

Influencing Factors on Society Behavior towards Household Waste Management in Tulungagung

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Abstract The purpose of this study is to evaluate the factors that influence the society behavior towards household waste management in Tulungagung, thus it can be used as basic consideration for improving the efforts of Tulungagung Government to solve the problem of waste management in a more effective, efficient, environmental-friendly and sustainable way. This study conducted in three villages of Tulungagung Regency, namely Plosokandang, Tamanan, and Beji. This study used a total of 270 respondents as research subjects, includes the productive housewives (25 – 45 years old). We described cross-sectional society behavior as referred from the variables of knowledge, attitudes, actions and waste management in Tulungagung. Field observation and questionnaires collection were conducted in February – March 2014. This study uses PLS (Partial Least Square) analysis tool as the mediation approach. The results showed that the behavior of society on the household waste management in Tulungagung is fairly good. Factors that influence the society behavior on the household waste management are analysis, accept, mechanisms, and operational techniques. Behavior of household waste management is also heavily influenced by the knowledge and maturity level of the society.

Keywords Household Waste, Partial Least Square, Waste Management

1. Introduction

The increasing volume and diversity of waste and litter became characteristics due to the increase of population growth, change in consumption patterns, increase in public consumption and life activity of urban communities. Waste generated from the society activity and consumption have become environmental problems that must be addressed by any local government to support the active participation of the local communities themselves. Waste problem is also seriously concerned by Tulungagung Government as the 2006 to 2011's award winning of Clean City in Indonesia. Nevertheless, in 2012 and 2013, Tulungagung got the city award of *Adipura* (annual sanitation award for cities) on the medium city category in Indonesia. However, local government is worried that the increasing waste problems in various places in Tulungagung will affect the next sanitation award. These waste problems is commonly caused by the inappropriate behavior of society on managing the waste, such as burned, littering, etc.

Garbage is basically a wasted material or waste results

sourced from human activity and natural processes that have no economic value, or may even have a negative economic value because of the need of treatment, either to remove or clean which requires significant costs [1-5]. Waste management is a systematic and continuous activities which includes the waste reduction [6-8]. Trash material is wasted or discarded from the source and the result of human activity and natural processes with no economic value [9, 10], even others stated that garbage is a not ready-made resource [11]. This whole time, waste management is still used the final approach, i.e. removing the generated waste in the production and consumption process directly to the landfill [12].

Based on the data from the Department of Public Works, and Department of Human Settlements and Housing Services of Tulungagung in 2013, waste volume as one of the environmental quality indicator along 2010-2012 averaged of 144.190,82 m³ per year. It increased averaged to 17.29% per year (4.777,85 m³ per year). However, waste volume to be further processed is only \pm 22.74% which includes 2.97% composting, 14.83% recycling and 4.94% was sorted. These data implied lacking waste management which potentially will lead to environmental damage in Tulungagung.

The enactment of Law No. 18 of 2008 on Waste Management became a recent benchmark for urban waste

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management policy in Tulungagung. It regulate waste management on the concept of zero waste by emphasizing the importance of the community participation in waste management. Tulungagung Local Government need to formulate an urban waste management policy in addressing the waste problem especially waste of from households that have the largest contribution (66%). The purpose of this new policy is to integrate the management of household waste with all relevant institutions and become a key instrument in implementing urban waste management policy in Tulungagung.

Policy implementation of the urban waste management in Tulungagung Government is emphasized more on the internal communication among relevant government agencies. Otherwise, external communication to the public is only in the form of warning billboards in certain areas such as 'Stay Clean', 'Dispose Trash in its Place', 'No littering', and 'Do not Throw Trash into the River'. Tulungagung Government does not have a special program that intensively deals with the socialization of urban waste management policy to the community in the form of sustainable waste management.

Therefore, this study evaluate the dominant factors that affect society's behavior towards household waste management in Tulungagung. Thus it can be used as basic consideration for improving the efforts of Tulungagung Government to solve the problem of waste management in a more effective, efficient, environmental-friendly and sustainable way.

2. Research Method

This study used a quantitative approach with data collection method of field observation and questionnaires. This study is a cross-sectional research, which seeks the dynamics correlations between risk factors along with its impact. Risk factors and its impact were observed simultaneously, which each subject is observed once. The risk factors and the impact measured according to the state or status at the time of observation. The method of analysis used inferential analysis of PLS (Partial Least Square) mediation approach.

2.1. Study Site

This study conducted in three villages, namely Plosokandang, Tamanan, and Beji, in Tulungagung Regency. These three study sites are a densely populated area and have the characteristics to be achieved in this study (Table 1), which represents the area of the city (Figure 1).

2.2. Data Collection

Data were collected by using a questionnaire for respondents who are housewives at the study site. According to Solimun [13], the amount of sample equals to 5 to 10 times of all latent variables; which this study has 18 indicators. This study used a total of 270 respondents as research

subjects. The respondent includes the productive housewives (25 – 45 years old). Field observation and questionnaires collection were conducted in February – March 2014.

This study used Likert scale in determining the size and rates of the categories, and measured constructs distance. Singarimbun and Effendi [14] explained Likert scale measured by providing the opportunity for a respondent to answer the questions with answers that have been determined the score 1 to 5. Questionnaires in this study using five alternative answers to be selected by the respondent (Table 2). The variables in the questionnaire are knowledge, attitudes and actions; which also used in some previous research on waste management [15].

Table 1. Charasteristic of Research Site

Village - District	Typology	Characteristic
Plosokandang - Kedungwaru	Urban region	<ul style="list-style-type: none"> ➤ Medium number of households ➤ The center of home industri of mats, brooms, and duster
Tamanan - Tulungagung	Urban region	<ul style="list-style-type: none"> ➤ Medium number of households ➤ Awarded as the clean environment at the national level in 2012
Beji - Boyolangu	Urban region	<ul style="list-style-type: none"> ➤ Education center ➤ Dense population

Table 2. Scoring of Lickert Scale

Choices	Score	Description
A	5	Strongly Agree
B	4	Agree
C	3	Neutral
D	2	Disagree
E	1	Strongly Disagree

Source: Riduan and Kuncoro [16]

2.3. Validity and Reliability

The research instrument were tested on its validity and reliability. The validity showed the accuracy of measuring instrument. This test ensuring the instrument to deliver the results in accordance to its purpose. If the correlation value is less than 0.3, it shall be declared as valid [17].

$$r = \frac{n \sum XY - (\sum X)(\sum Y)}{\sqrt{\{n \sum X^2 - (\sum X)^2\} \{n \sum Y^2 - (\sum Y)^2\}}}$$

Description:

r = coefficient of correlation

X = the value of each question

Y = total value of all the questions for one variable

Reliability measure the consistency of the instruments when measured several times with the same measuring instrument. Reliability is an index that indicates the extent to which the instrument can be reliable or unreliable.

$$r_i = \left| \frac{k}{(k-1)} \right| \left| 1 - \frac{\sum \sigma b^2}{\sigma t^2} \right|$$

Description

r_i = the reliability of the instrument

k = number of the questions

$\sum \sigma b^2$ = sum of each variance

σb^2 = total variance

2.4. Data Analysis

This study used the analysis of Partial Least Square (PLS) approach to evaluate the dominant factors that influence the behavior of the waste management in Tulungagung City community. An assumption of linearity must be met in PLS model. Linearity assumption is the assumption that all variables were related in a linear form. Linearity test create a scatter diagram or the curve fit approach. The assumption of linearity tested by curve fit with SPSS software. Reference used the principle of parsimony, i.e. (1) a linear model is significant, or (2) when the entire probable model is insignificant. Specification of the basic model for testing is linear, quadratic, cubic, inverse, logarithmic, power, S, compound, growth and exponential model. Two of these provisions indicate that the linearity assumption is met.

The goodness of fit on models in PLS assumed from the

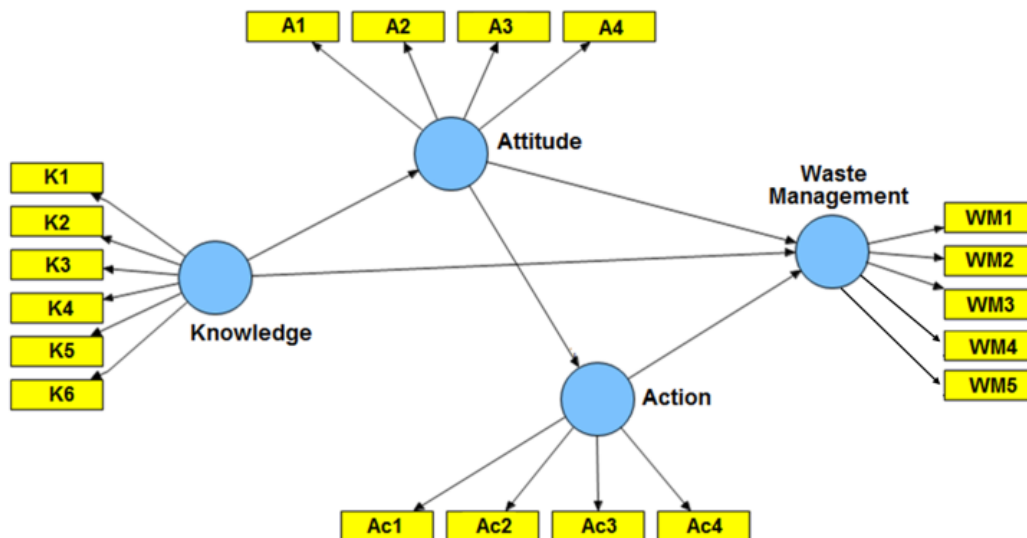
predictive relevance (Q^2) value. This Q^2 value is calculated based on the value of R^2 of each endogenous variable. The predictive relevance (Q^2) value is:

$$Q^2 = 1 - (1 - R_1^2)(1 - R_2^2)(1 - R_3^2)$$

In this study, we determined that people's behavior consists of as endogenous variables of knowledge (K), attitude (A), and action (AC), which affects waste management (WM), as shown in the following Fig. 2.

Society behavior includes three variables, i.e. knowledge, attitude, and action as a form of structured relationship. It begins from knowledge, then requires an attitude, and ends with actions that lead to waste management. It requires the hypothesis that suit the behavior type of the society [20]:

1. Independent variables; suspected as the cause (Presumed cause variables) on the dependent variable. Independent variables can also be referred to as the variable that precedes (antecedent variables).
2. Dependent variable; allegedly as a result (presumed impact variable) from independent variables. The dependent variable can also call as a consequence variable (consequent variable).
3. Mediation/intermediate variable; mediate independent and dependent variable when it showed indirect correlation.



Description:

K1 = Acknowledgement	WM1 = Aspect of regulatory/legal
K2 = Understanding	WM2 = Aspect of organizational/institutional
K3 = Application	WM3 = Technical operation
K4 = Analysis	WM4 = Financial aspect
K5 = Syntesis	WM5 = Public participation
K6 = Evaluation	
Ac1 = Perception	A1 = Acceptance
Ac2 = Integrated response	A2 = Response
Ac3 = Mechanism	A3 = Respect
Ac4 = Adaptation	A4 = Responsible

Figure 2. Overview of City's Society Behavior on Waste Management

The correlation between the independent, mediation, and dependent variables described in the following Fig. 3 [20]:

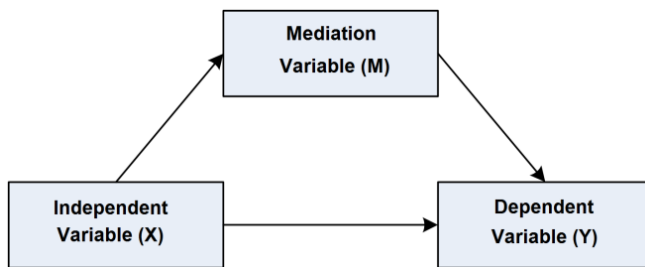


Figure 3. Correlation of Independent, Mediation, and Dependent Variable

3. Result

Relationship between six variables (six hypotheses) result all significant linear models (sig p-value of the linear model < 0.05) as shown in Table 3. Therefore, the six correlation between variables in this study were qualified to be proceeded to PLS model.

Table 3. Linearity Testing Assumptions

Correlation	Test Result	Information
Attitude – Knowledge	Significant Linear Model (Sig Linear 0.000 < 0.05)	Linear
Action – Knowledge	Significant Linear Model (Sig Linear 0.049 < 0.05)	Linear
Waste Management – Knowledge	Significant Linear Model (Sig Linear 0.000 < 0.05)	Linear
Action – Attitude	Significant Linear Model (Sig Linear 0.007 < 0.05)	Linear
Waste Management – Attitude	Significant Linear Model (Sig Linear 0.000 < 0.05)	Linear
Waste Management – Action	Significant Linear Model (Sig Linear 0.006 < 0.05)	Linear

The goodness of fit on models in PLS assumed from the predictive relevance (Q²) value, which is calculated based on the value of R² of each endogenous variable as follows:

1. Waste Management → R² of 0.3273 or 32.73%. This indicates that 32.73% Waste Management is influenced by Knowledge, Attitude, and Action.
2. Attitude → R² of 0.264 or 26.4%. This indicates that 26.4% attitude is influenced by Knowledge.
3. Action → R² of 0.7929 or 79.29%. This indicates that 72.29% action is influenced by Knowledge and Attitude.

Thus the predictive relevance (Q²) value is: **Q² = 0.6342**. The results shows predictive relevance value of 0.6342 or 63.42% is categorized as very high, thus implied that this model have a relevant predictive value. Relevance predictive value of 63.42% indicates that the diversity of data can be 63.42% explained by the built PLS model. Otherwise, the remaining 16.58% is explained by other variables (which is not included in the model) and errors.

Variable measurement was based on the indicators. Outer model is an outer loading value or outer weight of each

indicator as a measure of each latent variable. Indicator with the largest outer loading or outer weight suggests the indicator as the strongest (dominant) variable measurement. Outer loading value is significant to measure latent variable, if the value of T-statistic is > 1.96 and P-value < 0.05.

3.1. Outer Model of Knowledge (K) Variable

The variable of knowledge is measured using five indicators (Table 4). The fourth indicator of *analysis* (0.747) has the highest outer loading value which indicates that the measurement of knowledge is mainly determined by the *analysis* indicator (Table 4, Fig. 5). In the practices, it means that housewives as the respondents have the ability to distinguish, separate and classify waste into wet and dry waste bins. *Analysis* is defined as an ability to describe a material or object into components, but still in an organizational structure, and still has something to do with one another. Analysis capabilities can be viewed from the use of verbs: to describe, distinguish, separate, classify, etc [21].

Table 4. Outer Model of Knowledge Variable

Indicator	Outer Loading	T-stat	P-value	Information
Acknowledgement	0.672	3.9047	0.0001	Significant
Understanding	0.723	5.1993	0.0000	Significant
Applications	0.557	2.4009	0.0164	Significant
Analysis	0.747	6.2050	0.0000	Significant
Syntesis	0.613	2.9782	0.0029	Significant
Evaluation	0.526	3.9047	0.0001	Significant

Analysis is the dominant factor of the knowledge variable on the society behavior towards household waste management in Tulungagung. Assessment of the knowledge level were based on the housewives understanding about garbage, waste sources, waste characteristics, the factors that affect the amount of waste production, waste management phase, and the use of waste, which is generally good. The observation shows that not all respondents who have a good level of analysis have a good knowledge in waste management. The knowledge or cognitive domains are essential for the formation of one's actions. This study implied that behavior that based on the knowledge will be lasting more than the behavior without knowledge [18]. Prior to adopting the new behavior, a person experienced sequential processes [23-25]:

- (1) Awareness, in which the person is aware of the stimuli (objects).
- (2) Feel attracted to the stimulus or object; the attitude of the subject has begun to arise.
- (3) To weigh, whether the stimulus is good or not for the person; this means that the attitude of the respondents are better.
- (4) Conducted an experiment; subjects starts to try things according to the objective of the stimulus.
- (5) Adaptation; subject has recently behaved in

accordance with the knowledge, awareness, and attitude towards the stimulus.

However, behavior-change does not always pass through these stages. If the acceptance or adoption of new behaviors goes through these processes – which is based on the knowledge, awareness and a positive attitude – then the behavior will last. On the other hand, if the behavior is not based on knowledge and awareness, it will not last long.

3.2. Outer Model of Attitude (A) Variable

The first indicator of Attitude, namely acceptance receives the highest loading outer value (0.960). This indicates that the primary measurement on attitude is acceptance indicator (Table 5, Fig. 6). This implied that society of Tulungagung has accepted the management of household waste that has been programmed. Attitude due to the stimulus of an object should be the attitude of response, either positive or negative response, like or dislike, agree or disagree, etc. Thus, the attitude has two possibilities, i.e. positive attitude and negative attitude toward the object.

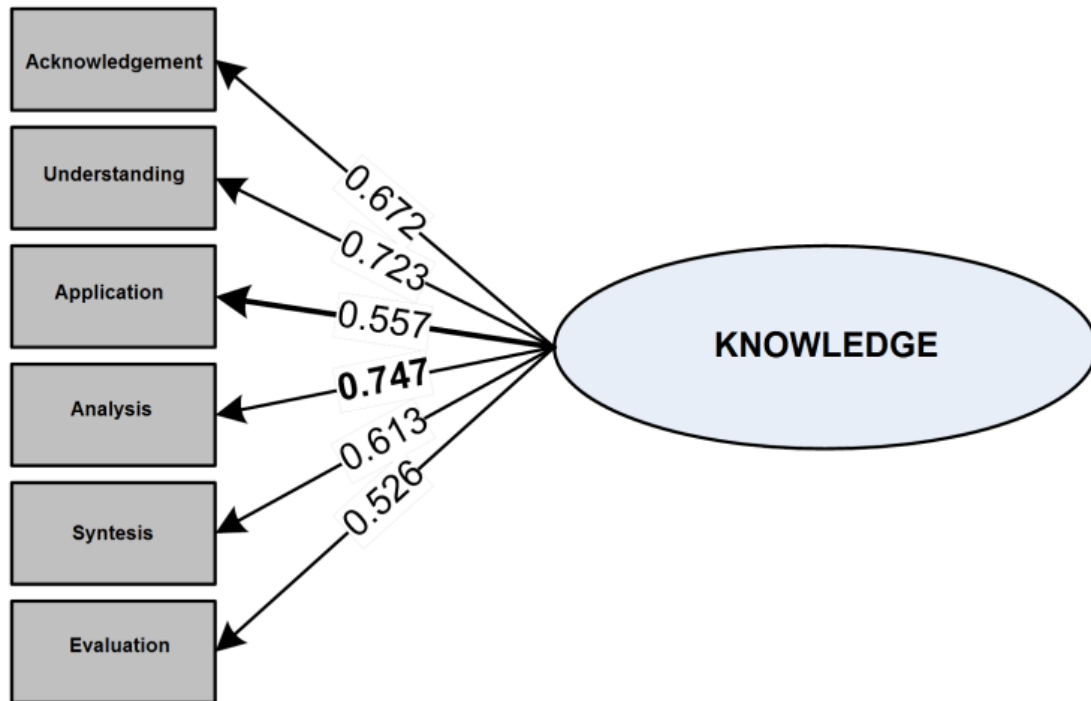


Figure 4. Outer Model of Knowledge Variable

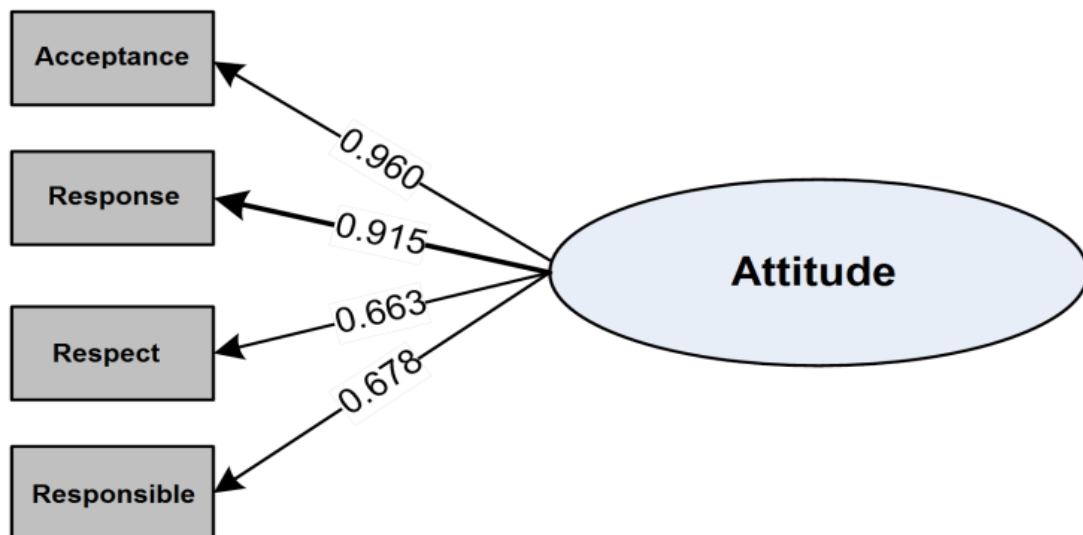


Figure 5. Outer Model of Attitude Variable

Attitude will indicate whether one approves, supports, favor or not on an object. When a person has a supportive attitude on an object, it means they having positive attitude toward the object. On the other hand, if someone does not support the object, means that the person is having a negative attitude towards the object in concern [26-30].

Table 5. Outer Model of Knowledge Variable

Indicator	Outer Loading	T-statistik	P-value	Information
Acceptance	0.960	2.8520	0.0043	Significant
Response	0.915	8.0605	0.0000	Significant
Respect	0.663	7.3470	0.0000	Significant
Responsible	0.678	5.8158	0.0000	Significant

When we linked the attitude with the knowledge variable, knowledge of the respondents is at the stage of *analysis*. Respondents have to consider the good and bad of the waste management information, which is obtained either written or oral in groups that held between the community, government and environmentalists. At the stage of attitude, the public accepted the waste management positively. Several studies suggested that attitude is a tendency to respond positively or negatively to an object through persuasion, a role model of a person or social group. Although a person's behavior is influenced by attitude, however it will not always automatically manifest in an action. It is due to the realization of an attitude in order to be a real force required supporting factors, e.g. facilities, support from other parties, as well as environmental experience and motivation [31, 32].

3.3. Outer Model of Action (Ac) Variable

The third indicator, namely mechanism, has the highest value of the outer loading (0.692), indicating that the main action measurements is determined from the mechanism indicator (Table 6, Fig. 7). Mechanism is a practice or action which is already well developed. This means that the action

has been modified without compromising the truth of such action. Measurement of society behavior in household waste management is done directly with the interview about the activities that have been carried out in few hours, days or months ago (recall). Measurements are also done directly, i.e. by observing the actions or activities of the respondent, which in this case is a housewife.

Action is a performed rule, conducted rules or overcome something or act. The inter-relationship between attitudes and actions is supported by knowledge. Action is a tendency to act and appear to be more consistent, harmonious, and in accordance with the attitude. If the attitude of an individual is the same with the attitude of a group in which he/she is a part or a member [2, 5, 11, 25, 33].

Table 6. Outer Model of Action Variable

Indicator	Outer Loading	T-Stat	P-value	Information
Perception	0.620	3.5017	0.0005	Significant
Integrated Response	0.572	2.4046	0.0162	Significant
Mechanism	0.692	4.2442	0.0000	Significant
Adaptation	0.678	5.0778	0.0000	Significant

Table 7. Outer Model of Waste Management Variable

Indicator	Outer Loading	T-stat	P-value	information
Aspect of regulatory/legal	0.659	3.5446	0.0004	Significant
Aspect of organizational/institutional	0.629	2.6335	0.0085	Significant
Technical operation	0.724	6.0350	0.0000	Significant
Financial aspect	0.658	3.9885	0.0001	Significant
Public participation	0.621	3.6952	0.0002	Significant

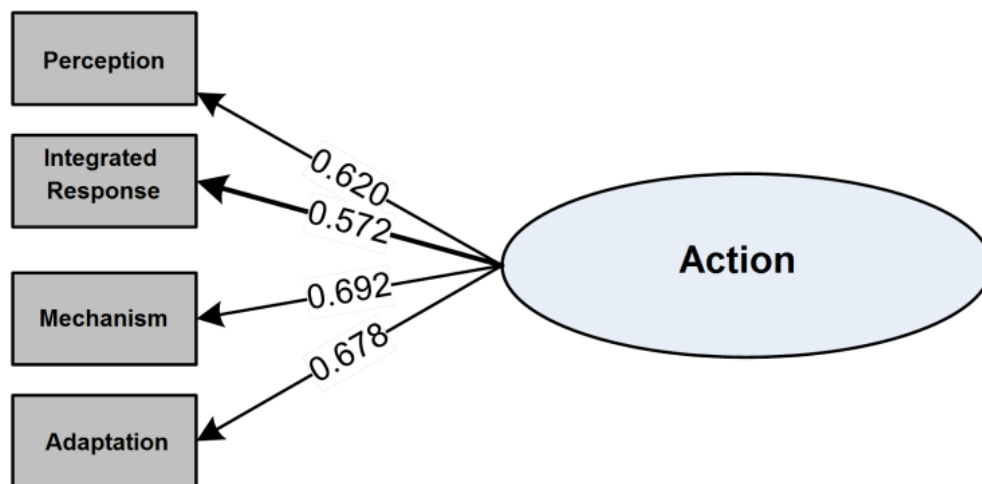


Figure 6. Outer Model of Action Variable

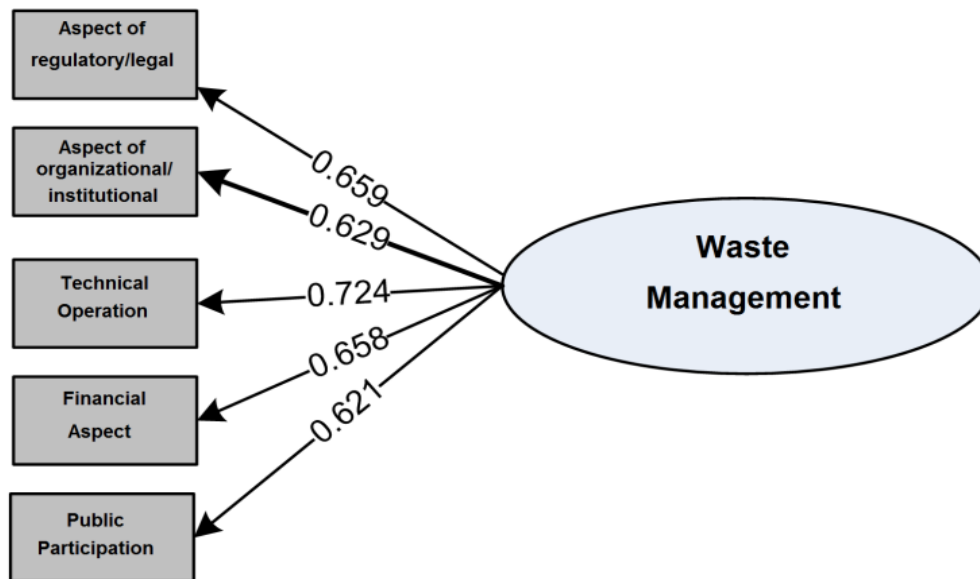


Figure 7. Outer Model of Waste Management Variable

3.4. Outer Model of Waste Management (WM) Variable

The indicator of technical operation has the highest value of the outer loading, indicating that the measurements of the waste management mainly determined by the technical operation (Table 6, Fig.7). The results showed that Tulungagung citizens manage their household waste by throwing it into the trash cans that have been provided outside their house. All types of waste were put together in the available trash cans; on a specific schedule, garbage worker will collect it into the wheelie bins to be discharged into container in the temporary landfill. If the containers were fully filled, it will be transported by using the garbage truck to be disposed to final landfill. While the future operational techniques of waste management proposed by Tulungagung society are to sort the waste into organic, inorganic, and hazardous waste materials and toxic garbage (B3). These three types of waste is not disposed in trash can but packaged in three different containers as follows. Organic waste is needed to be chopped (1 cm size) and put into compost basket. Inorganic waste (plastic, cans, glass, iron, etc) will be packed in specific containers, as well as B3 waste (batteries, tin container, mosquito poison, etc). Inorganic and B3 waste collected on a specific schedule to be sorted considering the possibility of recycling and reuse.

4. Discussion

Tulungagung society has a fairly good behavior in waste management. Factors that influence the society behavior on the household waste management are *analysis*, *acceptance*, *mechanisms*, and *operational techniques*. Most citizens have awareness on their own waste processing, although the waste management is still limited in the activities of sorting the garbage. They separate the wet and dry trash, and utilize

reusable items by reselling it. Although many people analyze the waste management and its implementation, but the desire of a good waste management has not been done completely. There are piles of garbage of each home which is burned and some people choose to throw their trash in the garbage disposal in the area adjacent to the house. Behavior of household waste management is influenced by the knowledge, age and maturity level of public. For some people who do not behave well in waste management is influenced by the lack of waste transporting facilities and infrastructure in their area, thus most people burn the trash. This research study is in line with Burton et al. [34] who found that there is a significant correlation between knowledge and the society behavior in waste management. Some studies also suggest that someone with knowledge and skills shaped their attitudes. Change of behavior is absolutely impossible without knowledge and the supported material, e.g. facilities and infrastructure [25, 36-38].

The strength of this study is to provide an overview of the society behavior on the household waste management. The behavior assessed from the correlation of knowledge, attitudes and actions. Thus, government would understand better improvement in the household waste management in the community. Knowledge improvement will need to be differed with attitudes improvement and so on. The respondents in this study is still limited to housewife as research subjects, whereas there are other family member such as husbands and children.

5. Conclusions

The society behavior on household waste management in Tulungagung is fairly good. Factors that influence the society behavior of people on the household waste management is *analysis*, *acceptance*, *mechanisms*, and

technical operation. Household waste management behavior is also strongly influenced by knowledge, age and maturity level of the society. There is a significant direct impact between knowledge and attitudes, attitudes toward action, and action toward waste management. Higher knowledge will lead to a higher attitude, a higher attitude will result in action, and the higher action will result in waste management.

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