

# Instrument Development On Measuring Malaysian Households' Intention To Practise Solid Waste Segregation-At-Source

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**Abstract:** *The grade of the environment is gradually declining especially when it comes to the severe problem of solid waste. It has become a challenging burden for many large metropolitan heterogeneous areas in most of the developing countries. The main purpose of this research is to investigate the relationship between households' attitude, descriptive norm and injunctive norm with intention to practise solid waste segregation-at-source and to ascertain the mediating effect of environmental concern and moderating effect of environmental knowledge between households' attitude, descriptive norm and injunctive norm with intention to practise solid waste segregation-at-source. The instrument is then validated from four main aspects: face validity, content validity, convergent validity and discriminant validity. After the validation process, the pre-test of this research instrument is conducted among 30 Malaysian households. All the statements have been adjusted after reliability and validity test. The final version of the instrument is set in both closed and open format which consists of eight sections: respondent's particulars (11 items), general questions on solid waste segregation-at-source (7 items), attitude (14 items), descriptive norm (12 items), injunctive norm (12 items), environmental concern (three sub-parts and 12 items), environmental knowledge (25 items) and intention to practise solid waste segregation-at-source (8 items). The instrument can further be used to examine other similar research areas such as sustainable consumption, recycling as well as solid waste management.*

**Index Terms:** *Attitude, Descriptive Norm, Environmental Concern, Environmental Knowledge, Injunctive Norm, Instrument Development, Intention to Practise Solid Waste Segregation-at-Source*

## I. INTRODUCTION

Malaysia is a transition nation which is now experiencing fast population growth [1-2], rapid changing lifestyle [3], great urbanisation [2,4] along with aggressive economic development [5] and consumption rates [6]. As a result, these changes at the national level have raised several severe environmental concerns [7] in terms of energy security, the volume rate of municipal solid waste [8] and daily solid waste generation in Malaysia.

A large amount of municipal solid waste generation has become a challenging burden for many large metropolitan

heterogeneous areas in most of the developing countries, especially Malaysia. In order to handle this public health issue, the recycling programme was first launched in Malaysia since the year 1993. However, it failed in getting much significant progression in it due to the lukewarm attitude and lack of households' participation [9]. Hence, it was re-launched by the Malaysian Ministry of Housing and Local Government in December 2000 [4].

Malaysian government aims to reach the 22 per cent national recycling target and 100 per cent recovery for the urban solid waste segregation-at-source by the year 2020 [2]. In accordance with the effort of government authority to have better solid waste management, Malaysian Ministry of Housing and Local Government declared 11th November as the National Recycling Day. In fact, the best way to managing the solid waste generation should be started from solid waste reduction at the source [10]. Starting from 1st September 2016, all Malaysian households in Johor, Melaka, Negeri Sembilan, Putrajaya, Kuala Lumpur, Kedah, Perlis and Kuantan are mandatory to practise solid waste segregation-at-source according to various solid waste compositions under Solid Waste Management and Public Cleansing Act 2007 (Act 672). They are cardboard, plastic, paper, food waste, glass, metal, farm waste, and lump waste. Likewise, it is an offence under the law for not separating solid waste at the source.

Households are also encouraged to play their significant social responsibility by practising recycling behaviour so as to preserve and protect the environment for the welfare of present and future generations [11]. However, it can be said that many of the environmental problems today are actually caused by the factor of attitude rather than technical problems [12] because it takes a long time to break the old traditions and alter the current attitudes and practices [13]. In this case, research, education, and public participation are some of the useful tools for long-term improvement and change in the ethics and attitude of the public towards proper waste management [14].

Unfortunately, in terms of the research discussion, there is no specific research which primarily focusing on the intention to practise solid waste segregation-at-source that can be found in the context of Malaysia [15]. The ongoing challenges in implementing solid waste segregation-at-

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source behaviour for a long-term in Malaysia still require a bigger and clearer picture towards the current scenario in order to raise the rate of effectiveness and efficiency of this policy. Therefore, this research has assumed that it has become a necessity to explore the importance to have the intention to practice solid waste segregation-at-source behaviour among Malaysian households. Ultimately, the main purpose of this research is to investigate the relationship between households' attitude, descriptive norm, and injunctive norm with intention to practise solid waste segregation-at-source as well as to ascertain the mediating effect of environmental concern and moderating effect of environmental knowledge between households' attitude, descriptive norm, and injunctive norm with intention to practise solid waste segregation-at-source.

## II. LITERATURE REVIEW

The publication of Development, Implementation, and Evaluation of Environmental Education Programmes by Stapp [16] triggered the growth of public awareness about environmental concerns since the late 1960s [17]. McKeown and Hopkins [18] highlight the importance of protecting the natural environment by developing the environmental consciousness and awareness to society. The society must have a certain level of understanding of the importance of nature (biotic and physical) and mankind [19]. Indeed, this feeling is rather organic for the harmonium development of personality as a member of certain society who is willing to solve the major environmental problems which including loss of biodiversity, global climate change, over-consumption of natural resources, deforestation, ozone layer depletion and natural pollution [20].

It is also important to stress that, fast population growth [1], rapid changing lifestyle [3], great urbanisation [4] along with aggressive economic development [5] and changes in consumption rate [6] have accelerated the daily generation and volume rate of municipal solid wastes in Malaysia. Consequently, the increases in the quantity of municipal solid waste have led to many negative environmental issues in Malaysia [21]. More terribly, it is reported that there is about 60 per cent of the 32 million Malaysians fail to throw their garbage into rubbish bins [22]. Therefore, Malaysian households should cultivate the intention to practise solid waste segregation-at-source immediately for a better and ideal living environment for the next generation in the future [23].

Previously, the dependent variable of intention to practise solid waste segregation-at-source behaviour has been investigated in various scopes of research. For examples, personality and social psychology [24], social psychology [25], environmental psychology [26-27], sustainable consumption [28], human ecology [29], health communication [30], and environmental management [31].

Subsequently, throughout the literature search, there are a number of factors influencing the intention to practise solid waste segregation-at-source. Table 1 shows a look back at how the selected similar research of intention to practise solid waste segregation-at-source unfolded.

**Table 1: Chronology of Selected Research Closely Related to Intention to Practise Solid Waste Segregation-at-Source**

Author (s)	Factors	Types of paper	Field of research
Kok and Siero [32]	Awareness, comprehension, attitude, intention, recycling intention, recycling behaviour	Empirical: Quantitative	Economic psychology
Davies, Foxall, and Pallister [33]	Attitude, recycling intention, actual recycling behaviour	Empirical: Quantitative	Marketing
Chen and Tung [34]	Perceived lack of facilities, consumers' recycling intention	Empirical: Quantitative	Environment and behaviour
Mahmud and Osman [35]	Theory of Planned Behaviour, recycling intention	Empirical: Quantitative	Social and behavioural sciences
Ramayah, Lee, and Mohamad [36]	Attitude, value, green product purchase intention	Empirical: Quantitative	Resources, conservation and recycling
Ittiravivongs [37]	Theory of Planned Behaviour, responsibility, perceived facility condition, economic incentive, intention to recycle	Empirical: Quantitative	Environment and energy
Fröhlich, Sellmann, and Bogner [38]	Situational emotion, connectedness with nature, intention for sustainable consumer behaviour	Empirical: Quantitative	Environmental education

Ho, Ahmed, and Lee [39]	Tong, and Attitude, subjective norm, awareness, knowledge, convenience, electronic waste recycling intention	Empirical: Quantitative	Manufacturing science and technology	recycling intention, electronic waste recycling behaviour	sustainability	
Ioannou, Zampetakis, and Lasaridi [40]	Theory of Planned Behaviour, household recycling intention	Empirical: Quantitative	Environment	Theory of Planned Behaviour, remanufactured products purchase intention, actual purchase behaviour	Production management	
Lee and Kang [41]	Economic advantage, human comfort, observability, intention of adoption of sustainable practice	Empirical: Quantitative	Ergonomics	Value-belief-norm theory, expectancy theory, pro-environmental intention, tourists' behaviour	Empirical: Quantitative	Tourism management
Kil, Holland, and Stein [42]	Place meaning and participatory planning intention	Empirical: Quantitative	Society and natural resources	Attitude, subjective norm, recycling intention	Empirical: Quantitative	Environmental psychology
Wan, Shen, and Yu [43]	Perceived policy effectiveness, recycling intention	Empirical: Quantitative	Environmental psychology	Action skill, knowledge, personality factors, situational factor, environmental behavioural intention	Empirical: Quantitative	Sustainability
Nguyen, Zhu, and Le [44]	Awareness, Theory of Planned Behaviour, trust, waste separation intention	Empirical: Quantitative	Human settlements	Willingness to pay, source separation intention	Empirical: Quantitative	Sustainable environment
Tonge, Ryan, Moore, and Beckley [45]	Place attachment, pro-environmental intention	Empirical: Quantitative	Travel	Conscientiousness, moral reflectiveness, consumers' green hotel visit intention	Empirical: Quantitative	Cleaner production, environmental, and sustainability
Periyayya, Nair, Shariff, Roland, and Thanaseelan [46]	Attitude, purchase intention of corporate social responsibility supported grocery brands	Empirical: Quantitative	Communication management			
Echegaray and Hansstein [47]	Theory of Planned Behaviour, electronic	Empirical: Quantitative	Cleaner production, environmental, and			

Vuong and Nguyen [51]	Perceived price, perceived quality, brand consciousness, fashion consciousness, hedonic shopping value, store environment, sales promotion, purchase intention towards fast fashion products	Empirical: Quantitative	Textile and apparel
Olya and Akhshik [55]	Demographic value, belief, and norm, pro-environmental intention	Empirical: Quantitative	Travel

As a conclusion, in terms of academic discussion, with respect to the best knowledge, the current research which focusing on the scope of intention to practise solid waste segregation-at-source is very limited. Taken together with the information portrayed in Table 1, this research can be seen as a major contribution whereby this research discovers the necessary to enrich the scarce literature on the relationship between attitude and intention to practise solid waste segregation-at-source; descriptive norm and intention to practise solid waste segregation-at-source; injunctive norm and intention to practise solid waste segregation-at-source; as well as the extent of environmental concern and environmental knowledge act as a mediator and moderator on these relationships respectively.

### III. METHODOLOGY

In this research, the measurement of a dependent variable, i.e. intention to practise solid waste segregation-at-source is completed by using eight closed-end questions which intended to picture the tendency to carry out the repeated action of segregating unwanted materials based on their recycling potential in respondents' daily routine. The measuring items for the dependent variable is adapted from Ayob, Sheau-Ting, Abdul Jalil, and Chin [56], Fornara et al. [28], Ghani, Rusli, Biak, and Idris [57], Ioannou et al. [40] as well as Tonglet, Phillips, and Bates [58]. Consequently, a five-point Likert scale which ranging from (1) strongly disagree to (5) strongly agree is employed to measure this current dependent variable in research. Table 2 displays the items to measure the intention to practise solid waste segregation-at-source.

**Table 2: Measurement Item of Intention to Practise Solid Waste Segregation-at-Source**

No.	Item	Source
1.	I truly intend to separate my household solid waste at home as much as possible in the next three months.	Ioannou et al. [40]
2.	I am willing to segregate piles of household solid waste into different categories if proper waste segregation facilities are provided.	
3.	I will try my best to separate most of my household solid waste at home if I am convinced with the benefits of solid waste segregation-at-source.	Ghani et al. [57]; Tonglet et al. [58]
4.	I will make an effort to segregate my household solid waste at home if the local authority enforces public participation in solid waste segregation-at-source.	
5.	I plan to separate my household solid waste at home if the local authority provides satisfactory services for the separated household solid waste collection.	
6.	I expect that I will take part in solid waste segregation-at-source activities if I am satisfied with the household garbage collection measures by the local authorities.	
7.	I have the tendency to separate unwanted household solid waste according to their recycling potential systematically.	Ayob et al. [56]; Fornara et al. [28]
8.	I will be willing to support the mandatory solid waste segregation-at-source policy under the Solid Waste and Public Cleansing Management Act 2007 (Act 672).	

The attitude measurement of respondents in this current research is designed by adapting the scale applied in previous research [58-60]. There are fourteen statements framed to interpret the attitude of respondents on the intention to practise solid waste segregation-at-source.

Out of these fourteen items, three items are negatively stated. Thus, the negative statement items are well reverse coded before data analysis takes place. This section is measured based on a 5-point Likert scale which ranged from "option 1" for "strongly disagree" to "option 5" for "strongly agree". This is used to indicate the degree of agreement or disagreement of respondents towards each of the statement. In other words, respondents are required to rate whether they agree with the statements by providing their responses according to the five response categories in a bid to reflect their attitude on the intention to practise solid waste segregation-at-source. Table 3 displays the items to measure the attitude with the intention to practise solid waste segregation-at-source.

**Table 3: Measurement Item of Attitude with Intention to Practise Solid Waste Segregation-at-Source**

No.	Item	Source
1.	I feel good about myself when I have the intention to practise solid waste segregation-at-source.	Zhang et al. [60]
2.	I believe that my intention to practise solid waste segregation-at-source will help reduce waste management cost.	
3.	I believe that my intention to practise solid waste segregation-at-source will help reduce pollution and contribute to a cleaner environment.	Tonglet et al. [58]
4.	I believe that my intention to practise solid waste segregation-at-source will help reduce wasteful use of landfills.	
5.	I feel that solid waste segregation-at-source requires additional efforts and is time consuming.*	
6.	I believe that my intention to practise solid waste segregation-at-source will help conserve natural resources and the environment.	
7.	I find that all citizens are responsible to inculcate the intention to practise solid waste segregation-at-source.	
8.	My feeling about the intention to practise solid waste segregation-at-source is positive.	Tonglet et al. [58]
9.	I find the idea to have the intention to practise solid waste segregation-at-source as unpleasant.*	
10.	I find the intention to practise solid waste segregation-at-source as meaningless.*	
11.	I will feel guilty if I do not have the intention to segregate my household solid waste-at-source.	
12.	It will be wrong of me not to have the intention to segregate my household solid waste-at-source.	
13.	I find the intention to segregate household solid waste-at-source as interesting.	Bobaei et al. [59]
14.	My feelings towards the intention to segregate household solid waste-at-source are favourable.	

Note: \* =negative statement

Next, there are twelve positive statements designed to verify the descriptive norm of respondents on the concept of intention to practise solid waste segregation-at-source. Descriptive norm was measured by using the questionnaire proposed in previous research [28,61-67].

It is noted that the respondents' rates ranged from 1 "never" to 5 "always". Respondents are requested how well each of the twelve different statements describes them by using a five-point response format. A total of the score will be computed in a bid to analyse the descriptive norm with the intention to practise solid waste segregation-at-source. Subsequently, the range of score is a minimum score of 12 and a maximum score of 60. Hence, the higher the score corresponds to a better descriptive norm on the intention to practise solid waste segregation-at-source. Table 4 shows the items to measure the descriptive norm with the intention to practise solid waste segregation-at-source.

**Table 4: Measurement Item of Descriptive Norm with Intention to Practise Solid Waste Segregation-at-Source**

No.	Item	Source
1.	Intention to practise solid waste segregation-at-source is generally considered as a common behaviour at my residential neighbourhood.	Kabis et al. [64]
2.	My relatives will appreciate it if I have intention to segregate the household solid waste at its source.	
3.	It is easy for me to see most of the people around me who have the intention to participate in solid waste segregation-at-source activities every day.	Lapinski et al. [66]
4.	I expect majority of my friends have the intention to support solid waste segregation-at-source.	
5.	Most people who are important to me think that it is appropriate to have the intention to practise solid waste segregation-at-source as their daily habit.	Koeneman et al. [65]
6.	I am of the opinion that the culture in this country strongly encourages the citizens to have the intention to support activities related to solid waste segregation-at-source.	
7.	Most of my friends have the intention to be voluntarily involved in solid waste segregation-at-source in order to protect the environment.	Fomara et al. [28]
8.	Most of my colleagues have the intention to practise solid waste segregation-at-source at their own houses.	
9.	Majority of the residents in my community always have the intention to find the proper way to practise solid waste segregation-at-source.	Eriksson and Forward [62]
10.	My neighbours have the intention to participate actively in solid waste segregation-at-source.	Culberg et al. [61]
11.	If there are many others who have the intention to practise solid waste segregation-at-source, I think it is an "appropriate" behaviour for me to practise it too.	Park et al. [67]
12.	Having the intention to practise solid waste segregation-at-source is actually what many of my acquaintances are practising now.	Jacobson et al. [63]

Besides that, there are twelve positive statements which measure the injunctive norm with the intention to practise solid waste segregation-at-source as shown in Table 5. It is further noted that these questions are adapted from Fornara et al. [28], Park et al. [67], Leavens, Brett, Morgan, Lopez, Shaikh, Leffingwell, and Wagener [68], and Minton and Rose [69]. This section measures how does injunctive norm can influence the intention to practise solid waste segregation-at-source. The five-point Likert-type scale which ranged from 1 "strongly disapprove" to 5 "strongly approve" is used in order to rate the respond of respondents towards the statements in this section. The total score of this construct is then computed in order to interpret the raw scores in a more manageable way. Subsequently, the summated scores are further segregated into three categories, namely Low (12-27), Moderate (28-44), and High (45-60). To conclude, the higher the score, the higher the injunctive norm towards intention to practise solid waste segregation-at-source.

**Table 5: Measurement Item of Injunctive Norm with Intention to Practise Solid Waste Segregation-at-Source**

No.	Item	Source
1.	Most people who are important to me think that I should have the intention to segregate my household solid waste.	Fomara et al. [28]
2.	Most of my neighbours would agree that I will likely engage in solid waste segregation-at-source in the next two weeks.	
3.	Nearly all my relatives think that it is a good idea for me to segregate household solid waste before the next disposal process.	
4.	Majority of my close friends would approve of my good intention to segregate solid waste-at-source every day.	
5.	Many of my family members would exhibit strong acceptability of my intention to think of solutions to reduce the volume of household solid waste.	Minton and Rose [69]
6.	My peers strongly approve of my good intention to learn the right way to segregate household solid waste at home.	
7.	My parents think that I should segregate my own solid waste as my daily routine.	
8.	My intention to segregate my own solid waste-at-source is socially accepted at my residential neighbourhood.	
9.	The local community does approve and accept my intention to know more about the importance of managing my own daily household solid waste.	Minton and Rose [69]
10.	Leaders of my community expect me to have the intention to recycle.	
11.	Majority of my group members think that being a person with the intention to segregate solid waste-at-source is the "right" thing for me at my community.	Park et al. [67]
12.	I expect the perceived adolescents' approval of my intention to practise solid waste segregation-at-source is necessary.	Leavens et al. [68]

Next, environmental concern encompassing three dimensions of environmental concern, namely egoistic concern, altruistic concern and biospheric concern. A total of twelve positive closed-end questions are designed to observe the three dimensions of environmental concern towards the intention to practise solid waste segregation-at-source. This section is adapted from the previous research of Stern and Dietz [70]. Respondents were asked to choose the most appropriate response to measure the intensity of respondents' view with respect to the statements constructed in this section in order to test the mediating variable of environmental concern in this research. Consequently, the five-point Likert scale ranges from (1) strongly disagree to (5) strongly agree [71] is used to measure in this section. Respondents need to think about to what extent they agree with the set of statements as shown in Table 6.

**Table 6: Measurement Item of Environmental Concern with Intention to Practise Solid Waste Segregation-at-Source**

No.	Item	Source
<b>Egoistic concern:</b>		
1.	I am very concerned about the impacts of having the intention to practise solid waste segregation-at-source in a bid to maintain my own well-being.	
2.	I believe that the intention to practise solid waste segregation-at-source can bring a lot of positive effects to my personal lifestyle.	Stern and Dietz [70]
3.	I can enhance my personal good health by having the intention to practise solid waste segregation-at-source in my daily life.	
4.	I am willing to practise solid waste segregation-at-source to maintain a continued high quality of life for my own future.	
<b>Altruistic concern:</b>		
5.	For the benefit of the people in my community, I should be prepared to segregate my daily household solid waste.	
6.	Thinking about the environmental conditions of my future generations, I should always try to practise solid waste segregation-at-source.	
7.	I feel that everyone should have the tendency to recycle used glass and paper in a bid to conserve and preserve the limited natural resources.	
8.	I have strong interest in the intention to practise solid waste segregation-at-source because of what it can contribute to the welfare and pleasure of children.	Stern and Dietz [70]
<b>Biospheric concern:</b>		
9.	I am more likely to perform solid waste segregation-at-source in order to prevent any species of birds from becoming extinct as a result of environmental pollution.	
10.	I am prone to carry out solid waste segregation-at-source when I think about the harm to marine life caused by human's excessive consumption pattern.	
11.	I become upset when I think about the negative consequences to animals caused by human's irresponsible behavior towards the environment.	
12.	I get depressed when I think of excessive deforestation for aggressive economic development which has threatened the plants.	

Lastly, this research measures the moderating effect of environmental knowledge by adapting the instruments developed by Bang, Ellinger, Hadjimarcou, and Traichal [72], Braun and Dierkes [73], Gambro and Switzky [74], Paço and Lavrador [75], Ramayah, Lee, and Lim [76], and Safari, Salehzadeh, Panahi, and Abolghasemian [77], based on the Malaysian context. The instrument in the present research consists of 25 statements. The negative statements in this section are well reverse coded before data analysis takes place. The rating consists of a five-point Likert-type scale and range from 1 "never true" to 5 "always true". The synthesis of scale can be obtained by aggregating the value and divide the value accordingly. Table 7 displays the items to measure environmental knowledge with the intention to practise solid waste segregation-at-source.

**Table 7: Measurement Item of Environmental Knowledge with Intention to Practise Solid Waste Segregation-at-Source**

No.	Item	Source
1.	Serious environmental pollution can be reduced by having the intention to practise solid waste segregation-at-source.	
2.	The tendency to segregate solid waste-at-source is a good measure to reduce wasteful use of landfills.	Ramayah et al [76]
3.	Households should be inclined to portray solid waste segregation-at-source in order to conserve and preserve the natural resources.	
4.	Malaysian households should be aware of the benefits of having the intention to practise solid waste segregation-at-source in daily life.	
5.	I am very knowledgeable about the proper way to carry out solid waste segregation-at-source.	Bang et al [72]
6.	Recycled paper products cause more pollutants compared to other types of paper materials.*	
7.	Most garbage will be sent to a landfill where it is buried after being dumped from the garbage trucks.	
8.	Overpopulation is one of the dangerous threats to the earth's environment.	
9.	Recycling means that household buys things that can be used again.	
10.	Animals alive to day are most likely to become extinct if their habitat is destroyed.	
11.	Coal and petroleum are examples of renewable energy.*	
12.	Environmental problems are a threat only to household in the cities.*	Gambro and Switzky [74]
13.	The main problem with landfills is that they take up too much space.	
14.	Building a dam on a river can be harmful because it makes the river muddy.*	
15.	An example of non-renewable energy is tidal wave energy.*	
16.	Aluminium cans is an example of items which cannot be recycled and reused.*	
17.	Species that no longer exists should be protected.*	
18.	Deforestation causes a dryer and hotter climate.	
19.	Greenhouse effect will increase the amount of carbon dioxide in the atmosphere.	
20.	Households are encouraged to use plastic cups as a contribution to a healthy environment.*	Braun and Diekes [73]
21.	Ecology is best described as the study of the relationship between organisms and the environment.	
22.	We must preserve and conserve the limited resources on the earth by using disposable plates and spoons.*	
23.	Practically, all the lead in our atmosphere is caused by the usage of cars.	Safian et al [77]
24.	Dichloro diphenyl trichloroethane (DDT) takes anywhere from several days to several years to deteriorate into harmless chemicals.*	Paço and Lavrador [75]
25.	Ecology views man as being different from nature.*	

Note: \* = Negative statement

#### IV. RESULTS AND FINDINGS

A good measurement must meet the tests of validity and reliability. This research has attempted to assess validity in many ways. The four basic approaches to establishing validity are face validity, content validity, criterion validity, and construct validity.

Face validity refers to a scale's content logically appears to reflect what was intended to be measured. It evaluates the feasibility, readability, consistency of style and formatting with the appropriateness of language and term usage in the questionnaire [78]. Face validity is also a subjective judgement on the operationalisation of construct and judgement which can be made by non-experts such as the respondents of the pilot test [79]. Thus, the feedbacks from pre-test by participants will be also used to validate the instrument [80]. Meanwhile, in order to ensure the high appropriateness of this current research, a panel of experts from the field of consumer sciences will be gathered to

evaluate the instruments prior to the pre-test. Changes will be made according to the suggestion from the experts. Consequently, the pre-test of this research was conducted from 1st January 2019 to 15th January 2019. In the pre-test section, a total of thirty Malaysian households regardless of races, religions, and ages were chosen randomly to complete the bilingual self-administrated instrument. There is a 100.0 per cent response rate in which the researcher received good feedback from the surveyed respondents.

Content validity refers to the degree that a measure covers the breadth of the domain of interest. It also addresses the match between test questions and variables that intended to be assessed [81]. This concept of the match is sometimes interpreted as alignment while the variable of the test may be referred [82]. As a result, the content validity in this research is enhanced by using the established dimensions and instruments from previous research.

Criterion validity is the ability of a measure to be correlated with other standard measures of similar constructs or established criteria. A researcher must make sure whether the measure that he used is practical throughout the research. Therefore, criterion validity can be applied by using a correlation coefficient in this research. The higher the correlation, the higher the validity of the instrument [83].

Construct validity exists when a measure reliably measures and truthfully represents a unique concept. Construct validity consists of several components, including face validity, content validity, criterion validity, convergent validity, and discriminant validity. Before a researcher moves further, he must be sure his measures look like they are measuring what they are intended to measure (face validity) and adequately cover the domain of interest (content validity). If so, a researcher can assess convergent validity and discriminant validity.

Convergent validity refers to the concepts that should be related to one another and in fact related. In this research, convergent validity is examined by using average variance extracted (AVE) in order to determine whether each construct have a wide range, or they are more or less similar [84]. Bagozzi and Yi [85] also explained that convergent validity for a model can be confirmed if all the AVE values are ideally greater than the acceptable threshold value of 0.50, meaning that 50 per cent or more variance of the indicators should be accounted for measured constructs.

Lastly, discriminant validity represents how unique or distinct is a measure. Fornell-Larcker criterion and cross-loadings are two sets of information which can be used to test the discriminant validity in a model. However, a specific construct should not correlate too highly with a measure of a different construct. This is because the specific construct should not have a stronger connection with another construct that it attempts to reflect. Chin [86] mentioned that a researcher should expect to see the item loadings to be higher than the cross-loadings while going down a particular column of the construct. If this is found to be the case, therefore, the discriminant validity can be proved in the research.



On the other hand, reliability can be tested by using composite reliability. Composite reliability is a measure of internal consistency [87]. More specifically, it can assess the inter-item reliability for each of the multi-item variables [88]. This concept will enable researchers to obtain some assessment of the item's validity and the likely reliability of the data to be collected.

A questionnaire with high accuracy means that the information gathered is reliable and valid. The accepted value for composite reliability should be 0.700 or higher [89-90]. However, Bagozzi and Yi [85] argued that the value of 0.600 or higher is still acceptable if it is exploratory research. As a result, Table 8 reports the assessment of composite reliability for each variable measured during the pre-test of this research.

**Table 8: Summary of Composite Reliability for the Pre-Test of Research**

Section	Variable	Number of items	Composite reliability (N=30)
A(I)	Respondent's particulars	11	Not applicable
A(II)	General questions on solid waste segregation-at-source	7	Not applicable
B	Attitude	14	0.779
C	Descriptive norm	12	0.919
D	Injunctive norm	12	0.940
E	Environmental concern	12	0.881
F	Environmental knowledge	25	0.810
G	Intention to practise solid waste segregation-at-source	8	0.919

Based on Table 8, all the composite reliability is beyond the suggested threshold of 0.700. The highest value of composite reliability comes from the injunctive norm (Section D), which is 0.940. However, the lowest value of which comes from attitude (Section B), which is 0.779, and it is still above 0.700, a recommended threshold of reliability. As a conclusion, the internal consistencies of all variables are acceptable for further data analyses since each reliability testing exceeds the suggested threshold of 0.700. Hence, the measurement instrument for this present research is accepted and reliable.

## V. CONCLUSION

The final version of the instrument is set in both closed and open format which consists of eight sections: respondent's particulars (11 items), general questions on solid waste segregation-at-source (7 items), attitude (14 items), descriptive norm (12 items), injunctive norm (12 items), environmental concern (three sub-parts and 12 items), environmental knowledge (25 items), and intention to practise solid waste segregation-at-source (8 items). The instrument can further be used to examine other similar research areas such as sustainable consumption, recycling as well as solid waste management.

## VI. ACKNOWLEDGMENT

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