

Implementing UTAUT Model to Analyze Consumer Behaviour in Mobile Recycling Application

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Abstract—Waste disposal keeps increasing globally, worsening environmental issues. Indonesia, with its rapidly growing cities, also struggles to manage all this waste. Numerous mobile applications were released to recycle waste effectively. However, The rate of mobile recycling application adoption is still low. We contend that lack of awareness and knowledge on recycling is the main cause of people's low adoption, that makes them deny the need for recycling. Hence, the objective of this study is to identify if sociopreneur awareness implementation, workshop, on recycling application influence the adoption of recycling applications. Theory of Planned Behaviour and Unified Theory of Acceptance and Use of Technology model is used to attest the acceptance of workshop on recycling application. Quantitative approach is employed in this study, using a survey questionnaire of 139 respondents. The structural model is calculated using Smart PLS tools, and the results are data validation. According to the findings, the user's intention for using recycling applications with a workshop feature is positively and significantly impacted by four variables (T-Values ≥ 1.96), which are Functional Expectancy, Attention, Support System, as well as PC Perceived Control. Regardless, Society Influence showed a negative effect (T-Values < 1.96) in this study.

Index Terms—Consumer Behaviour, Mobile Recycling Application, TPB (Theory of Planned Behaviour), UTAUT (Unified Theory of Acceptance and Use of Technology)

I. INTRODUCTION

The amount of trash produced globally keeps increasing, which is causing environmental issues to worsen. 3.2% of global greenhouse gas (GHG) emissions are attributed to waste, making it a significant source of emissions. Serious problems with waste

management have also been affecting Indonesia. Because of growing urbanization, major Indonesian cities produce more than 8 million tonnes of trash each day [1]. Meanwhile, effective waste management and recycling in cities depends on their population. Even slight changes in recycling practices can have a significant influence on a city's ability to sustain itself ecologically and economically. Attaining moral behaviour is not an easy feat, though, because urban residents are diverse in terms of their ethnicities, cultural backgrounds, and social backgrounds. Therefore, getting citizens actively involved in this sector can be very difficult [2].

Numerous initiatives in the waste domain has already made use of mobile applications to encourage consumers to recycle waste more effectively [3]. Several companies in Indonesia are releasing applications providing online recycling through waste collection. However, the majority of the solution they offer is direct waste collection, which all too frequently results in low adoption. For example, a brief Google Play Store search can quickly reveal over fifty applications for recycling waste [2]. Nevertheless, the lack of awareness and knowledge on recycling within the application makes them denying the need for recycling and individual accountability, causes the main problem of low adoption from users. It can be difficult to persuade people to recycle and alter their waste disposal habits [4].

As a real example, one of the most popular recycling application in Indonesia is Duitin. Duitin is an application in the form of a digital service that facilitates users to pre-process recyclable waste by accessing a waste pick-up facility through a mobile application [5]. Duitin was claimed to has successfully collected 170 tons of waste from July 2020 to December 2021 through the recycling service facility in the form of the Duitin application . That is only 0.00089% compared to the total waste generation in Indonesia in 2023 of 19 million tons [6]. Moreover, Duitin application users from 2020 to 2022 have reached around 100 thousand, with 75% of users are located around Jakarta [7]. Based on an interview with Duitin's COO, Adijoyo, on June 27, 2022, it was revealed that

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Duitin gets around 145 users every day [8]. However, in 2024, Duitin users on the Google Play Store were still around 100 thousand users. This figure shows the low increase in users of the recycling application. This phenomenon also occurs in a number of other recycling applications, including Rapel, Rekosistem, and others, in addition to Duitin .

While in fact, people's acceptance of online recycling is essential to guaranteeing the effective execution of waste management in Indonesia. Therefore, it's critical to comprehend and pinpoint the key factors influencing people's adoption of recycling applications. But in reality, not much research has been done on the adoption of recycling applications [2], [9]. Until now, these research have not yet determined every key factor that could be significant for influencing people's acceptance of recycling application. Previous studies were mostly concerned with benefit, perceived risk, and trust values in general [9].

Based on the major cause of low adoption of the recycling application, the lack of awareness and knowledge on recycling [4]. The objective of this study is to identify if sociopreneur awareness implementation on recycling application influence the adoption of recycling application. This factor may be used by recycling applications as a reference to improve its feature.

The modified construct, which is used in this study, consists of the TPB (Theory Planned Behaviour) and the UTAUT (Unified Theory of Acceptance and Use of Technology). The construct includes FE (Functional Expectancy), A (Attention), SI (Society Influence), SS (Support System), and BI (Behavioural Intention) that is accounted for the UTAUT model, and PC (Perceived Control) that is accounted for the TPB model. Among the most widely used models, UTAUT can explain 50% of the variation in technology usage and acceptance and 70% of the variation in behavioural intentions to use technology [10], [11]. Moderator factors are not used in this study since it draws on multiple earlier studies that similarly did not utilize the whole UTAUT model [12].

II. LITERATURE REVIEW

A. Consumer Behaviour

Consumer behaviour is known as an exploration of how people, groups, and organizations choose, purchase, and utilize products and services to fulfill their needs and desires [13]. Numerous factors impact consumer behaviour, including of: 1) cultural aspects; 2) social aspects; 3) individual aspects like age, profession, financial status, and way of life; and 4) psychological aspects [14].

Cultural aspects refer to the diverse range of perspectives and values that people acquires from their family and other significant entities. Customs and habits in day-to-day living are directly linked to an individual's culture. For instance, behaviour and appearance. In light of this, culture serves as an indicator that affects

consumer behaviour [15].

Social aspects are defined as employment, education, and location, as an example of a social component that affects social behaviour. Everyone is free to choose with whoever they desire to engage and whether or not the group is beneficial to us [14].

Individual aspects also impact consumer behaviour, that is, lifestyle and financial circumstances have an impact on consumer behaviour. A person in a financial situation is able to afford or has extra money. A consumer's lifestyle also influences their purchasing decisions. A person leading a lavish lifestyle, for instance, will surely influence customer behaviour. When it comes to using their money or salary to support their lifestyle, they will be devoted [14].

B. Mobile Application

Mobile application is known as a software or program designed to assist users that can operate on a mobile device [16]. In addition to simplifying tasks for users, mobile applications also try to solve problems by tailoring technology-based media to the target user's needs in order to help them solve a specific issue [17]. The creation of mobile applications has led to limitless possibilities to mobile users who have integrated applications into their everyday routines. The most popular applications categories include social networking, games, news, maps, and music [18].

C. Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT) is a paradigm that was put forth in [19]. Eight important theories of behaviour prediction were combined by the researchers to create UTAUT. Four variables (performance expectancy, effort expectancy, social influence, and facilitating condition) make up UTAUT and are elements that have an impact on behavioural intention. Reference [19] states that Perceived Usefulness (PU) and Perceived Ease of Use (PEU) in the Technology Acceptance Model (TAM) are similar to Performance Expectancy (PE) and Effort Expectancy (EE) in the UTAUT. Moreover, the factor "subjective norm" in the TAM2, a TAM extension, is also similar to Social Influence (SI). As well as Facilitating Conditions that is synonymous with the Diffusion of Innovation theory's (DOI) compatibility construct. In addition, UTAUT takes into account the moderating variables (gender, age, experience, and voluntariness of use), which are important for comprehending how user characteristics affect the adoption of technology.

This model has been employed in several research across a range of fields, such as organizational learning systems [20], [21] mobile banking implementations [22], [23], and 3G mobile communication [24], [25]. In health care systems, UTAUT is also used as a framework for training [26]. In relation to the UTAUT, its global and complete approach serves as justification for choosing this model for this investigation. Eight different user acceptance models have served as the inspiration for UTAUT's constructs [19].

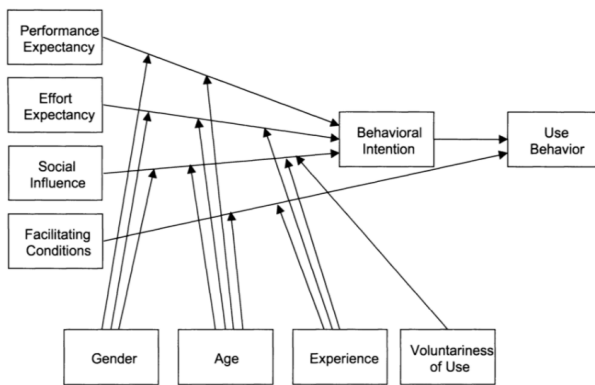


Fig. 1. UTAUT Framework Model

D. Theory of Planned Behaviour (TPB)

The Theory of Planned Behaviour (TPB) was originally introduced in 1980 as the Theory of Reasoned Action. It forecasts the intention of an individual to take an action at a specific place and time. The idea was to take every activity that a person is able to regulate into consideration. The main idea of this model is behavioural intent, that is affected by the subjective evaluations of the advantages and disadvantage of a certain outcome as well as attitudes related to the probability whether a behavior would result in the desired outcome [27].

TPB proposes that when examining consumer behaviour, researchers should look into both internal (such as attitude and PC) and external (such as subjective norm) influences. Since its conception, researchers have expanded TPB by adding additional variables in an effort to better understand how intention is formed, which then results in actual behaviour. In summary, TPB provides a strong framework for consumer behaviour research while also providing room for the inclusion of additional constructs, making it adaptable to a variety of research contexts [28].

Hence, the researcher decided to employ the TPB and UTAUT model to attest the acceptance of sociopreneur implementation on recycling application. On the basis of it, the conceptual framework of the suggested research model for this study is provided by the TPB and UTAUT.

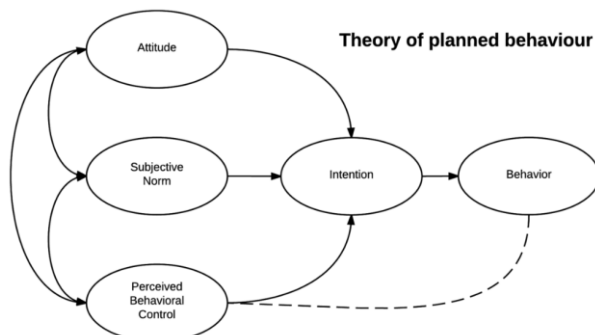


Fig. 2. TPB Framework Model

E. Social Entrepreneur

Social entrepreneurship is an approach taken to solve social issues using business tactics. Those that manage social enterprises are known as sociopreneurs (social entrepreneurs) [29]. Typically, sociopreneurs launch

these social enterprises through small projects aimed at addressing local problems such as access to water, promoting local businesses, integrating with individuals to lower unemployment [30]. Social entrepreneurship helps achieve sustainable development goals by resolving social issues and boosting their influence thereafter [29]. Because they address so many social needs and improve the lives of impacted communities, social entrepreneurs are frequently held in high respect by society [31]. Social entrepreneurship blends the use of social structures and traditional commercial practices.

Young social entrepreneurs are closely associated with the traits of the millennial generation, who have grown up with digital media at their fingertips. The state of society, which is under pressure to meet demands and tackle growing global concerns, is what gave the opportunity for the rise of social entrepreneurs. This demonstrates the potential of young people if their social context allows them to be creative [32]. Because they aim to produce value by bringing about change, sociopreneurs function as creators in motion driven by social or other objectives in order to find new communities [29]. This distinction is evident in the mission, which naturally affects how social entrepreneurs perceive and evaluate each and every opportunity that arises [33].

Social entrepreneurs aim to tackle current social issues by fusing innovation, creativity, and social awareness [34]. One way to increase awareness is through workshop. Workshops have shown to be an effective tool for raising awareness and encouraging positive change [35]. Where workshops also provide education, engagement, and empathy, not just action-oriented. They have the potential to increase the issue's awareness to a larger audience. Participants can become advocates for the topic and educate others by sharing their knowledge and experiences [35].

III. RESEARCH MODEL

Table 1 displays the prior studies on UTAUT. Venkatesh created the UTAUT model in 2003 [19] with the intention of comprehending user behaviour with regard to internet usage. Concepts from several information technology acceptance models have been included into the UTAUT model, which has been shown to be an effective model that takes into account a variety of user behaviour characteristics about technology [19], [36]. The UTAUT paradigm is well-liked by information system researchers that study user behaviour and information system acceptance, based on [37] and [38]. The UTAUT paradigm can describe a number of qualities into a variable, including social characteristics (described as a society influence variable) and individual characteristics (described as functional expectancy and attention variables).

This study uses six primary variables, of which one is dependent and the other five are independent. The one dependent variable is BI (Behavioural Intention), while five independent variables in this study are FE (Functional Expectancy), A (Attention), SI (Society Influence), SS (Support System), and PC (Perception

Table 1. Variable Description

Variable used	Variable reference	Description	References
Functional Expectancy (FE)	Performance Expectancy	The degree to which the technology will assist users in completing specific tasks and maintain their satisfaction.	[12], [19], [47], [48]
Attention (A)	Effort Expectancy	The technical complexity of technology use and the user's intended level of effort.	[12], [19], [49], [50]
Society Influence (SI)	Social Influence	The degree to which user's perceptions of society influence their choices regarding the use of the system.	[10],[12], [19]
Support System (SS)	Facilitating Condition	Customer preferences for the tools and technical assistance that were offered to support the degree of system utilization.	[12], [19], [48], [51]
Perceived Control (PC)	Perceived Control	Humans are driven, it is acknowledged, by the need to project oneself as competent, superior, and capable in a variety of situations.	[12], [42], [52]
Behavioural Intention	Behavioural Intention	The willingness of the people (individual subjectivity) and the methods they intend to employ in order to carry out an action.	[12], [19], [42], [52]

Control). Figure 2 provides an explanation of the association between the variables, showing how the five independent variables control the one dependent variable.

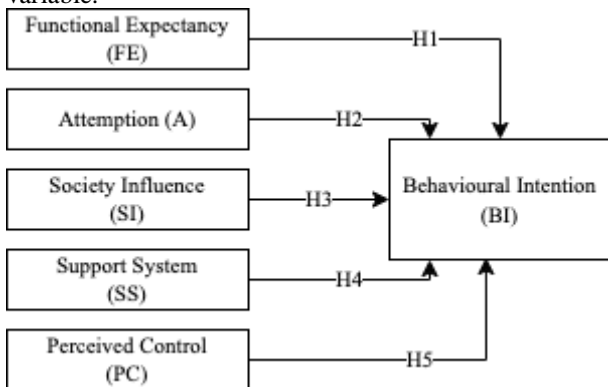


Fig. 3. Research Model

A. Functional Expectancy (FE)

Functional expectancy can be interpreted as the degree to which the execution of sociopreneur

awareness in recycling application will benefit consumers in acknowledging the issue and engaging specific actions. One of among the most important indications of a technological inclination is Functional Expectancy, according to a number of earlier studies [39][40].

H1: Functional Expectancy will significantly impact Behavioural Intention of mobile recycling application with a workshop feature

B. Attention (A)

Attention variable is defined as the anticipated intricacy of utilizing technology and the intended level of effort required by the user [19]. According to previous research, people's perceptions of online recycling that is clear, user-friendly, and understandable may have a role in the rise in application usage.

H2: Attention will significantly impact Behavioural Intention of mobile recycling application with a workshop feature

C. Society Influence (SI)

The concept of society influence variable refers to how people are persuaded to use recycling application by their friends and other people in their social circle. Society Influence can also be described as the degree to which a society's opinion weighs in determining whether or not an individual should use the system [19]. According to J. Venkatesh [10], system usage behaviour is positively impacted by the society influence variable.

H3: Society Influence will significantly impact Behavioural Intention of mobile recycling application with a workshop feature

D. Support System (SS)

Support system is described as the preferences of the user for the tools and technical assistance that were offered to support their degree of system use [19]. According to [41], a crucial support system can have a big impact on how each user uses the system. It is imperative that users comprehend the system and maintain data backups to ensure optimal system utilization.

H4: Support System will significantly impact Behavioural Intention of mobile recycling application with a workshop feature

E. Perceived Control (PC)

Perceived control is described as the universally acknowledged human driving force, which is the drive to recognize each person's talent, supremacy, and competency in a number of conditions. Perceiving elements that facilitate or impede behaviour performance is known as control belief. Perceived behavioural control is ultimately the combination of all aspects of control belief, dependent upon the degree of power attributed to each component at any given time [42]

H5: Perceived Control will significantly impact Behavioural Intention of mobile recycling application with a workshop feature

IV. RESEARCH METHODS

This study employed a quantitative approach as its method, using a survey questionnaire. Statistical calculations are emphasized in quantitative approaches. This research method consists of eight stages in total. The specific stages of this study include problem identification and formulation, literature review, conceptual model development, research instrument preparation, collect information data from questionnaires, validate research data with analysis, discussion about the findings of analysis of the data, and conclusion preparation.

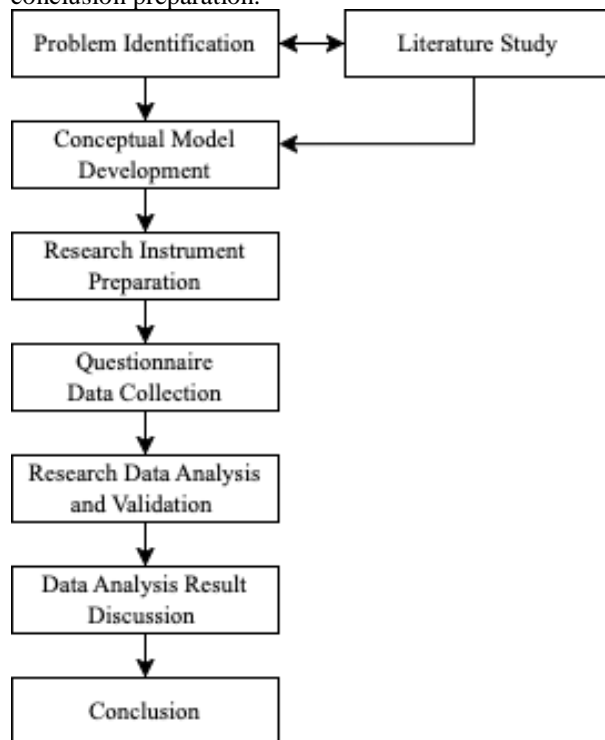


Fig. 4. Research Method

During the conceptual model development stage, Researchers undertake research and comparisons of model from earlier research linked with the UTAUT framework. Additionally, the researcher assessed various paper's reviews of the literature. These papers are associated to the acceptance of a mobile application in different sectors. This comparison led to the findings of Karulkar's research [42], who made modifications to the UTAUT model, and [43], that used the UTAUT2 model to perform comparable research. Additionally, indicators or items that can be used as questionnaire questions were gathered from Karulkar's research [42]. In this study, 139 respondents data were received from the questionnaire distribution. Smart PLS tools were used to validate the data and calculate the structural model based on these findings. Once the calculation results are displayed, an analysis of the data is required in order to determine the relationships between the factors selected for this study and the use of the recycling application

All of the constructs (dependent and independent variables) in the proposed study model are instrument assessment items that were developed and modified from earlier studies. This study used eighteen items or indicators and six variables. Table 2 displays the number of indicators that measure each variables. Every

indicator is measured using a five-point Likert scale ranging from 1 – 'Strongly Disagree' to 5 – 'Strongly Agree'. According to some research, the Likert scale is thought to be more reliable than the three-point scale [44]. In addition, four questions about the participant's demographics are included in the questionnaire.

Table 2. Indicators and Reference of Instrument Measurement

Variable	Item/Indicator	References
Functional Expectancy (FE)	4	[12]
Attention (A)	3	[12]
Society Influence (SI)	3	[12], [53]
Support System (SS)	3	[12]
Perceived Control (PC)	3	[12]
Behavioural Intention (BI)	2	[12], [54]

V. DATA ANALYSIS AND RESULTS

A. Reliability Analysis

In this study, reliability test was used to validate the research instrument prior to primary analysis. Reliability reveals the level of stability and consistency of instrument measurements using Cronbach's Alpha (α). According to [45], to be considered as highly reliable, the Cronbach's Alpha (α) value should be greater than 0.7 ($\alpha > 0.7$). Given the results in Table 3, every instrument in this research is considered reliable. Where the Cronbach's Alpha value of all variables are above 0.7, except the Attention variable which has an exact value of 0.7 which can still be tolerated. This could be due to the similarity of each variable's measurement indicators, making them appear redundant. The solution is to make changes to the question items so that it will help to increase the composite dependability value by removing any questions with redundant intentions that could cause confusion for respondents when answering.

Table 3. Reliability Analysis and Convergent Validity Analysis

Variable	Cronbach's Alpha ($\alpha > 0.7$)	Average Variance Extracted (AVE > 0.5)
Functional Expectancy (FE)	0.701	0.516
Attention (A)	0.700	0.597
Society Influence (SI)	0.745	0.652
Support System (SS)	0.772	0.681
Perceived Control (PC)	0.875	0.804
Behavioural Intention (BI)	0.850	0.869

B. Convergent Validity and Discriminant Validity Analysis

In this study, convergent validity and discriminant validity were evaluated to determine the validity of the constructs. For the discriminant validity analysis, the latent constructs were correlated using the square root of AVE. Table 4 displays that for all constructs, the square root of the AVE is higher than the pairwise correlations. Consequently, in terms of discriminant validity, the instrument's psychometric characteristics are acceptable [46].

For the convergent validity analysis, it is stated that an acceptable level of Average Variance Extracted (AVE) is above 0.5 ($AVE > 0.5$), as in [45]. The results in Table 3 display that every variable has an Average

Table 4. Discriminant Validity Test Result

Variable	A	BI	FE	PC	SI	SS
A	0.773					
BI	0.427	0.932				
FE	0.297	0.419	0.719			
PC	0.441	0.518	0.242	0.897		
SI	0.143	0.242	0.450	0.182	0.808	
SS	0.269	0.377	0.143	0.382	0.187	0.825

Variance Extracted value higher than 0.5, thus they are all acceptable. Convergent validity is also attained when a variable's indicators are highly correlated and have enough outer loading scores. Each variable with indicators having a value greater than 0.708 is measured using the standard load [45]. In Table 5, it can be seen that there are three indicators under 0.708. The Functional Expectancy variable has two indications, which are FE1 and FE3. The other indicator is found in the Attention variable, that is A2. These findings suggest that there is a gap between the characteristics of measurement results and the theoretical concepts that account for the characteristics of the two variables. The reason for this is that the question items do not accurately describe these variables as a combination. To solve this issue and improve the description of the variables, the question items should be replaced.

Table 5. Convergent Validity Test Result

Item Code	FE	A	SI	SS	PC	BI
FE1	0.689					
FE2	0.794					
FE3	0.679					
FE4	0.708					
A1		0.760				
A2		0.676				
A3		0.870				
SI1			0.891			
SI2			0.800			
SI3			0.723			
SS1				0.738		
SS2				0.883		
SS3				0.848		
PC1					0.961	
PC2					0.755	
PC3					0.959	
BI1						0.941
BI2						0.924

C. Path Analysis of the Structural Model

For the two-tailed test, the critical values are 1.65 at a significance level of 10%, 1.96 at a significance level of 5%, and 2.57 at a significance level of 1%. The T-Values (critical ratio) could be used to determine the path coefficient's significance. When the T-Values ≥ 1.96 , it is considered that there is a significant relation [45]. On the other hand, P-Values can be interpreted as an indicator of the probability that the strength of the evidence will accept or reject H0 (null hypothesis). The null hypothesis is more strongly rejected when the P-Values are higher. P-Values ≤ 0.05 indicates strongly against the null hypothesis, in contrast, P-Values > 0.05 indicates weak against the null hypothesis. The null hypothesis is known as a hypothesis that indicates no significant difference between any two data groups.

Fig. 5 displays the measurement model's output using Smart PLS application. In total of five hypotheses were

tested, one dependent variable (BI) was verified in the model. According to the study findings, four out of five hypotheses were accepted. Thus, hypotheses (H1, H2, H4, and H5) were supported, while hypothesis H3 was rejected. The findings showed that FE has significant effect on BI with a T-Values of 3.860 (significance ≥ 1.96); thus, accepting hypothesis H1. Also, A was found to be significant in impacting the BI with a T-Values of 2.108 (significance ≥ 1.96); hence accepting hypothesis H2. While, the correlation between SI and BI has a T-Values of 0.137 (significance < 1.96); thus, rejecting hypothesis H3. Furthermore, the results also indicated that SS is significantly affecting the BI with a T-Values of 2.388 (significance ≥ 1.96) and this result accepts hypothesis H4. Finally, the effect of PC on BI was significant with a T-Values of 3.717 (significance ≥ 1.96); and hypothesis H5 was accepted.

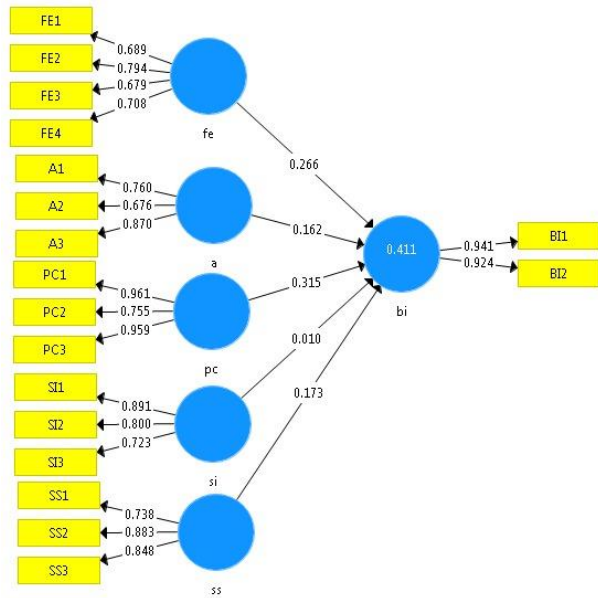


Fig. 5. Structural Model Measurement Result

Table 6. Result of Path Coefficient Score

Path	Original Sample	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ((O/STDEV))	P Values
FE -> BI	0.266	0.269	0.069	3.860	0.000
A -> BI	0.162	0.167	0.077	2.108	0.036
SI -> BI	0.010	0.029	0.070	0.137	0.891
SS -> BI	0.173	0.171	0.072	2.388	0.017
PC -> BI	0.315	0.299	0.085	3.717	0.000

Table 7. Hypothesis Test Result

Hypothesis and Relationship	Result
H1: Functional Expectancy -> Behavioural Intention	Accepted
H2: Attention -> Behavioural Intention	Accepted
H3: Society Influence -> Behavioural Intention	Rejected
H4: Support System -> Behavioural Intention	Accepted
H5: Perceived Control -> Behavioural Intention	Accepted

VI. DISCUSSION

Given the results in Table 7, one hypothesis was rejected, the relationship between the Society Influence variable on Behavioural Intention. This hypothesis have a T-Values under 1.96 (5% significance level). Furthermore, it is accepted by the P-Values as well, that scores above 0.05. This indicates that the null

hypothesis is being tended by the hypotheses found in this study. This goes against the four supported hypotheses, in particular, the connections between the variables of Functional Expectancy, Attention, Support System, and Perceived Control on behavioral Behavioural Intention. The T-Values and P-Values in these four hypotheses each scored above 1.96 and below 0.05, meaning that the null hypothesis is more unlikely to be accurate.

Functional Expectancy and the benefits provided by implementing workshop in recycling applications for respondents are related. Based on this study, it is proven that due to the significant needs of respondents for awareness feature as a starter for them to use recycling applications, there is a link between Functional Expectancy and Behavioural Intention. This awareness feature can increase respondent's knowledge and realizing the needs for recycling, especially in adopting and using recycling applications. Additionally, this is directly comparable to Attention, where respondents find it easier to use the recycling application if there is a workshop feature. Other factors that make a significant contribution are Support System and Perceived Control. This might be due to the traits of Generation Z, which constitutes the majority of respondents, have a high understanding of technology and tend to be more independent, including capable of making their own decisions.

On the contrary, the Society Influence, which is confirmed having an adverse correlation with the user's Behavioural Intention to use recycling application with workshop features. This could be due to the small number of people using recycling applications, so there is almost no influence on recycling from the people around them. Hence, they do not feel the need to use recycling applications from their social influence. This may be distinct if environmental organizations represented the majority of this study participants.

There is still a lot of limitations in this study, such as the indicators in the questionnaire which do not yet possess excellent values of reliability and validity. In order to improve the quality of the information about the factors influencing user intentions to use recycling applications, it would be preferable if more people answered this questionnaire.

VII. CONCLUSION

This study employed the UTAUT and TPB model to explain the main factors that impact people's acceptance of recycling applications with workshop feature. In this study, it can be concluded that the user's intention to use recycling applications with a workshop feature was found to be positively and significantly influenced by Functional Expectancy, Attention, Support System, and Perceived Control variables. The benefits offered that could increase user's awareness and knowledge about recycling are highly influenced by these four variables. Including the psychological factors, respondents are technology savvy and tend to be more independent individuals. However, the variable that has been shown to have no apparent impact on the user's intentions to use recycling applications with a workshop

feature is the Society Influence variable. This variable has little to no effect on the intention of the user to use recycling applications with a workshop feature because of the small number of people using recycling applications, that affects the social influence around the respondents.

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