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Determinants of the behavioural intentions of households to recycle E-waste in Sri Lanka

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ABSTRACT

This study seeks to recognize the determinants of behavioural intentions of households to recycle e-waste (ER = e-waste recycling) in Sri Lanka. Structural equation modelling was applied to analyse the data of 230 households. The measurement model confirmed the appropriateness of the considered constructs and variables to estimate statistical relationships among the recognized variables. The structural model emphasized that factors such as environmental awareness, attitude to recycling, social pressure, and rules and regulations positively affect the behavioural intentions to recycle e-waste while the inconvenience and cost of recycling affect it negatively in Sri Lanka. Apart from that the moderating effect stresses that previous experience in ER reduces the inconvenience of recycling and therefore past experience of ER indirectly increases the perception of ER. This study also highlights that socio-economic factors such as education, age, household size, gender, and income significantly affect the behavioural intentions to recycle e-waste and the impact of these demographic factors varies across the urban, rural, and state sectors.

Contribution/ Originality
It is worthy to conduct country specific studies to recognize the determinants of behavioural intention to recycle e-waste. However, there is no systematic study which would focus on the aforementioned fact in Sri Lanka except studies which reviewed policies related to EM. This study therefore fills the gap in the literature.

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1. INTRODUCTION

1.1. Waste management and the emergence of ER

The industrial revolution decades ago and recent technological development have created an enormous number of electrical and electronic products which make human life easier. Especially development of Information Technology (IT) resulted in computers, printers, mobile phones, copiers, televisions, and radios besides electronics such as refrigerators, microwaves, washing machines, and cookers. Rapidly growing population and consumption-oriented wider middle income group essentially enhanced the demand for these electronic and electrical products. Continuous advancement in technology shortened the lifetime of products and consumers are therefore willing to replace older products with newly introduced versions (Cairns, 2005). Outdated electronic and electrical products have consequently become a threat to the society. According to Davis and Heart (2008) outdated, end-of-life, or rejected electrical or electronic appliances are identified as e-waste. Electrical or electronic tools and equipment with no capacity to fulfil consumers' requirements are also recognized as e-waste (Peralta and Fontanos, 2006).

According to Saoji (2012) electronic waste is one of the world's rapidly growing issues, and Cairns (2005) recognized e-waste as a rapidly growing stream of waste which has been growing at the annual rate of 3-5%. Davis and Heart (2008) highlighted that the growth rate of global e-waste stock is three times higher than that of ordinary solid waste. According to Shinkuma and Huong (2009) the discussion of e-waste has a long history which dates back to the 1970s following environmental pollution in developing countries due to imported hazardous waste. The Basel Convention (BC) in effect since 1992 mainly focuses on controlling transboundary movement of hazardous waste. (Buenker, 2007). The theme of the BC in 2004 was "Creating innovative solutions for the environmentally sound management of electronic waste". Under this scenario the term 'EM' emerged and as Kiogora (1995) elaborated, *"EM is the management of activities associated with the generation, storage, collection, transfer, transport, processing, and disposal of e-waste which should be environmentally compatible adopting principles of economy, energy, aesthetics, and conservation. It encompasses the general functions of management such as planning, organizing, forecasting, directing, controlling, and staffing in ensuring all the various parts of the undertaking function accurately and efficiently"* (Mwathi, 2014).

E-waste causes many environmental problems and adverse health effects. E-waste can be classified into two categories – 'hazardous' and 'not hazardous'. Approximately 38 chemical elements are included in e-waste and the toxicity of many of the chemical elements is still unknown (Samarakoon, 2014). However, mercury, cadmium, lead, polychlorinated biphenyls, and brominated flame retardants are common in most e-waste. Table 1 indicates some of the health effects of the selected hazardous ingredients of e-waste.

Table 1: Negative health impacts of the selected hazardous ingredients of e-waste

E-toxin	Health Effects
Arsenic	Arsenic causes for cancer, especially for lung and skin cancers.
Brominated Flame Retardants	Harm for children and there is a greater risk of having thyroid and neurobehavioral disease.
Cadmium	Chromium might cause for DNA damage.
Mercury	Exposure to mercury have short term (vomiting, lung damages, and skin rashes) and long term (damages to brain and kidney) health issues.
Polyvinyl Chloride (PVC)	Burning PVC causes for hormone disruptions.

Source: Adopted from Samarakoon (2014)

EM has massive positive effects in terms of economic, health, and environmental aspects, and ER is one of the main components of EM. Recycling refers to the process of converting waste materials into useful materials. Therefore recycling protects the environment and reduces the pace of depletion of natural and other limited resources (Bandara *et al.*, 2007). According to the World Bank (2012) ER includes four main steps: generation and stockpiling, collection, treatment, and output as illustrated in figure 1. Both imported and locally collected e-waste should be sorted out before dismantling and shredding. Some of the dismantled and shredded e-waste might be reused while most of the shredded e-waste is converted into secondary raw materials.

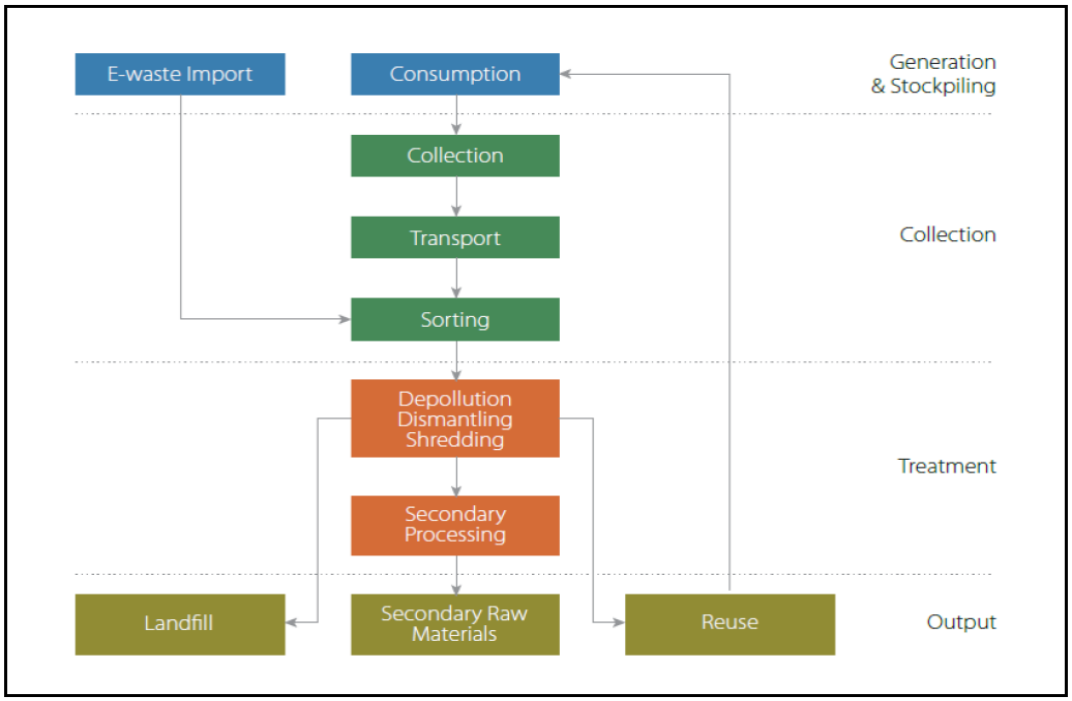

Figure 1: Key steps in the process of ER

Source: World Bank (2012)

1.2. Sri Lanka's experience in EM

Similar to other developing countries, Sri Lanka has also been dealing with increasingly growing both locally and internationally imported e-waste in recent decades. Despite Sri Lanka has a long history in EM, official measures related to EM were taken in1992 with the engagement of BC to control the movement of HW and disposal across countries. Institutions such as the Central Environmental Authority (CEA) and the Ministry of Environment and Renewable Energy are responsible for EM in Sri Lanka and they have partnered with many organization such as telecommunication, electrical home appliance and information technology to manage e-waste more efficiently. Current e-waste generation of Sri Lanka has been reached by far the largest and as UNDP highlighted annual e-waste production of Sri Lanka is 7-75 metric tons. This is mainly due to rapid urbanization, industrialization and use of advanced ICT. Personal computers, washing machines, printers, photocopiers, mobile phones, refrigerators, televisions, air-conditioners and different kinds of batteries are the common e-waste in Sri Lanka. Lifespan of such products along with annual imports and growth rate of using are indicated in the table 2.

Table 2: Annual imports, lifespan and growth rate of using main electronic products

Product Name	Annual Imports	Average Lifespan	Growth Rate of Using (%)
Computers	300,000	6	8.5% - 10%
Printers	130,000	6	5% - 7%
Televisions	400,000	12	6% - 8%
Mobile Phones	1,200,000	3	8% - 5%
Air-Conditioners	40,000	15	4% - 6%
Refrigerators	250,000	25	4% - 6%
Photocopy Machines	6000	10	2% - 4%

Source: Calculated based on Suraweera (2016)

As showed in table 2, annual imports of highlighted electronic products are considerably higher and most of such products have relatively low lifespan. Similarly, use of most of the electronic goods is growing at a considerably higher rate. Hence, it is crucial to strengthen the process of ER in the context of Sri Lanka. Despite the CEA and other institutions have developed the e-waste related policies. Most of the policies are already at the draft level (Samarakoon, 2014). However, some of the companies in Sri Lanka provide 'trade-in discount' for consumers who handover outdated or out of using electronic equipment. As indicated in table 01 above, most of the e-waste contains hazardous heavy metals such as mercury, lead cadmium, silver, selenium, gold, aluminum, mercury, hexavalent and organic chemicals such as Poly Brominated Biphenyls (PBBs). Such materials are dangerous to human health and environment as well. This rapidly growing waste stream requires special attention, way of processing and management due to hazardous nature of E-waste.

1.3. The objectives and structure of the study

Though there is growing concern about EM at the national level, the effectiveness of such policies and programs depends entirely on individuals' perception of the policies and programs. Consequently it is essential to observe households' intentions to recycle e-waste. This study focuses on households' behavioural intention to recycle e-waste in Sri Lanka. The objectives of this paper are outlined as follows.

- Examining determinants of households' behavioural intentions to recycle e-waste in Sri Lanka
- Provide appropriate suggestions and policy recommendations which encourage households to engage in ER.

The next section of the paper will evaluate the literature on ER and its determinants. Then the methodology applied to accomplish the main objectives of the study will be described along with data collection procedures. The next section explains the results of the study followed by conclusions and recommendations.

2. LITERATURE REVIEW

In general, EM is a series of activities which include generation, storage, collection, transport and processing and disposal of E-waste in order to reduce environment pollution. As Kiogora (1995) highlighted the process of EM is also engaged with general management principles such as planning, organizing, directing, controlling and staffing. According to Shinkuma and Huong (2009), the concept of EM emerged during the period of 1970-1980 with environmental pollution occurred in developing countries due to import HW into developing countries. The concept has been rapidly spreading across the world due to large storage of E-waste in the expansion of ICT related industries and other electronic utensils. The amount of E-waste has been increasing faster than any other solid waste and growing approximately at 3%-5% annually (Cairns, 2005). Particularly, Davis and Heart (2008) indicated that the growth of E-waste is more than three times higher than that of ordinary solid waste. By 2009, more than 50 million tons of E-waste were disposed while it had increased up to 72 million tons by

2015. Similarly, the rate of global ER had increased approximately by 15% on average during the period of 2009-2014. (Jiang *et al.*, 2016). Not only in the history, even currently more than 50% of E-waste generated in developed countries are exported into developing countries (Wang *et al.*, 2016) Most of such imported E-waste are reused by the developing countries as second hand products.

Baldé *et al.* (2017) and Balde *et al.* (2014) highlighted the term E-waste in relation to all types of Electrical and Electronic Equipment (EEE) which are not going reused. Similarly, Baldé *et al.* (2017) and Balde *et al.* (2014) projected that the volume of E-waste will increase up to 52.3 million tons by 2021 and however Jiang *et al.* (2016) confirmed 72 million tons of E-waste even by 2015. As Namias (2013) explained that ER rate is significantly higher in the European Union (EU) compared to the United States (US). Similarly, Namias (2013) indicated that E-waste generation in EU countries has been increasing annually by 8.3 - 9.1 million tons on average while global E-waste generation has been rising at approximately 40 million tons per year. Apart from that, EU countries applied two main approaches, namely Waste Electrical and Electronic Equipment (WEEE) Approach and RoHS Restriction of Hazardous Substances (RoHS) to recycle the E-waste. In contrast, US currently does not have well-established E-waste recycle policy for the whole country. However, different states have different policies to manage the E-waste. More specifically, 25 states have state-specific EM policies and 19 out of 25 states have bans on disposing e-waste in landfills. According to Namias (2013), approximately 13.6% - 26.6% of US E-waste are recycled. The electronic key product in the US such as Computers, Computer Displays, Hard-copy Devices, Keyboard and Mice, Televisions and Mobile Phones is mandated to recycle. Japan has a policy called "Home Appliance Recycling Law" which enacted in 1998. The policy mandates four types of electronic products (Television, Refrigerators, Washing Machines and Air Conditioners) to be recycled (Namias, 2013). Therefore, consumers are required to hand over such products to the place where they purchased. A fee which covers part of the recycling related expenditure is also required to be paid by the consumers (Kahhat *et al.*, 2008). Then, retailers send the products to manufacturer for recycling and Japan recycles approximately 75% of E-waste that they collect through Home Appliance Recycling Law (Namias, 2013).

Similar to develop countries, emerging and developing countries also face a sharp increase E-waste due to growing demand for such products. However, most of such countries apparently apply improper disposal methods such as open burning and mixing with other solid wastes which create adverse environmental and health effects. Duan *et al.* (2013), Wang *et al.* (2016) and Dwivedy and Mittal (2013) indicated that most of the Asian and African countries have E-waste based such issues leading considerable risk to human health.

The concept of EM has been increasingly discussed during the last decade and various policies related to the concept have been implemented by relevant authorities. However, the effectiveness of such policies highly depends peoples' reaction to the policies. Thus, behaviour intension of the public on EM related policies plays a crucial role and has been recognized as one of the integral parts of the EM system. Consequently, number of studies have been carried out to examine the publics' perception on such policies which lead to better environmental management system. Yin *et al.* (2014) conducted a case study to observe factors affect ER in China. They conducted a survey with 1035 respondents and found that 47.9% of them were willing to pay only 0% - 5% of recycling cost of used mobile phone. Apart from that, Yin *et al.* (2014) found that the educational level of respondents, region and their income level also significantly affect their perception on ER.

In contrast to Yin *et al.* (2014), a study by Nixon and Saphores (2007) highlighted that the public in California is willing to pay 1% Advance Recycling Fee (ARF) for ER. Similar to Yin *et al.* (2014), Wang *et al.* (2016) also confirmed that both income and the cost of recycling are the key determinants of ER. Apart from that Wang *et al.* (2016) pointed out that factors such as attitude on recycling, environmental awareness, norms and publicity also influence people' behaviour intention on ER. Wang *et al.* (2016) also observed the people' behavioural intention to ER in China and recognized that

factors such as residential conditions, recycling habits, economic benefits and convenience of recycling facilities and services affect are also important. Apart from that, Hornik *et al.* (1995) categorized people' intention on EM into four main categories such as intrinsic incentives, extrinsic incentives, internal facilitators and external facilitators. Further, Hornik *et al.* (1995) highlighted that internal facilitator is the key dimension while consumer knowledge and commitment to recycling affect recycling behaviour of consumers. However, factors which coming under external incentives such as monetary rewards and social impact are also considered as determinants of behavioural intention on ER Hornik *et al.* (1995). In addition to that, Sidique *et al.* (2010) stressed that demographic factors such as age, education level, location and household size highly link with households' behavioural intention on ER.

Considering the reviewed existing knowledge, it is apparent that most of the scholars have ended up with mixed findings on behavioural intention on ER. Similarly, people' behavioural intentions vary across countries and time. Therefore, it is essential to conduct country specific studies to recognize the determinants of behavioural intention on ER. However, there is no systematic study which focuses on the aforementioned fact in the context of Sri Lanka except the studies which reviewed policies related to EM. Consequently, it is timely important to examine behavioural intention on ER in the context of Sri Lanka.

3. METHODOLOGY

3.1. Conceptual framework and variables

The theory of plan behaviour (TPB) developed by Ajzen (1985) provides the theoretical basis for this study. As Ajzen (1985) highlighted, behavioural intention is based on three dimensions: attitudes, subjective norms, and perceived behavioural control. Two additional dimensions – past experience of recycling and demographic information - were included in the theoretical model following the empirical studies by Xu *et al.* (2017) and Saphores *et al.* (2006). Xu *et al.* (2017) observed that past experience of recycling had a positive impact on behavioural intentions of present recycling practices. Saphores *et al.* (2006) elaborated on the significance of demographic factors and types of residential areas with intentions to recycle. The conceptual framework adopted by the study is illustrated in Figure 2 below.

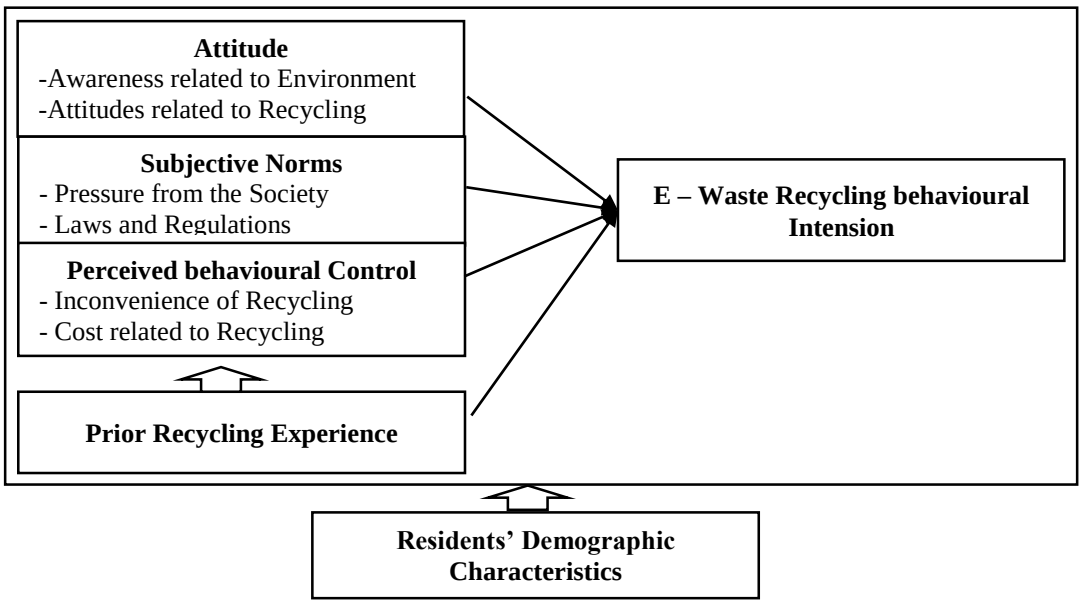

Figure 2: Conceptual framework

Source: Created by authors based on Nguyen and Lobo (2018)

The conceptual framework clearly depicts how attitudes, subjective norms, and perceived behavioural control affect residents' behavioural intention to recycle e-waste. Furthermore, the framework highlights the direct and indirect impact of past recycling experience on both behavioural intention and perceived behavioural control along with the effect of demographic factors of the entire model. The questionnaire for this study was prepared based on the abovementioned conceptual framework suggested by Nguyen and Lobo (2018). Table 3 summarizes the details related to each construct.

Table 3: Descriptions of variables

Constructs	Items	Measurements
Environmental Awareness (EA)	EA1	ER is one of the keys of decreasing the use of landfill and reducing greenhouse gasses.
	EA2	ER is a key way to protect natural resources.
	EA3	ER increases the quality of environment.
Attitude towards Recycling (AR)	AR1	I feel satisfaction when recycling E-waste.
	AR2	ER is important to have a pleasant community environment.
	AR3	ER is a responsibility of us and it helps to lessen the amount of E-waste generated.
	AR4	I do not like the concept of ER.
Social Pressure (SP)	SP1	If neighbours are engaged ER, I am also interested in doing so.
	SP2	The media motivates me ER.
	SP3	The community activities affect involvement in ER.
Cost of Recycling (COR)	COR1	ER programs are expensive.
	COR2	Transportation cost of e-waste to recycling place is high.
	COR3	Handling fees of ER are high.
Laws and Regulations (LR)	LR1	Law and regulations need to force residents to engage in ER.
	LR2	Government policy motivates me to engage in ER.
	LR3	I agree with law and regulation related to ER.
Inconvenience of Recycling (ICR)	ICR1	Sorting e-waste is difficult.
	ICR2	Lack of time to transport E-waste to collecting place.
	ICR3	Lack of transport facilities to send E-waste to collecting place.
	ICR4	ER of neighbours is not up to the standard level.
Prior Experience (PE)	PE1	I am familiar on recycling facilities.
	PE2	I am aware of the materials suitable for recycling.
	PE3	How many time did u recycle E-waste at you home during last three months?
Behavioural Intention (BE)	BI1	I like to contact ER institutions to engage in e-waste in the future.
	BI2	I like to dispose e-waste properly if collection system is efficient.
	BI3	I like to attend environmental awareness programs.
	BI4	I like to inform my relatives about ER.

Source: Created by authors based on Nguyen and Lobo (2018)

3.2. Sampling and data collection

This study collected the data through an online survey conducted through the Qualtrics survey platform. The survey link was emailed to 350 individuals who lived in all nine provinces of Sri Lanka. The list of email addresses was collected from a market research institute which applied the Purposing Sampling Technique (nonrandom sampling) as the sample frame is unknown. The survey link was distributed irrespective of socio-economic characteristics in order to have a more diverse sample.

However, only 230 people had responded to the survey. The questionnaire consists of of all the key variables highlighted in the conceptual framework and in line with the constructs and measurements indicated in table 3.

3.3. Analytics techniques

Analytical techniques such as Exploratory Factor Analysis (EFA) and Structural Equation Modelling (SEM) were used to accomplish the objectives of the study. Initially the EFA was utilized to discover the principal construction of a set of items followed by SEM which examine the structural relationships among the key variables highlighted in the conceptual framework. SEM allows capturing both direct and indirect relationships among the variables and is therefore more appropriate than applying conventional regression analysis. Scholars such as Nguyen and Lobo (2018) have also applied SEM for similar empirical studies.

4. RESULTS AND DISCUSSION

4.1. Demographic features of the sample

It is important to examine the demographic factors of the respondents before explaining the main results of the study. Table 4 indicates the key demographic variables and the percentage of individuals who fall into each category of the demographic variables. As table 4 summarized, the three main sectors of Sri Lanka – urban, rural, and estate - are well represented by the sample. 38% are from the urban sector, 34% are from the rural sector, and 28% are from the estate sector. The majority of the respondents are between 41 and 51 years old and 52% are men.

Table 4: Demographic characteristics of the sample

Variables	Categories	Percentage (Rounded)
Location	Urban	38
	Rural	34
	Estate	28
Age	<=18	02
	19 – 29	10
	30 – 40	32
	41 – 51	36
	52 – 62	12
	> 62	08
Gender	Male	52
	Female	48
Education	Primary	02
	Secondary	22
	Tertiary	41
	Postgraduate or above	35
Income (USD/per month)	< 120	00
	120 – 170	02
	170 – 220	08
	220 – 270	10
	270 – 320	12
	320 – 370	21
	370 – 420	24
	420 – 470	11
	470 – 520	07
	> 520	05
Household Size	< =2	12
	2 – 4	52
	> 4	36

Source: Created by authors based on the survey data

It is important to highlight that 41% of the sample completed tertiary level of education while 35% had postgraduate or higher degrees. More than 57% earned 270 – 420USD per month while only 5% earned more than 520USD per month. 52% were from households of 2 – 4 members.

4.2. Statistical Analysis

4.2.1. The measurement model (MM)

The MM is estimated to check the Composite Reliability (CR), Convergent Validity (CV), and Discriminant Validity (DV) of selected variables. Confirmatory Factor Analysis (CFA) was employed in this regard and the results are indicated in table 05. All the factor loadings are higher than the threshold level of 0.5. CR of the selected constructs were evaluated using the estimated value for CR in the 5th column of table 5. If the values are higher than the cut-off of 0.6, the constructs are considered internally consistent. Since the estimated values for CR are higher than 0.6, the constructs are internally consistent. The CV was measured based on the Average Variable Extract (AVE) and if the AVE values are greater than 0.5, the CV is confirmed. As the 4th column of table 5 indicates, all the AVE values are greater than 0.5 and therefore the CV of the construct is assured.

Table 5: Results of the MM

Constructs	Items	Factor Loadings	AVE	CR
Environmental Awareness (EA)	EA1	0.653	0.741	0.879
	EA2	0711		
	EA3	0.688		
Attitude towards Recycling (AR)	AR1	0.720	0.691	0.863
	AR2	0.609		
	AR3	0.589		
	AR4	0.675		
Social Pressure (SP)	SP1	0.832	0.687	0.932
	SP2	0.742		
	SP3	0.756		
Cost of Recycling (COR)	COR1	0.821	0.710	0.867
	COR2	0.723		
	COR3	0.801		
Laws and Regulations (LR)	LR1	0.652	0.697	0.709
	LR2	0.732		
	LR3	0.781		
Inconvenience of Recycling (ICR)	ICR1	0.835	0.731	0.795
	ICR2	0.657		
	ICR3	0.789		
	ICR4	0.715		
Past Experience (PE)	PE1	0.837	0.654	0.921
	PE2	0.784		
	PE3	0.897		
Behavioural Intention (BE)	BI1	0.891	0.697	0.798
	BI2	0.671		
	BI3	0.756		
	BI4	0.801		

Source: Calculated by authors based on the survey data

Both the square root of the AVE values and correlations among the constructs should be taken into account for the discriminant validity. The condition for the DV is the square root of the AVE should be higher than that of the correlation values among the constructs. The lowest value reported for the square root of the AVE is 0.808 which is related to past experience (PE). And since other square roots of AVEs are even greater than 0.808, it can be concluded that the DV is achieved.

The overall significance of the MM was checked using three indices of overall fitness: absolute, incremental, and parsimonious indices. Mainly, indices such as X^2, the Goodness of Fit Index (GFI), the Adjusted Goodness of Fit Index (AGFI), Root Mean Square Residual (RMR), Standardized Root Mean Square Residual (SRMR), and Root Mean Square Error of Approximation (RMSEA) were considered under absolute fit measures. As table 6 indicates, all of the indices under absolute fit measures meet the required criteria of each index and the MM therefore has a good fit under absolute fit measures. Incremental fit measures were tested with the Normed Fit Index (NFI), Tucker–Lewis Index (TLI), Comparative Fit Index (CFI), Incremental Fit Index (IFI), and Relative Fit Index (RFI). In line with the testing criteria the estimated index values are higher than the threshold of each index and therefore the MM fits well under incremental fit measures. Finally, Parsimony Goodness of Fit Index (PGNFI), Parsimonious Normed Fit Index (PNFI), Parsimonious Comparative Fit Index (PCFI), and The Ratio of _2 to the Degree of Freedom (CMIN/DF) were examined to check the goodness of fit under parsimonious fit measures. Similar to the previous two measures, the parsimonious fit measure is also achieved as the test criteria comply with the estimated test values.

Table 6: Goodness of test of the MM

Indices on Overall Fitness	Indicators	Criterion	Results	Decision
Absolute Fit Measures	x^2	P > 0.05	0.067	Fitted
	GFI	> 0.9	0.923	Fitted
	AGFI	> 0.9	0.945	Fitted
	RMR	< 0.08	0.043	Fitted
	SRMR	< 0.05	0.031	Fitted
	RMSEA	< 0.08	0.053	Fitted
Incremental Fit Measures	NFI	> 0.9	0.987	Fitted
	TLI	> 0.9	0.935	Fitted
	CFI	> 0.9	0.901	Fitted
	IFI	> 0.9	0.945	Fitted
	RFI	> 0.9	0.922	Fitted
Parsimonious Fit Measures	PGNFI	> 0.5	0.765	Fitted
	PNFI	> 0.5	0.787	Fitted
	PCFI	> 0.5	0.798	Fitted
	CMIN/DF	< 3	1.983	Fitted

Source: Calculated by authors based on the survey data

4.2.2. The structural model (SM)

The main objective of the SM is to estimate the statistical relationships highlighted in the conceptual framework. More specifically, the SM examines EA, AR, SP, CR, LR, ICR, and PE associated with Behavioural Intention (BE) along with their causal impacts. It is important to note that all these selected determinants have reported statistically significant relationships with behavioural intention to recycle e-waste. More importantly, laws and regulations related to EM have become the most influential factor of ER, reporting the coefficient value of 0.468 which is statistically significant at 1% level. The finding is in line with the previous studies by Wang *et al.* (2016) and Nduneseokwu *et al.* (2017). In fact, most of the laws and regulations for EM in Sri Lanka were imposed at the provincial council level and it is very important to legislate appropriate policies at the national level too. Apart from laws and regulations the estimated path coefficient for environmental awareness is 0.356 and also statistically significant at the 1% level. Environmental awareness is crucial in terms of ER as it essentially requires some knowledge related to negative impacts of e-waste and how to recycle e-waste. Hence when the environmental awareness increases, the behavioural intention to recycle e-waste increases and the finding is consistent with Read *et al.* (2017) and Gonul *et al.* (2016).

As the SM highlights, social pressure also positively affects behavioural intention to recycle e-waste. The estimated path coefficient of 0.308 is statistically significant at 1% and the same relationship between social pressure and behavioural intention to recycle e-waste has been discovered by Tonglet

et al. (2004) and Xu *et al.* (2017). Influences from friends and family members and media awareness campaigns also directly affect individuals' perception of ER. Similarly, attitudes to recycling also positively and significantly affect behavioural intentions to recycle e-waste. However, the path coefficient related to attitude to recycling is quite small compared to the other path coefficient discussed previously and therefore individuals' attitudes have only a marginal impact on behavioural intentions to recycle e-waste. In contrast, inconvenience and expenditure related to recycling is negatively related to behavioural intention to recycle e-waste. The estimated path coefficients are -0.287 and -0.178 and both path coefficients are statistically significant at 5%. The cost attached to recycling and difficulty of the process of ER apparently detract individuals from ER. Similar results have been observed by Wang *et al.* (2016) in China and highlighted that the cost of recycling decreases the probability of recycling e-waste.

This study considers past experience as a mediator and examines the impact of past experience on the behavioural intention to recycle e-waste through its impact on the inconvenience of recycling. As the SM indicates, the estimated path coefficient of past experience for inconveniences of recycling is -0.201 which is significant at 5%. Thus past experience of ER reduces the inconvenience of recycling and therefore past experience of ER indirectly increases the behavioural intention to recycle e-waste. Scholars such as Sidique *et al.* (2010) and Philippsen (2015) also stressed that past experience were positively linked with ER. However, Sidique *et al.* (2010) and Philippsen (2015) had discovered a direct association between prior experience and behavioural intention to recycle e-waste while this study emphasizes the indirect link between past experience and behavioural intention to recycle e-waste in Sri Lanka.

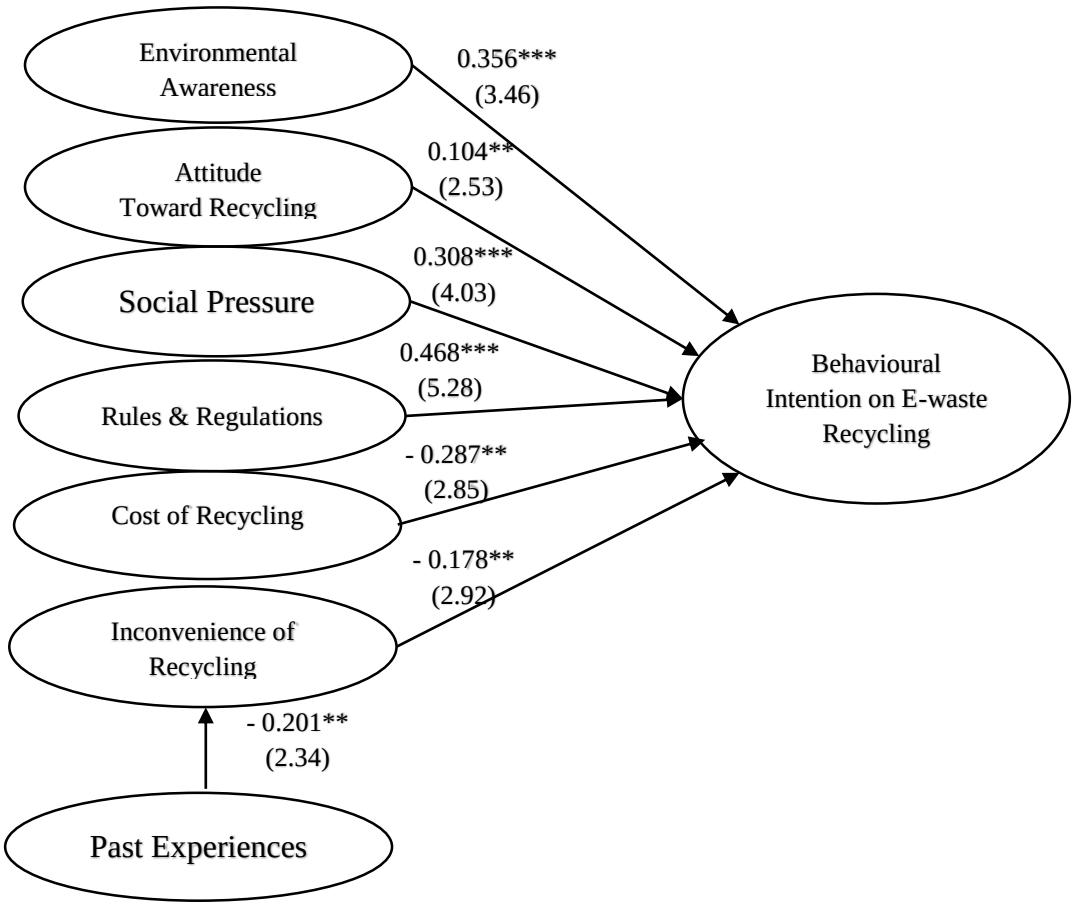

Figure 3: Estimated path coefficient of the SM

Source: Calculated by authors based on the survey data

4.2.3. Impact of demographic factors on behavioural intention on ER

Apart from the key factors highlighted in the SM, it is important to examine how demographic factors affect the behavioural intention on ER. The current study recognizes key demographic factors such as education, age, household size, gender and also income and examines their effects on the behavioural intention of ER. Since the respondents were from all three sectors such as urban, rural and estate, the path coefficients are estimated for each sector separately in order to recognize sector-wise most influential demographic factor on behavioural intention on ER. Table 7 indicates the results related to this analysis.

Table 7: Impact of demographic factors on behavioural intention of ER

Demographic Variables	Urban	Rural	Estate
Education	0.345***	0.231**	0.209**
	(3.454)	(2.152)	(2.321)
Age	0.108*	0.028*	0.321
	(1.821)	(1.753)	(1.002)
Household Size	0.274**	0.253*	0.005*
	(2.32)	(1.832)	(1.795)
Gender	0.342**	0.321**	0.275**
	(2.563)	(2.632)	(2.621)
Income	0.321*	0.365	0.421
	(1.923)	(1.231)	(1.031)

Source: Calculated by authors based on survey data

As table 7 indicates, demographic factors such as education, age, income, household size and gender significantly affect their behavioural intention on ER. More specifically, education which reported 0.345 path coefficient, statistically significant at 1% level has become the most influential demographic factor which affects behavioural intention on ER in urban sectors. Similarly, gender, household size is also important in the context of the urban sector. However, both income and age have shown only a weak relationship with behavioural intention on ER. In contrast, gender has become the most crucial explainer of behavioural intention on ER in both rural and estate sectors of Sri Lanka. Apart from that, household size and education which reported the path coefficients of 0.253 and 0.231 are the second and third important demographic factors respectively in the context of the rural sector of Sri Lanka. However, income hasn't reported any significant relationship with behaviour intention on ER in both rural and estate sectors. In the estate sector, in addition to gender, demographic factors such as education and household size are the only two factors which significantly affect the perception on ER. Therefore, it is observed that individuals' demographic factors also affect the behavioural intention of ER and also the impacts of demographic factors vary across the sectors. The findings related to the demographic factors and behavioural intention on ER are consistent with the studies such as Schultz *et al.* (1995), Gamba and Oskamp (1994), Domina and Koch (2002) and Johnson *et al.* (2004).

5. CONCLUSION AND RECOMMENDATIONS

This study examines the determinants of households' behavioural intentions to recycle e-waste in Sri Lanka. Data were collected from 230 households through an online survey conducted through the Qualtrics survey platform. The collected data were analysed with SEM which includes both the MM and SM. The MM confirms that the selected variables met all the requirements for CR, CV, and discriminant validity. The overall significance of the MM was examined under three indices of overall fitness: absolute, incremental, and parsimonious indices; and recognized that the MM is good enough to test the CR, CV, and discriminant validity.

The SM which was conducted to estimate the statistical relationship between the considered variables highlights that all the recognized determinants significantly affect households' behavioural intentions to recycle e-waste. Factors such as environmental awareness, attitude to recycling, social pressure, and rules and regulations positively affect the behavioural intentions to recycle e-waste while the inconvenience and cost of recycling affect them negatively in Sri Lanka. This study observes the moderating effect of past experience on ER on the behavioural intentions to recycle e-waste as well. The moderating effect stresses that past experience of ER reduces the inconvenience of recycling and therefore indirectly increases the behavioural intentions to recycle e-waste. This study highlights that demographic factors such as education, age, household size, gender, and income significantly affect the behavioural intentions to recycle e-waste and the impact of these demographic factors varies across the urban, rural, and estate sectors. The authors of the study strongly recommend to conduct proper environmental awareness campaigns which focus on e-waste management (EM) and recycling to lessen the hazardous impact of e-waste and motivate the public to recycle e-waste. Incorporation of such awareness campaigns into the school and university curricular may create crucial long-term impacts. Similarly, it is mandatory to legislate well-defined rules and regulation related to disposal of E-waste and also there should be a well-established monitoring system related to enact rules and regulations.

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