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PREDICTORS OF E-WASTE RECYCLING INTENTION AMONG HOUSEHOLD'S RESIDENTS: THE ROLE OF ENVIRONMENTAL AWARENESS, ENVIRONMENTAL KNOWLEDGE, AND PERSONAL NORMS

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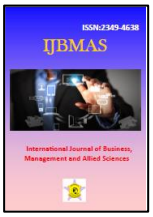

ABSTRACT

Statement on the factors influencing recycling intention can lead to better and more effective recycling programs in a community. The main aim of this study was to examine factors related with household's e - waste recycling intention. Study participants were sampled from households under the coverage of residential areas in the city of Coimbatore. Of 400 invited households, 242 agreed to participate in the study. A self-reported questionnaire was used for assessing socio - demographic profile and the constructs (i.e. Environmental knowledge, Environmental Awareness, and Personal norms). The results reveals that the constructs play a critical role in the households Recycling Intention. From the study is observed that Environmental knowledge is the most significant predictor of recycling intention. However, after Environmental Awareness was added into the model, the variance in Recycling intention increases to 0.192%. Overall, our findings show that environmental knowledge and awareness holds for improving households e - waste recycling intention.

Key words: E - waste, Environmental Awareness, Environmental Knowledge, Personal Norms, Recycling Intention.

1.INTRODUCTION

Electronic waste management is getting increasingly complicated and challenging, particularly in developing countries. These changes are the result of significant population growth, urbanization, rising standard of living, and shifts in consumer habits (Mahar et al., 2007). Waste management faces several issues across the world, including the growing volume and complexity of e-waste (Webster,2012). This problem causes a slew of environmental problems, including infectious illnesses, environmental degradation, water and soil contamination, greenhouse gas emissions, and severe effects on human life quality (Miller,2000). These issues are widespread in underdeveloped nations with insufficient rubbish collection services. Recycling, as described by Rudnick (2008), is a process in which previously used materials are gathered, processed, rebuilt, and re-used. Instead, recyclable solid waste.

Recycling is an important part of the waste management hierarchy since it is a long-term endeavour to reduce human impacts on the environment (Chen & Tung, 2009). Governments across the world have established numerous initiatives to solve the issues and encourage people to recycle (Wilson, Rodic, Alabaster, 2012).

The primary goal of this research is to look at the impact of environmental knowledge, environmental awareness, and personal norms on e-waste recycling intentions. This study will look back at previous research on recycling intentions and actions.The study will then go on to explain and clarify three variables that influence recycling intentions. To close the gap, this study explores the findings of a survey performed in the study region to investigate Environmental Awareness, Environmental Knowledge, and Personal Norms on recycling intention. Finally, the findings will be examined, as well as the policy implications.

1.1 LITERATURE REVIEW

The term "recycling intention" refers to a person's desire to engage in recycling activities (Park and Ha,2014). Recycling intention has been established in the literature using social psychology variables and models. Ajzen's (1991) Theory of Planned Behavior (TPB) is a popular model for evaluating recycling intentions. It's a follow-up to the Theory of Reasoned Action (TRA) (Fishbein and Ajzen,1975). The subjective appraisal of a person's actions is reflected in their attitude. Subjective norms refer to how important people make you feel about yourself. Ajzen (1985) built on these two notions by adding perceived behavioral control (PBC) to TRA and forming TPB to investigate the intention and behavioral choices, as well as the individual's ability to complete the behaviour.TPB has been used in the past to conduct systematic analyses of recycling intentions. (Mahmud and Osman, 2010; Afroz R et al., 2020; CerenOztekin et al., 2017; Mahmud and Osman, 2010). As a result, the current study combines environmental knowledge, environmental awareness, and personal norms to determine household recycling intention.

1.2 The Role of Personal Norms (PNs)

Some elements of social responsibility and moral values are present in household recycling behaviour. It is established when a person is aware of the consequences of not engaging in a certain action and accepts responsibility for those consequences. When they have the fundamental information and desire for recycling, it is to tell them about their own recycling norm. Previous research has linked PNs to a desire to recycle (Davis, et al.,2008;Kaiser, F.G et al., 1999;DeFeo,G ,2010).

If a person's norm is that recycling is beneficial for the people around him as well as the environment, he or she will most likely recycle.The significant link between PNs and recycling intentions necessitates the development of policies that promote recycling as a social activity that is beneficial, enjoyable, and vital to the general population (Miafodzyeva,S 2013). The presence of PNs was found to be a significant predictor of intention (Shi et al.,2017; Wang et al., 2016 a). As a result, the

purpose of this study is to look at the influence of personal norms in determining recycling intentions in household.

H_1: Personal norms has a significant relationship on recycling intention.

1.3 The Role of Environmental Awareness

(Tonglet et al., 2004; Saphores, 2007) discovered that residents' attitudes regarding recycling intentions, as well as their environmental knowledge and protection consciousness, successfully boosted their e-waste recycling intentions. Furthermore, (Hansmann et al.,2006) claimed that individuals' knowledge and attitudes about recycling had a significant beneficial influence on battery recycling in Switzerland. It is critical(Rathnaraj, 2022) to evaluate the results that are created as a result of completing a certain activity while analysing the recycling intention. Environmental knowledge has been found to have a favourable influence on recycling intentions in previous research (Kochan et al., 2016; Wan et al., 2012). According to certain research, awareness has an indirect impact on recycling intentions (Park and Ha, 2014). These inconsistencies from previous studies serve as the foundation for incorporating environmental awareness into the study of recycling intention.

H_2: Environmental Awareness has a significant relationship on recycling intention.

1.4 The Role of Environmental Knowledge

According to the KAP model (Knowledge, Attitude, and Practice), increasing a person's knowledge about a subject matter causes them to change their attitude, and then both attitude and knowledge ultimately determine whether to do a certain activity (Isa,2016). "Theoretical or practical understanding (i.e., facts, information, and abilities) of a certain subject" is how knowledge is defined (Abhary et al., 2009;Rav - Marathe et al., 2016). Environmental knowledge was found to be favourably associated to environmental attitude (Ramsey and Rickson 1976).Specific knowledge about recycling programs and availability of facilities) (Chung and Lo 2004) and general knowledge about the environment (Nixon and Saphores, 2009) were found to be important variables in recycling, with more sources of information indicating that a person was more likely to recycle.

H_3: Environmental knowledge has a significant relationship on recycling intention.

2. METHODOLOGY

2.1 Research Design

The descriptive research design is used in this study. Demographic variables were evaluated based on their frequencies and percentages in the descriptive study approach. Multiple Regression was used to assess and display the degrees of relationships that exist between research variables, as well as how the predictor factors affecting recycling intention across households were studied and presented.

2.2 Sampling Method

One of the four local divisions in the zone was chosen at random to form the study's sample. Following these steps, a local location was chosen based on its high-income level. Purposive sampling was chosen because the study's focus on household e-waste recycling intentions. Respondents were required to click on a link to access a questionnaire that had been submitted. Due to the general demographics of the target respondents, the internet was determined to be the most appropriate and effective method for gathering information. After filtration, there were 242 viable responses for analysis.

2.3 Instruments and Measures

The survey questionnaire was created using modified measuring items on a five-point Likert scale ranging from strongly disagree to strongly agree. The study used tools developed by (Tonglet et al., 2004) in the preceding literature (Nixon and Saphores, 2007). Results from pilot testing were used

to assess the questionnaire prior to data collection. The questionnaire was addressed for data collection when the reliability standards were met.

2.4 Demographic Variables

Gender, age, marital status, education level, monthly income, occupation, and residential status were all questions that were asked of the households.

2.5 Reliability

The reliability test for the Instruments is described in the Table 1. From the reliability analysis it is found that Cronbach's alpha for the research instruments are summarily higher than 0.8. Hence the instruments of the study are found to be reliable.

Table 1. Summary of the Reliability Test

Variables	Mean	S.D	Cronbach's Alpha Values	Number of Questionnaire Items
Environmental Knowledge				
I know that recycling preserves natural resources for the benefit of present and future generations	3.46	1.160	0.879	05
I know that proper management of e waste reduces the use of landfills and emissions of greenhouse gasses.	3.12	1.055		
E waste can be a resource if properly managed	3.46	1.160		
I know that e waste contains toxic and hazardous substances that are harmful to human health & deteriorates the environment	3.37	1.023		
I know that e wastes should be disposed separately from general household wastes.	3.33	1.084		
Environmental Awareness				
I am aware of the benefits recycling e-waste	3.28	2.816	0.859	04
I know that electronic products contain potentially toxic substances	3.22	1.031		
I know that not recycling e-waste can cause environment pollution	3.30	0.987		
I know that the way we manage e-waste can harm human health	3.39	1.002		
Personal Norms				
I would feel proud if I actively recycled my e-waste.	3.81	1.147	0.894	04
I feel I should not waste anything if it could be used again.	3.29	0.989		

I would feel guilty if did not recycle my e waste.	3.81	1.143		
Not recycling goes against my principles.	3.67	0.928		
Recycling Intention				
I plan to take part in recycling activities	3.52	1.143	0.813	04
I intend to drop- off my e waste at collection centers to create space in the house.	3.67	0.928		
I am willing to participate in environmental programs by the government	3.58	0.857		
I intend to drop off my e waste if there are formal collection systems.	3.84	1.142		

3. DATA ANALYSIS AND RESULTS

3.1 Result of Descriptive Analysis

The demographic results of the 242 valid questionnaire respondents indicated that 47.7% were male and 51.9 percent were female. A total of 24.3 percent obtained a postgraduate degree. The respondents' ages vary from 20 to 30 percent (32.5 %), 30 to 40 % (27.2 %), 40 to 50 % (22.4 %), and beyond 50 percent (17.5 percent). In terms of marital status, 73.7 percent of households were married and 25.9% were single. Most respondents (24.7%) were retired workers, 21.6 % were self-employed, and 20.6 % were private employees. According to the respondents' income levels, 42% earned between Rs. 40,000 - Rs. 50,000, 34.2% earned between Rs. 30,000 - Rs. 40,000, and 24% earned between Rs. 20,000 - Rs. 30,000. In terms of residential status, 45.7 percent resided in urban regions, 37.4 percent in semi-urban areas, and 16.5 percent in rural areas.

To determine whether there are the differences between environmental awareness, environmental knowledge, and personal norms and intentions to e - waste recycling between gender, independent sample t- test was used. One way ANOVA test was used to find out the significance level on all the variables among different age groups and education levels of respondents.

Independent t - test were conducted to determine the significance differences between male & female and environmental awareness, environmental knowledge, personal norms, and recycling intention. The test reveals that there is no significance difference among male and female respondents with respect to all the variables @ 5 % degree of freedom. However, at 0.01 significance level, the results revealthat significance difference between male and female exist for recycling intention and personal norms. Whereas no difference exists with respect to environmental knowledge and environmental awareness. The females show higher intention to recycle than male (Female mean value = 11.18, Standard Deviation = 2.60) and male (mean value = 9.62, Standard Deviation = 2.923) supports this. The personal norms towards recycling intention of female are more than that male. The mean value of 11.18, Standard Deviation = 2.605 for female and mean value = 9.62, Standard Deviation = 2.923 for male substance these (Table 2).

Table 2. Differences in recycling intention, environmental awareness, environmental knowledge, and personal norms among male and female respondents.

Constructs	Gender	N	Mean	SD	t	Sig**	Sig***
Recycling Intention	Male	116	9.62	2.923	-4.369	0.222	.000
	Female	126	11.18	2.605	-4.348		.000
Environmental Knowledge	Male	116	10.36	3.698	-1.817	0.584	0.70
	Female	126	11.20	3.724	-1.818		0.70
Environmental Awareness	Male	116	8.87	4.755	0.982	0.565	0.327
	Female	126	9.38	3.079	-0.965		0.336
Personal Norms	Male	116	9.62	2.923	-4.369	0.222	0.000
	Female	126	11.18	2.605	-4.348		0.000

** 5% Significance; *** 1% Significance

One way ANOVA was conducted to determine the significance differences between education level and environmental awareness, environmental knowledge, personal norms and recycling intention.Concerning e - waste recycling intention the test reveals that there is no significant difference among education level with the respect to all the variables @5% degree of freedom level (Table 3).

Table 3. Differences in Recycling Intentions, Environmental Awareness, Environmental Knowledge , and Personal Norms among respondents Education Level.

One way ANOVA						
Variables		Sum of Squares	df	Mean Square	F	Sig.
RI	Between Groups	32.251	3	10.750	1.315	.270
	Within Groups	1945.319	238	8.174		
	Total	1977.570	241			
Ek	Between Groups	99.822	3	33.274	2.435	.066
	Within Groups	3252.810	238	13.667		
	Total	3352.632	241			
AW	Between Groups	112.410	3	37.470	2.418	.067
	Within Groups	3688.814	238	15.499		
	Total	3801.223	241			
PN	Between Groups	32.251	3	10.750	1.315	.270
	Within Groups	1945.319	238	8.174		
	Total	1977.570	241			

(RI = Recycling Intention, EK = Environmental Knowledge, AW = Environmental Awareness, PN = Personal Norms). sig @ 0.05 level.

Respondents are classified into four groups according to age: 20 - 30, 30 - 40, 40 - 50, Above 50. One way ANOVA test was used to explore whether there is any significance difference in the mean

scores of the respondents among the groups. The details of the one-way ANOVA test can be seen in Table 4.

Results showed that among the age groups, significant difference exists for environmental knowledge (F = 5.094, p=0.007), environmental awareness (F= 5.743, p= 0.003) and recycling intention (F = 4.271, p= 0.012). However no significant difference exists for personal norms among various age groups. Therefore post - hoc multiple comparison test was conducted for different age groups across e - waste recycling intention, environmental awareness, environmental knowledge. The test results revealed that intention to e - waste recycling is more in the age group above 50 years. The mean difference of -0.505 and significance p value 0.048 substantiate the same. For the variable, environmental awareness, is high between the age group 25 - 35 years, the (mean difference of -0.282 and significance value 0.001). Environmental knowledge is high between the age group above 19 - 24 years, the mean difference of -0.413 and significance value 0.024 substantiate the same.

Table 4. Differences in Recycling Intention, Environmental Awareness, Environmental Knowledge, and Personal Norms between different Age Groups.

Dependent Variable and sum of squares	**Age group**	**N**	**Mean**	**S.D**	**Group Comparison**	**Mean diff.**	**Sig.**	**F**	**Sig**
Intention to recycle	20 - 30	52	3.82	1.542	30-40	0.127	0.01	4.271	0.012
					40-50	-0.538	1		
Between groups					Above 50	0.505	0.048		
(4) = 10.95	30-40	69	3.52	1.432	20-30	-0.127	0.01		
					40-50	-0.181	0.002		
Within groups					Above 50	0.377	0.003		
(238) =196.061,	40-50	65	3.76	1.427	20-30	0.538	1		
					30-40	0.181	0.002		
Total (242) = 197.51					Above 50	0.559	0.024		
	Above 50	56	4.16	1.846	20-30	-0.505	0.048		
					30-40	-0.377	0.003		
					40-50	-0.559	0.024		
Environmental Awareness	20 - 30	52	4.79	1.617	30 - 40	-0.597	0.012	5.743	0.003
					40 - 50	-0.88	0.005		
Between groups					Above 50	0.714	0.003		
(4) = 38.46	30 - 40	69	2.64	1.687	20 - 30	0.597	0.012		
					40 - 50	-0.282	0.001		
Within groups					Above 50	0.669	0.021		
(238) =376.75	40 - 50	65	2.86	1.732	20 - 30	0.88	0.14		

					30 - 40	0.282	0.001		
Total (242) =3801.22					Above 50	0.952	0.034		
	Above 50	56	3.56	1.784	20 - 30	-0.714	0.003		
					30 - 40	-0.669	0,021		
					40 - 50	-0.952	0.034		
Environment Knowledge	20 - 30	52	30.22	10.248	30 - 40	-0.773	0.014	5.094	0.007
					40- 50	-1.065	0.005		
Between groups					Above 50	-0.413	0.024		
(4)= 36.83	30 - 40	69	33.22	10.09	20 - 30	0.773	1		
					40 - 50	-0.291	0.021		
Within groups (238) = 331.79,					Above 50	0.36	0.002		
	40 - 50	65	36.44	9.35	20 - 30	1.065	0.005		
Total					30 - 40	0.291	0.021		
(242) = 3352.60					Above 50	0.651	0.004		
	Above 50	56	2.84	1.737	20 - 30	0.413	0.024		
					30 -40	-0.36	0.002		
					40 - 50	-0.651	0.004		

To find out the level of variance to serve as predictors of e - waste recycling intention , multiple regression was used with elements of environmental awareness, environmental knowledge and personal norms as independent variables, and recycling intentions of e - waste as dependent variable. It showed that all the variable, explained very well to recycling intention ($R^2 = 0.41$). An overview of beta value for the sample as well as the whole population, is given table 5. From multiple regression, it was found that Environmental knowledge there is no relationship between environment knowledge and the e - waste recycling intention.

Table 5. Environmental Awareness, Environmental Knowledge, and Personal Norms as predictors of Intentions to Recycle: Summary of Multiple Regression Model Coefficients.

Dependent variable and model coefficients	**Potential predictors identified by regression**	**Unstand. coefficient B**	**beta**	**t**	**Sig.**	**Hypothesis**	**Accepted/ Rejected**
Intention to recycle.	Environmental Knowledge towards recycling	0.04	0.004	0.081	0.936	H_1	Rejected

N= 242 R^2 =0.41 F=55.586 P=0.000	Environmental Awareness towards recycling	0.168	0.222	4.162	0.000	H_2	Accepted
	Personal norms towards recycling.	0.409	0.528	9.301	0.000	H_3	Accepted

Note: (B = estimate of the regression coefficient for the whole population of household residents. β = regression coefficient for the sample. P<0.05. R^2 = total variance explained by the model)

The analysis shows that environmental awareness (β= 0.222, t = 4.162,sig .000 , p<0.05) and personal norms (β= 0.528, t = 9.301,sig .000,p<0.05) did significantly predict house hold e - waste recycling intention. Therefore, there is enough evidence to accept the alternative hypothesis.

4. CONCLUSION

In this research, the role of environmental awareness, environmental knowledge, and personal norms on e - waste recycling intention among household was explored. As per this study, environmental awareness and personal norms influences residents e- waste recycling intention in a positive manner.

This study revealed that environmental awareness is the primary influencing factors among household in actively participating towards formal collection. Such behaviour contributes to save natural resources and reduces environmental problem. Therefore, to a proper communication strategy would help to increase the awareness on proper methods of e- waste recycling. This would definitely reduce use of landfills and raise awareness and beliefs among the people.

It is clear from the study that people want to actively participate in e - waste recycling and would be and would feel proud it if the toxic materials are used again. So local government should take initiative to increase the formal collection centers. Environmental related programs should be initiated in order to increase the knowledge and awareness level of people.

Though the empirical regression model stated that, the environmental knowledge does not have significant relationship between recycling intention yet solid waste management authorities could take care and strengthen publicity among recycling and their benefits to the environment, and also increases their awareness level

It is obvious that the study of e -waste recycling intention is extremely important and the variables taken in this study are considered to be important predictors of e-waste recycling intention Transforming recycling behavior into regular activity and encourage the people to regularly participate in recycling practices is important (Thomas and Sharp, 2013).

To the best of our knowledge, this study introduces different variables to examine the role of e - waste recycling intention. The empirical evidence and findings from this study are helpful to the formal recyclers to conduct promotional campaign and communicate directly with the household in order to enhance the e - waste recycling intention in an effective manner

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