs, resulting in appropriate discriminant validity.

Table 2. Description of The Measurement Items

Variable	Measurement Item	Factor Loading	Validity
Attitude	A5 Saving waste at the waste bank is a good thing.	0.837	Valid
	A6 Joining as a waste bank customer is a good deed.	0.949	Valid
Subjective Norm	SN1 My family recommended me to join as a waste bank customer.	0.897	Valid
	SN2 I followed the waste bank on the advice of my brother.	0.905	Valid
	SN3 My friend recommended me to be a waste bank customer.	0.867	Valid
	SN4 I joined the waste bank for the motivation of my neighbour.	0.839	Valid
	SN5 My idol influenced me to become a waste bank customer.	0.798	Valid
	SN6 My neighbourhood play an active role in inviting	0.824	Valid

		residents to take part in waste bank activities.		
Knowledge	K4	I know the benefits of joining a waste bank customer.	0.814	Valid
	K5	I know the impact of collecting waste in waste banks on the environment.	0.892	Valid
	K6	I know the impact of joining a waste bank on the environment.	0.923	Valid
Financial Motive	FM1	I collect trash to get rewards.	0.867	Valid
	FM2	I became a waste bank customer to earn additional income.	0.901	Valid
	FM3	I do waste bank activities to get rewards.	0.883	Valid
	FM4	I would like to manage waste if I get a reward.	0.774	Valid
	FM5	The reward has encouraged me to join a waste bank customer.	0.805	Valid
Intention	I1	I am interested in becoming a waste bank customer.	0.915	Valid
	I2	I am interested in managing waste by becoming a waste bank customer.	0.924	Valid
	I3	I have the intention of protecting the environment from waste through a waste bank.	0.861	Valid
	I4	I am interested in joining as a waste bank customer to make a profit.	0.730	Valid
Behavior	D1	I am consistent in collecting waste for the waste bank.	0.920	Valid
	D2	I regularly manage waste through a waste bank.	0.942	Valid
	D3	I consistently clean the environment from waste to deposit it in the waste bank.	0.909	Valid
	D4	I always deposit waste into the waste bank.	0.879	Valid
	D5	I am active in being a waste bank customer.	0.897	Valid
	D6	I took part in the activities of the waste bank.	0.861	Valid

Table 3: Construct Reliability, and Validity

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Attitude	0.766	0.931	0.888	0.800
Subjective Norm	0.927	0.936	0.943	0.733
Knowledge	0.850	0.855	0.909	0.771
Financial Motive	0.902	0.918	0.927	0.718
Intention	0.881	0.892	0.919	0.741
Behavior	0.955	0.976	0.963	0.813

Reliability was tested through the results of Cronbach's Alpha (CA) and Composite Reliability (CR). As shown in Table 3. the CA and CR values of all latent variables are more than the recommended standard value, namely 0.70. This result is more than 0.70, indicating good reliability. Validity is tested through convergent validity and discriminatory validity. Convergent validity testing can be seen from the Average Variance Extracted (AVE) value, which is said to be valid if the value is more than 0.50. Table 3. shows that the AVE results for all variables are > 0.50 , which means that all variables are valid to be used for research and to continue further testing because the reliability and validity of the measurements are all acceptable.

Discriminate validity can be determined by looking at the value of the value of the Fornell-Larcker Criterion on HTMT. the Fornell-Larcker Criterion measurement shows that the correlation of a variable with the variable itself cannot be smaller than the correlation of other variables.(Hair et al., 2017) The following are the results of measuring the Fornell-Larcker Criterion on HTMT:

Table 4. Fornell-Larcker Criterion

	Attitude	Subjective Norm	Knowledge	Financial Motive	Intention	Behavior
Attitude	0.894					
Subjective Norm	0.327	0.856				
Knowledge	0.428	0.469	0.878			
Financial Motive	0.095	0.274	0.234	0.847		
Intention	0.438	0.361	0.526	0.240	0.861	
Behavior	0.162	0.651	0.386	0.270	0.339	0.902

Based on table 4, each construct, such as Attitude, Subjective Norm, Knowledge, Financial Motive, Intention, and Behavior, has good discriminant validity from other variables in the model. The squared factor loadings for each latent variable are greater than the correlations between them. For example, Attitude has a squared factor load of 0.894, which is greater than the correlation with other variables such as Subjective Norm, Knowledge, Financial Motive, Intention, and Behavior. The same applies to the other variables in the model. This finding provides confidence that the structure of the model built is consistent, and each latent variable can be distinguished well in the confirmatory analysis. Thus, the results of the Fornell-Larcker Criterion Table support the reliability of the model in measuring the proposed constructs.

Table 5. T-Statistic

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
Attitude -> Intention	0.248	0.246	0.065	3.808	0.000
Subjective Norm -> Intention	0.083	0.088	0.072	1.161	0.246
Knowledge -> Intention	0.355	0.358	0.082	4.302	0.000
Financial Motive -> Intention	0.110	0.110	0.060	1.827	0.068
Intention -> Behavior	0.339	0.341	0.065	5.194	0.000

Table 5. shows the results of hypothesis testing, namely in the bootstrapping resampling test, the T-Statistic value shows that attitudes and knowledge can he a significant positive effect on intentions, and intentions can have a significant positive effect on behavior a T-value of more than 1.96 and a P-value of more than 0.05, thus indicating that there is a positive and significant influence. Meanwhile, the subjective norm variables on intentions and financial motive for intentions show a T-statistic value of less than 1.96 and P-value of more than 0.05, thus indicating that

there is no influence and is significant, thus supporting H1, H3, and H5. Meanwhile, subjective norms and financial motive can have a significant positive effect on intentions, having a T-statistic value of less than 1.96 and P-value of more than 0.05, which indicates that they have no significant effect and therefore do not support H2 and H4.

The Effect of Attitude on Intention

The t-statistic of 3.808 indicates that the relationship between Attitude and Intention is statistically significant. The very small p value (0.000) confirms that the effect of Attitude on Intention in this study has high significance. The findings of this study are corroborated by research by Pandey & Yadav (2023) which shows the positive influence of attitudes on intention of environmentally friendly apparel, both direct and indirect relationships through consumer involvement.

Attitudes not only reflect individuals' views on a topic, but are also a key foundation that shapes their decisions and actions (Folkvord et al., 2021; Ahn et al., 2022). This research highlights the crucial role of attitudes in shaping intentions, bringing to the fore an understanding of how individuals' attitudes play a significant role in shaping their inclinations or intentions. As such, an in-depth understanding of the role of attitudes provides an important foundation for designing strategies or interventions that aim to motivate or direct individual behavior in accordance with specific goals or policies.

The Effect of Subjective Norm on Intention

The t-statistic result of 1.161 indicates that the relationship between Subjective Norm and Intention is not statistically significant. The relatively large p value (0.246) indicates that there is insufficient evidence to reject the null hypothesis that the effect of Subjective Norm on Intention is not significant. The results of this study are supported by opinions Wan et al. (2018) which proves that the interaction between usability and subjective norms, as well as perceived quality and subjective norms, negatively affect behavioral intentions. However, this is different from the findings of research conducted by Aslan (2023) who said that religiosity, subjective norms, and halal awareness significantly influence purchase intention for halal food and beverages.

These findings provide important insights into the role of subjective norms in shaping intentions, suggesting that in this specific context, they may not be the cause of significant variability in individuals' intentions to perform an action. It can be concluded that the variation in findings related to the role of subjective norms in shaping intentions, which can be influenced by contextual factors and differences in research contexts.

The Effect of Knowledge on Intention

The t-statistic result of 4.302 shows that the relationship between Knowledge and Intention is statistically significant. The very small p value (0.000) confirms that

the effect of Knowledge on Intention in this study has high significance. This study's findings are also backed by research undertaken by Juma'h & Li (2023) which shows that auditors' knowledge of blockchain is positively related to their intentions, indicating their optimism towards this technology.

The importance of knowledge indicates that the higher the knowledge, the greater the likelihood of forming positive intentions (Nautiyal & Lal, 2022; Choi et al., 2024). It can be concluded that higher levels of knowledge are crucial in forming positive intentions related to the adoption of that knowledge in professional practice, signaling the importance of deep understanding in forming positive attitudes.

The Effect of Financial Motive on Intention

The t-statistic of 1.827 indicates that the relationship between Financial Motive and Intention is not statistically significant at the commonly used significance level ($\alpha = 0.05$). However, the p-value which is slightly above 0.05 (0.068) suggests that there is an indication that this effect may have marginal relevance. These results are in line with research conducted by Zeiske et al. (2021) who said that the financial motive for commuting to work by public transport was less important after the incentive was removed.

The relationship between financial motivation and intention to participate in Bank Sampah may not have direct statistical significance. Even so, it is possible that financial motivation may have a marginally significant influence or limited relevance to an individual's intention to engage in Waste Bank activities. This suggests that other factors or specific contexts may also play a role in shaping the intention to participate in the Waste Bank empowerment program.

The Effect of Intention on Behavior

The t-statistic of 5.194 indicates that the relationship between Intention and Behavior is statistically significant. The very small p value (0.000) confirms that the effect of Intention on Behavior in this study has high significance. The results of this study are supported by opinions Pham et al. (2023) which shows a positive relationship between herd behavior, information adoption, and purchase intention.

The stronger the intention to engage in a particular behavior, the more likely individuals are to effectively engage in concrete actions that are in line with their expressed intentions (Zhuang et al., 2022; Green, 2024). The implication is that the higher the level of participation intention in the Bank Sampah empowerment program, the more likely the individual is to effectively engage in concrete actions that support the program, such as waste collection, management, and recycling. This conclusion makes an important contribution to the understanding of the factors that influence participatory behavior in the context of Waste Bank, and can help design more effective strategies to increase community engagement in Waste Bank empowerment efforts.

D. CONCLUSIONS

Based on the results of the data analysis, it can be concluded that attitudes and knowledge have a positive and significant effect on intentions. Meanwhile, subjective norms and financial motives have no significant effect on intentions. Intentions themselves have a positive and significant influence on behavior. This research explores intentions and behavior in empowering the waste bank movement. The results show a positive and significant attitude towards the intention to empower waste banks. Apart from that, this research also considers the influence of subjective norm. In contrast to attitudes, the results of subjective norms have no significant influence on intentions to empower waste banks. This means that the intention is held or created due to the influence of friends or other important people who are visible and dominant. Then it is known that knowledge influences intentions to empower the waste bank movement. This is different from financial motives, which do not influence intentions to empower the waste bank movement.

ACKNOWLEDGEMENT

Sincerely, we would like to express our appreciation and gratitude to the Department of Management of Diponegoro University for the support and guidance that has been provided to us. Department of Master of Management Diponegoro University for the support and guidance that has been provided in this research. Thank you for the resources and facilities that have been provided, which has made a great contribution in completing this journal article. We also would like to thank the author's friends who have made valuable contributions to this research. Valuable contributions in this research. Collaboration and joint discussions have helped us develop better ideas and research findings. All this support has positively influenced the preparation of this journal article. Hopefully, our research can provide benefits and meaningful contributions to the development of knowledge in the field of management.

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