

Gheorghe, Iuliana Raluca; Purcarea, Victor Lorin; Gheorghe, Consuela Madalina

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Antecedents of Consumer Intentions towards E-waste Recycling. A Perspective on the Toy Industry from Romania

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ANTECEDENTS OF CONSUMER INTENTIONS TOWARDS E-WASTE RECYCLING. A PERSPECTIVE ON THE TOY INDUSTRY FROM ROMANIA

Iuliana Raluca Gheorghe^{1*}, Victor Lorin Purcărea²
and Consuela Mădălina Gheorghe³

^{1), 2), 3)} University of Medicine and Pharmacy "Carol Davila", Bucharest, Romania

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Abstract

Building a circular economy in Romania has raised several challenges, specifically referring to the management of electronic waste. Although Romania has made significant progress in the collection, recycling, and recovery of large waste, little attention has been paid to recycling small electronic waste, such as toys. The Romanian toy market is extremely attractive because there is no real competition and the barriers to entry on the market are almost nonexistent. This fact results in a powerful industry that would not be affected by any economic and health crisis, and that grows yearly, but produces significant e-waste. Thus, addressing the issue of e-waste management in the toy industry has positive implications for both Romania and the EU. This study expands the existing literature on circular economy by investigating consumers' intention to participate in e-waste recycling in the Romanian toy industry. The sample was made up of 291 mothers, with ages of more than 50 years (35,1%), university degrees (84%) and who usually do not recycle products (35,7%). Several antecedents have been identified that influence consumers' intention to recycle electrical toys and integrate them into an empirical model. Using structural equation modeling, the model was validated, and the findings revealed that the intention to recycle toys was influenced by the attitude towards e-waste electrical toys recycling, self-efficacy, and social norms, in contrast to the following variables that were not statistically significant in the context of the toy industry: awareness, social influence, and measures of the government and NGO. The results of this study provide important information for the implementation of the good practices of circular economy by educating the population and, at the same time, raising awareness through social marketing campaigns.

Keywords: Circular economy, waste management, toy industry, e-waste recycling, consumer decision making, structural equation modeling, social marketing.

JEL Classification: D12, D83, D91, I18, M31, Q53

* Corresponding author **Iuliana Raluca Gheorghe** – e-mail: raluca.gheorghe@umfcd.ro



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Introduction

The rise in technology and the technological need of consumers triggered, especially during the pandemic, an unprecedented demand for electrical and electronic consumption. This drastic change raised serious challenges among specialists in terms of the management of electronic waste, as one of the pressing problems of today's modern society (Forti et al., 2020).

The environmental and health impacts of electronic waste have been largely discussed in the scientific literature, pointing out the fact that more than 1000 different substances are included in the umbrella of electronic waste, such as, for example, cadmium and mercury, both toxic to humans and the environment (Blake, Farrelly and Hannon, 2019; Shevchenko, Laitala and Danko, 2019). The EU (European Union) developed an action plan with the purpose of "closing the loop" of the product lifecycles through sustainable production and consumption and efficient waste management by integrating all the stakeholders in a complex socio-economic system, which would transform into a circular economy (Islam et al., 2021). The implementation of the principles of circular economy is based on three pillars of sustainable development, namely, economic, social, and environmental aspects, materialized in eco-efficiency indicators, investments, employment, innovation, waste management, and material use (Momete, 2020).

Although developing an efficient circular economy would lead to increased investments, and productivity, and reduced waste or improved recycling and reused materials, some EU countries are not ready to transition from a linear economy to a circular economy, such as Romania (Albastroiu Nastase et al., 2022).

Building a circular economy in Romania has proved to be challenging because of the cultural and behavioral barriers encountered in both companies and consumers, being characterized as modest and rather frail (Vermeșan, Mangău and Tiuc, 2020). However, the trend for e-waste recycling is for growth, maintaining an average of more than 1% because it has been heavily invested in the infrastructure necessary for a circular economy (Dobre-Baron et al., 2022). In this regard, one of Romania's challenges is to minimize the loss of resources that could somehow reenter the economic cycle, focusing on the 4R of sustainable development: reduce, reuse, recycle, and recover (Kirchherr, Reike and Hekkert, 2017).

Consumers, government, policymakers, private investors, charities, product manufacturers, parts manufacturers, service providers, and other stakeholders concerned with the recycling and waste management are the main actors in a circular economy (Islam et al., 2021), but the starting point of the process is the consumer, who determines the destination of a used item. As such, from a circular economy perspective, a consumer can select one of the following paths: (1) maintenance / prolonged use (sharing or repair); (2) reuse and distribution; (3) remanufacture / refurbishment; and (4) recycling (Parajuly et al., 2019), thus understanding consumer behavior is paramount in order to improve the management of electronic waste (Saphores, Ogunseitani and Shapiro, 2012). Furthermore, a positive behavior of consumers with e-waste in Romania could not be assessed due to several factors, such as: insufficient collection points, poor awareness of individuals about e-waste management, and improper monitoring activities (Mihai, 2020).

While most of the scientific literature has focused on the adoption of circular economy principles in various fields, such as fashion, beauty, construction, or agriculture, little

attention has been given to the issues raised by the circular economy in the toy industry (Albastroiu Nastase et al., 2022).

The e-waste umbrella encompasses many types of e-waste products, such as, for instance, in the small equipment group (group 7) electrical and electronic toys are included (Islam and Huda, 2018). Generally, depending on the knowledge and awareness of consumers about the management of electronic waste from electrical toys, consumer behavior can be divided into the following areas of interest: consumption, storage, repair, and reuse, disposal, and recycling (Bovea et al., 2018).

Today, the rate of this type of electronic waste has grown proportionally with the short life span of toys, having an accelerated trend (Perez-Belis, Bovea and Gomez, 2013). At the European level, the average amount spent per child on toys is approximately 177 euros (Albastroiu Nastase et al., 2022), suggesting an increased number of plastic waste products, which do not benefit from coherent recycling guidelines, especially when the vast majority of toys have been produced as disposable and have not been manufactured as reusable items (Darby and Obara, 2005). Although in Romania, the recycling rates of electrical toys gradually increased (Lucache et al., 2017), according to an EU Commission report, the average weight in tones for the production of electrical toys with electronic waste in Romania during 2014-2020 was 1569, 143 (Eurostat, 2020). Furthermore, the Romanian toy sector is one of the areas where opportunities may come from the implementation of the principles of circular economy but have not been adequately addressed.

Although it is difficult to estimate the real intention of a population to participate in recycling activities and determine the suitable disposal of e-waste electrical toys, in Romania there is a need to change the mentality of producers and consumers (Dobre-Baron et al., 2022), even in the case of electrical toys, and to implement sustainable initiatives. These initiatives should be oriented toward the circularity of materials by making the main buyers of electrical toys, parents, more aware of the negative impact of e-waste electrical toys on the environment by providing information and raising awareness of these environmental issues. Therefore, it is important to investigate the recycling behavior of electronic waste by parents when it comes to electrical toys in the context of a circular economy. More precisely, the objective of this study is to assess the antecedents that can influence the intention of consumers to recycle electrical toys in electronic waste.

The remainder of the paper is structured as follows: section 1 contains a more in-depth literature review about circular economy, e-waste management, and the toy industry, which would help in elaborating the conceptual framework of the study regarding the e-waste recycling of toys. Section 2 provides a description of the methodology of the study, while section 3 focuses on the presentation of the results. Section 4 highlights the most important points of discussion and the limitations of the study and ends with the relevant conclusions of the study.

1. Review of the scientific literature on the management of toys on e-waste in Romania

The concept of a circular economy has gained a lot of attention in recent years due to issues such as waste and pollution, being identified as the only solution to a global crisis. The concept is described in the scientific literature as 'an economic system that targets zero waste and pollution throughout the life cycle of materials, from environmental extraction to

industrial transformation and to final consumers, applying to all involved ecosystems' (Nobre and Tavares, 2021). Despite its importance, the transition from a linear economy to a circular economy is a very complex process that involves changes made at the economic, environmental, and social levels, and according to the Index of National Circularity (INC), not all European countries, part of the EU, have been successful in implementing the principles of circular economy (Momete, 2020). Along with Bulgaria and Greece, Romania is one of the countries that registered challenges in implementing circular economy strategies because of the lack of human resources, expertise, and cultural and behavioral barriers of both consumers and companies (Strat, Teodor and Săseanu, 2018). Since 2007, Romania has made significant progress in achieving an efficient process of selective collection, recycling, recovery, and storage of large waste, but it must minimize the loss of resources, which could ensure the implementation of good practices of the circular economy (Albastroiu Nastase et al., 2022), as in the case of consumption of single bottled water (Gheorghe, Purcărea and Gheorghe, 2019). Therefore, the environmental and health impacts of e-waste and e-waste management have been the subject of an extensive body of literature (Islam et al., 2021), being concluded that not all EU countries efficiently dealt with e-waste management, and, in fact, Romania has serious issues regarding e-waste management of some categories (Păcesilă et al., 2016), since, for instance, little is known about the progress in recycling in the Romanian toy industry.

Toys are examples of items that have short life spans, approximately 2-3 years (Islam et al., 2021), and end up as waste when a child's interests change, on average, after 6 months (Albastroiu Nastase et al., 2022). This translates into an increase in the number of plastic toys that do not necessarily have a straightforward recycling direction. The preliminary assumptions of this stems from the disposal habits- toys being small-can be deposited in the normal household bins, along with other waste (Dimitrakakis et al., 2009), and from their manufactured complexity, mostly, being plastic. For instance, all toys are made out of plastic materials such as polyvinyl chloride-PVC, which is used for dolls and accessories of cuddly toys, polyoxymethylene-POM and nylon- PA for figures and transformable toys, polyethylene- PE used in early childhood games, telephones and musical and audio toys (Perez-Belis, Bovea and Gomez, 2013). An industry that uses heavily plastics and that usually sells plastic toys due to their relatively cheap prices and fast production in a multitude of colors will generate more than 1 million tons of waste by 2023 (Albastroiu Nastase et al., 2022). Therefore, an efficient e-waste recycling disassembly process is required based on the separation of a component or a group of pieces of a toy. The aim would be to determine the concentration contained in these plastic materials and what the implications would be in terms of costs and time to recover them. Furthermore, toys may also contain heavy metals, and disassembling them in small parts would enable the assessment of their potential recyclability and implicitly to properly identify the recovery strategies.

According to Albastroiu Nastase et al. (2022), the Romanian market for children's toys has not been affected by any economic or health care crisis and is growing yearly because there is no direct competition on the toy market and entry barriers have been significantly reduced. Although the toy retail market is undersized in Romania, with only three large retailers on the market, and 90% being imported, every holiday, whether Easter, Christmas, or International Children's Day, increases toys and games sales. Even the pandemic contributed to the increase in toys sales, when schools and kindergartens closed. Due to hygiene and ownership perceptions, parents' purchasing habits of toys made Romania an extremely attractive field for toys manufacturing companies. However, there is a company that offers services based on

sharing or renting toys, instead of buying repeatedly, called *Evertoys*. Basically, Evertoys promotes and implements locally the principles of circular economy, but to actually ascertain its real success still needs time, and parents need to be aware of the existence of such a company and the benefits it offers. Due to the infancy of such strategic action, consumer behavior remains critical to managing and reducing e-waste (Arain et al., 2020).

Consumers are one of the core elements of a e-waste solution, and key factors are the environmental awareness of consumers and their behavior with respect to the issue of e-waste issue (Islam et al., 2021). Generally, consumer behavior focusing on electronic waste can materialize in: (1) consumption; (2) storage; (3) repair and reuse; (4) disposal and (5) recycling (Bovea et al., 2018). As most toys are generally disposed of in the form of a donation, to other families or charities, little is known about the recycling behavior of consumers of these items. According to Perez-Belis et al. (2015), the vast majority of consumers donate used toys to families and charities, but also dispose of them in the domestic bins (67,1%), while 32,9% recycle them. As such, consumer disposal practices largely determine the final routes of e-waste, depending mostly on their choices and not on the latest technology (Chung, Lau and Zhang, 2011; Dindarian, Gibson and Quariguasi-Frota-Neto, 2012). Based on the ideas mentioned above, we may assume that toys, due to their small size, are stored (Dagiliūtė et al., 2019), before reaching a disposal phase. The easiest method of disposing of toys in Romania is to donate them to charity or local schools and kindergartens, where the reuse of items is often significantly higher (Gupta and Kumar, 2014). There is also the possibility of giving toys to family and friends (Tan et al., 2018), before considering throwing toys together with other waste items (Wieser and Tröger, 2018).

In practice, recycling behavior often overlaps with disposal behavior (Islam et al., 2021), and consumer awareness of available recycling methods has proven to have a direct relationship with the willingness to recycle electronic waste (Colesca, Ciocoiu and Popescu, 2014). Recycling behavior is strongly influenced by a sense of duty and is determined by self-efficacy rather than subjective norms and benefits (Kumar, 2017). In the same vein, Wang et al. (2018) mentioned that consumers' intentions to recycle are influenced by attitude, subjective norm, and environmental behavior.

Having in mind the recommendation of Borthakur and Govind (2019) that more local-specific studies should be given to more local-specific studies across product categories, and since the recycling behavior for small electronic and large electronics categories is entirely different, we believe it is appropriate to address this gap in the literature by investigating the recycling intentions of consumers in the toy industry. To our knowledge, there is a lack of scientific literature that would concentrate on assessing the antecedents of consumer e-waste recycling decisions in the electrical toy industry, with specific interest for Romania.

The proposed conceptual framework, which will be further presented, is based on an already existing model elaborated by Delcea et al. (2020), which, in its turn, was based on the Theory of Planned Behavior (Ajzen, 1991) and the concept of self-efficacy (Bandura, 1997), and consists of the following components: attitude, awareness, self-efficacy, social norms, social influence, government and NGO actions, and the intention of recycling e-waste, as illustrated in Figure no. 1.

We have selected this conceptual framework because Delcea et al. (2020) have already applied a research instrument in Romania and validated it accordingly, through structural equation modeling (SEM). Moreover, the conceptual framework proposed by Delcea et al. (2020)

includes the constructs of the Theory of Planned Behavior model, along with items which would measure the awareness manifested by the consumer, some intrinsic factors such as social and personal norms, as well as government and NGOs perception roles in determining the intention to recycle e-waste. Delcea et al. explained that lack of consumer knowledge about products and disposal sites plays an important role in consumer decisions and that consumer awareness has been shown to positively influence the intention of an individual to engage in an e-waste recycling behavior. Moreover, personal and social norms regarding the understanding of the consequences of an e-waste recycling behavior will have a positive impact on the attitude toward e-waste recycling and the intention of an e-waste recycling behavior of a consumer. Inclusion of government and non-governmental organizations' measures in the model is relevant because different organizations can play a key role in facilitating the awareness of the population about proper management of electronic waste. Self-efficacy was also included in the model because the belief in the own ability to change a behavior will have a positive outcome and will become important, especially in environmental behavior (Lee, Haley and Yang, 2017). Furthermore, Delcea et al. (2020) also considered collecting the following demographic information: gender, age, educational level, residential area, marital status, occupation, family size, and income (per month).

Consequently, according to Delcea et al.'s explanations (2020), the following hypotheses have been elaborated:

H1: *The attitude of a consumer regarding recycling electrical toys from electronic waste is positively related to his intention to recycle electrical toys.*

H2: *A consumer's awareness about recycling e-waste electrical toys is positively related to his intention to recycle electrical toys.*

H3: *The self-efficacy of a consumer related to recycling electronic waste toys is positively related to his intention to recycle electronic toys.*

H4: *Social norms have a positive impact on the intention of a consumer to recycle electrical toys.*

H5: *Social influence positively impacts the intention of a consumer to recycle electrical toys.*

H6: *The actions of government and NGO contribute positively to the intention of a consumer to recycle electrical toys.*

2. Research Methodology

2.1. Participants

A sample of 300 women was built following the non-probabilistic guidelines of a convenience sampling method. This sampling method was selected because it is easy to access and affordable, with subjects readily available and specific for quantitative studies (Etikan, 2015). As the researcher decides the subjective methods which are going to be used for the sample, the inclusion criteria were the following: participants should be mothers of at least one child, with an age over 18 years, and to have given their consent to participate in the study. Of the 300 women, 298 agreed to participate. However, we validated 291 questionnaires due to a less than 30% percentage of filling in the forms.

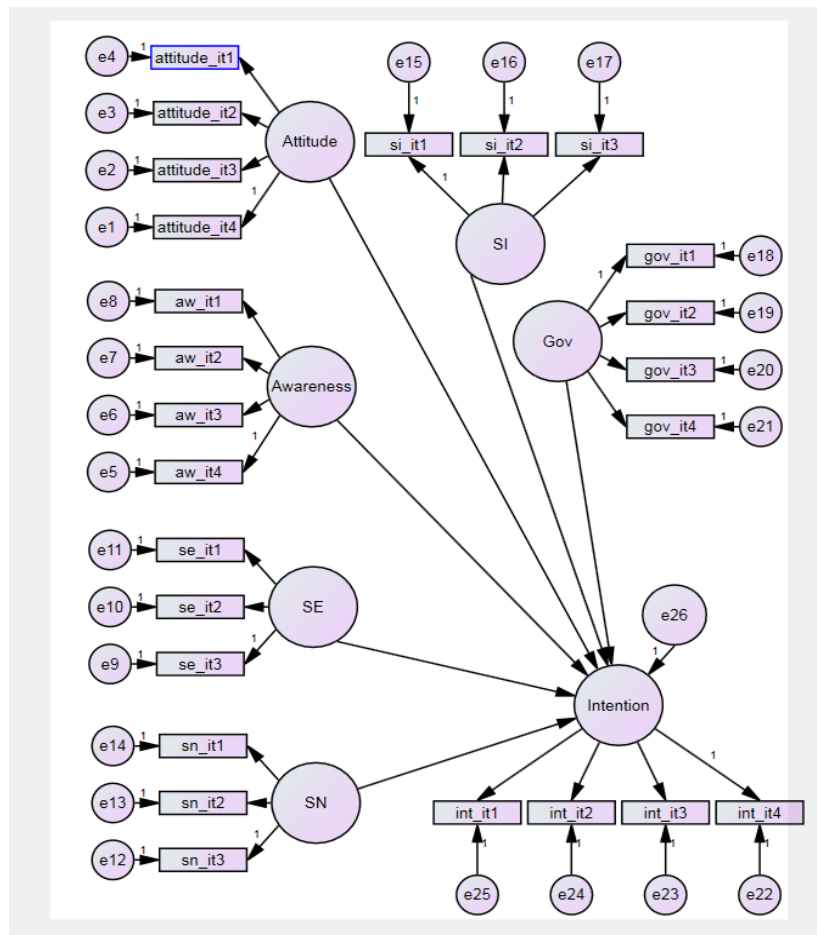


Figure no. 1. Conceptual framework of the research model

2.2. Procedure

During one month (July-August 2022), the researchers approached mothers at the playgrounds in the parks from Bucharest, Romania. We have selected a face-to-face data collection method because we strongly believed that the subject of recycling electrical toys needed more explanations, that is, what is classified as an electrical toy, and why recycling electrical toys is important. We used this opportunity to also present the purpose of the research, mentioning the confidentiality and anonymity aspects of participating. After completing a written consent, envelopes with the questionnaires were provided to all participants to return their responses. No incentives were given for participation.

2.3. The measurement instrument

Data were collected using a questionnaire consisting of two sections: the first section encompassed sociodemographic items, while the second section referred to items similar to

Delcea et al. instrument (2020), but some items were easily changed to emphasize electrical toys and not random electronic waste products. The constructs that were modified, related to social norms, social influence, government and NGO measures, as well as the intention to recycle electrical toys. All the statements included in Section 2 of the questionnaire have been evaluated using a 5-point Likert scale, ranging from 1-strongly disagree to 5-strongly agree.

2.4. Design and analysis

Sociodemographic data was collected and processed with the help of IBM SPSS version 20. For qualitative data, we used frequencies and percentages.

The data collected through the questionnaire was processed and analyzed using IBM Amos version 20, but the model and the hypotheses were tested with SEM. The feasibility and validity of the model were assessed through confirmatory factor analysis, namely, each item should load on the designated latent variable and it should exceed the threshold of 0.5, and by the construct reliability (CR) and the average variance extracted (AVE) (Harrington, 2009). In order to have good feasibility, the CR values should be greater than 0.7, and, in relation to the AVE threshold, this should be above 0.5, in order to have good convergent validity (Byrne, 2016).

For a more in-depth analysis, it is recommended to check the fit indexes of the model. Most fit indexes should have values greater than 0.9, for example, the comparative fit index (CFI), the normed fit index (NFI), the incremental fit index (IFI), and the Tucker-Lewis index (TLI) (Byrne, 2016). The imposed threshold value of the root mean square error of approximation (RMSEA) should be below 0.06, which means a good model fit (Hu and Bentler, 1999).

The hypotheses of the model are supported if the statistically significant threshold is below 0.05.

3. Findings

3.1. The sociodemographic profile of the participants

The vast majority of participants had more than 50 years, university studies, from urban areas, divorced, with 2-3 children, and who do not usually engage in recycling activities of any kind, as depicted in Table no. 1.

Table no. 1. The demographic profile of the respondents

Variable	Frequency	Percentage (%)
<i>Age</i>		
18-30 years	98	33.7
31-50 years	91	31.3
> 50 years	102	35.1
<i>Education level</i>		
Primary school	65	22.3
Secondary school	67	23.0
University studies	84	28.9
Post-university studies	75	25.8
<i>Residential area</i>		
Urban	156	53.6
Rural	135	46.4

Variable	Frequency	Percentage (%)
<i>Marital status</i>		
Single	92	31.6
Married	98	33.7
Divorced	101	34.7
<i>Occupation</i>		
Services	71	24.4
Production	80	27.5
Freelancer	61	21.0
Other	79	27.1
<i>Family size</i>		
1-3 persons	113	38.8
4-6 persons	94	32.3
> 7 persons	84	28.9
<i>Number of children</i>		
1 child	74	25.4
2-3 children	83	28.5
4-5 children	64	22.0
> 5 children	70	24.1
<i>Household income</i>		
< 500 euros	72	24.7
500-1000 euros	66	22.7
1001-1500 euros	69	23.7
>1500 euros	84	29.9
<i>Do you usually recycle?</i>		
Yes	95	32.6
No	104	35.7
Do not know	92	31.6
<i>Do you usually recycle e-waste?</i>		
Yes	93	32.0
No	91	31.3
Do not know	107	36.8

3.2. The Measurement Model

The results of the confirmatory factor analysis (CFA) revealed that all elements were loaded correctly on their designated latent variables, and their values were more than 0.5, while the CR values of all constructs were greater than 0.7, suggesting good feasibility, and, in addition, the AVE values of all constructs were greater than 0.5, showing that the model has good convergent validity. Based on the research literature, we may conclude that the feasibility and convergent validity criteria have been satisfied (Table no. 2).

Table no. 2. CFA, CR and AVE outcomes

Items	AT	AW	SE	SN	SI	GOV	INT
AT_it1	0.71						
AT_it2	0.71						
AT_it3	0.71						
AT_it4	0.74						
AW_it1		0.83					
AW_it2		0.76					
AW_it3		0.81					

AW_it4		0.75					
SE_it1			0.75				
SE_it2			0.71				
SE_it3			0.71				
SN_it1				0.80			
SN_it2				0.85			
SN_it3				0.84			
SI_it1					0.79		
SI_it2					0.79		
SI_it3					0.83		
GOV_it1						0.79	
GOV_it2						0.78	
GOV_it3						0.85	
GOV_it4						0.77	
INT_it1							0.78
INT_it2							0.78
INT_it3							0.77
INT_it4							0.70
CR	0.81	0.87	0.77	0.87	0.85	0.87	0.84
AVE	0.51	0.62	0.52	0.69	0.65	0.63	0.58

Note: AT- attitude, AW- awareness, SE-self-efficacy, SN- social norms, SI- social influence, GOV- government and NGO measures, INT- intention to recycle toys, CR- construct reliability, AVE- average variance extracted.

The goodness-of-fit indexes are illustrated in Table no. 3. It was revealed that they had satisfactory values, suggesting that all the conditions to achieve a robust measurement model were satisfied.

Table no. 3. The fit indexes of the measurement model

Index	Value	Recommended value	Status
CFI	0.98	0.90-0.95	Adequate
NFI	0.91		Adequate
RFI	0.90		Adequate
IFI	0.98		Adequate
TLI	0.98		Adequate
RMSEA	0.02	< 0.06	Adequate

Note: CFI-Comparative fit index, NFI-Normed fit index, RFI-Relative fit index, IFI-Incremental fit index, TLI-Tucker-Lewis index, RMSEA-Root mean square error of approximation

3.3. The structural model

The structural model analysis consisted of testing the significance of the estimated path coefficients at a p-value less than 0.05. From table no. 4, it can be observed that only three hypotheses were supported, but at different levels of statistical significance. The results showed that the factors which influence the intention to recycle electrical toys are the attitude towards recycling electrical toys from electronic waste, self-efficacy, and social norms. From the values of the structural path coefficients, it can be concluded that the most powerful factor is the self-efficacy of a consumer with respect to the recycling of electrical toys e-waste, followed by the attitude towards the recycling of electrical toys e-waste, and social norms regarding the recycling of electrical toys.

Table no. 4. The hypotheses results

Hypotheses	Relationship	Value of path coefficients	Decision
H1	Attitude-> Intention	0.377**	Supported
H2	Awareness-> Intention	-0.062^	Not supported
H3	Self-efficacy-> Intention	0.442**	Supported
H4	Social norms-> Intention	0.082*	Supported
H5	Social influence-> Intention	0.028^	Not supported
H6	Government and NGOs measure-> Intention	0.008^	Not supported

Note: **p<0.001; *p<0.05; ^p>0.05 (not statistically significant)

4. Discussion

Given the limited research in the field of toys recycling in Romania and the intentions of consumers to recycle toys, the purpose of the study was to identify the antecedents that can impact the intentions of consumers to recycle electrical toys. Taking into account the findings, it was observed that the antecedents with significant influence on the intention to recycle electronic waste from electrical toys were the attitude of consumers, followed by self-efficacy and social norms. These findings are in line with other studies in the field. For instance, attitude generally has a positive influence on consumer recycling behavior, and now we have the proof that it also applies in the toy industry (Nduneseokwu, Qu and Appolloni, 2017; Delcea et al., 2020). Moreover, social norms usually play a very important role in other contexts, but in our case study, they proved to be a weak predictor for the intention of recycling electrical toys.

Similarly to attitude, self-efficacy was expected to have a direct and positive influence on consumer recycling behavior, highlighting that the outcome is in line with previous findings from the research literature (Sujata et al., 2019; Delcea et al., 2020). According to Bandura (1986), self-efficacy expectations are either learned or changes via four main sources of information: self-experience, verbal persuasion, emotional arousal, and vicarious experience. If people have poor prior experience with recycling behavior, the perceived self-efficacy can be changed by relevant educational actions such as advertising (Yoon, Haley and Yang, 2017).

Awareness about the recycling of toys did not have any influence on the intention of recycling them. This finding was somewhat unexpected because Romania has had many campaigns that informed the population about several methods of e-waste recycling and, at the same time, educated people to sort waste and properly dispose of it. Unfortunately, when it comes to the toy industry, people do not consider e-waste dangerous and toxic (Pandebsie et al., 2019), and we believe that the main obstacles are the low levels of awareness that result in inadequate recycling abilities in a population (Liu et al., 2019). We assume that despite the presence of some level of knowledge related to electronic waste among consumers, sometimes awareness of the existence of any electronic waste recovery programs, such as *Evertoys*, is limited (Gu et al., 2017), and the two critical factors that could inhibit participation in a recycling program are the lack of information and the flawed communication strategies of the government and NGOs (Milovantseva, 2016; Martinho, Magalhães and Pires, 2017). Consumer awareness of e-waste should be raised with the help of customized education campaigns, with a specific focus on content development that would form an attitude. Therefore, the underlying assumption of e-waste information campaigns is that people behave in a certain way because they lack information or knowledge (Kataria and Larsen, 2009). Viscusi (1992) stated that information delivered in such campaigns need to

fill the information gaps or misconceptions of consumers in order to form the desired attitudes. As such, policy formulation should focus more on consumers' attitudes toward e-waste and not necessarily on awareness or education.

Social marketing principles can affect the recycling behavior of a person by changing their perceptions and norm requirements (Bruvoll and Nyborg, 2004). Consequently, social marketing transformed into a widely used policy in the case of recycling (Berglund, 2006), so we strongly believe that the effects of this kind of campaigns should be investigated in the toy industry and toy e-waste recycling.

A social marketing campaign about e-waste recycling of electrical toys should inform consumers why it is essential to ensure proper recycling and should also focus on awareness raised among higher income households, married residents, and pro-environmental behavior should be promoted from a very young age, which would transform in recycling habits.

Conclusions

This research contributes significantly to the existing literature on the management of electronic waste in several ways. Although there is a huge body of literature that focuses on e-waste management, case studies on e-waste management in the toys industry are scarce. Furthermore, this research underscores the most important antecedents that can influence the intention of consumers to recycle electrical toys and not dispose of them by giving them to charities. The findings of this research are useful for government and non-governmental organizations in elaborating their campaigns on e-waste recycling and triggering the expected attitude in the targeted population. Our findings also proved that in the toy industry, providing only information is not enough to raise awareness about the need for e-waste recycling in the toy industry, but rather to educate, otherwise increasing consumerism in the toy industry, lack of awareness, interest, and concern about environmental issues, and low prices in toys may result in an unsustainable market, leading to a larger electrical industry of e-waste.

When interpreting the results of this research, attention must be paid to the following limitations: the sample size is relatively small, but in line with the methodology, and was made up of women. Future research should include a larger sample that would also include men, and not only parents but also grandparents. To improve the understanding of which antecedents contribute to the explanation of the recycling intention of electrical toys, several factors should also be included, such as guilt or shame. Moreover, it would be helpful to conduct further research to investigate the e-waste category of toys depending on groups of toys, such as, for instance, cuddly toys, toys that transform, and dolls. Knowing the factors that impact the intentions of consumers regarding electronic waste recycling in the electrical toys industry would ensure an easier transition to a circular economy in Romania because all stakeholders will contribute to the education of consumers, by implementing efficient awareness campaigns.

References

- Ajzen, I., 1991. The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, [online] 50(2), pp.179-211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T).

- Albastroiu Nastase, I., Negrutiu, C., Felea, M., Acatrinei, C., Cepoi, A. and Istrate, A., 2022. Toward a circular economy in the toy industry: the business model of a Romanian company. *Sustainability*, [online] 14(1), p.22. <https://doi.org/10.3390/su14010022>.
- Arain, A.L., Pummill, R., Adu-Brimpong, J., Becker, S., Green, M., Ilardi, M., Van Dam, E. and Neitzel, R.L., 2020. Analysis of e-waste recycling behavior based on survey at a Midwestern US University. *Waste Management*, [online] 105, pp.119-127. <https://doi.org/10.1016/j.wasman.2020.02.002>.
- Bandura, A., 1986. *Social foundations of thought and action: a social cognitive theory*. Prentice-Hall series in social learning theory. Englewood Cliffs, N.J: Prentice-Hall.
- Bandura, A., 1997. *Self-efficacy: the exercise of control*. New York: W.H. Freeman.
- Berglund, C., 2006. The assessment of households' recycling costs: The role of personal motives. *Ecological Economics*, [online] 56(4), pp.560-569. <https://doi.org/10.1016/j.ecolecon.2005.03.005>.
- Blake, V., Farrelly, T. and Hannon, J., 2019. Is Voluntary Product Stewardship for E-Waste Working in New Zealand? A Whangarei Case Study. *Sustainability*, [online] 11(11), p.3063. <https://doi.org/10.3390/su11113063>.
- Borthakur, A. and Govind, M., 2018. Public understandings of E-waste and its disposal in urban India: From a review towards a conceptual framework. *Journal of Cleaner Production*, [online] 172, pp.1053-1066. <https://doi.org/10.1016/j.jclepro.2017.10.218>.
- Bovea, M., Ibáñez-Forés, V., Pérez-Belis, V., Juan, P., Braulio-Gonzalo, M. and Díaz-Ávalos, C., 2018. Incorporation of Circular Aspects into Product Design and Labelling: Consumer Preferences. *Sustainability*, [online] 10(7), p.2311. <https://doi.org/10.3390/su10072311>.
- Bruvoll, A. and Nyborg, K., 2004. The Cold Shiver of Not Giving Enough: On the Social Cost of Recycling Campaigns. *Land Economics*, [online] 80(4), p.539. <https://doi.org/10.2307/3655809>.
- Byrne, B.M., 2016. *Structural equation modeling with Amos: basic concepts, applications, and programming*. Third edition ed. Multivariate applications series. New York: Routledge, Taylor & Francis Group.
- Chung, S., Lau, K. and Zhang, C., 2011. Generation of and control measures for, e-waste in Hong Kong. *Waste Management*, [online] 31(3), pp.544-554. <https://doi.org/10.1016/j.wasman.2010.10.003>.
- Colesca, S.E., Ciocoiu, C.N. and Popescu, M.L., 2014. Determinants of WEEE Recycling Behaviour in Romania: A fuzzy Approach. *International Journal of Environmental Research*, [online] 8(2). <https://doi.org/10.22059/ijer.2014.726>.
- Dagiliūtė, R., Zabulionis, D., Sujetovienė, G. and Žaltauskaitė, J., 2019. Waste of electrical and electronic equipment: Trends and awareness among youths in Lithuania. *Waste Management & Research*, [online] 37(1), pp.95-101. <https://doi.org/10.1177/0734242X18806999>.
- Darby, L. and Obara, L., 2005. Household recycling behaviour and attitudes towards the disposal of small electrical and electronic equipment. *Resources, Conservation and Recycling*, [online] 44(1), pp.17-35. <https://doi.org/10.1016/j.resconrec.2004.09.002>.

- Delcea, C., Crăciun, L., Ioanăș, C., Ferruzzi, G. and Cotfas, L.-A., 2020. Determinants of Individuals' E-Waste Recycling Decision: A Case Study from Romania. *Sustainability*, [online] 12(7), p.2753. <https://doi.org/10.3390/su12072753>.
- Dimitrakakis, E., Janz, A., Bilitewski, B. and Gidarakos, E., 2009. Determination of heavy metals and halogens in plastics from electric and electronic waste. *Waste Management*, [online] 29(10), pp.2700-2706. <https://doi.org/10.1016/j.wasman.2009.05.020>.
- Dindarian, A., Gibson, A.A.P. and Quariguasi-Frota-Neto, J., 2012. Electronic product returns and potential reuse opportunities: a microwave case study in the United Kingdom. *Journal of Cleaner Production*, [online] 32, pp.22-31. <https://doi.org/10.1016/j.jclepro.2012.03.015>.
- Dobre-Baron, O., Nițescu, A., Niță, D. and Mitran, C., 2022. Romania's Perspectives on the Transition to the Circular Economy in an EU Context. *Sustainability*, [online] 14(9), p.5324. <https://doi.org/10.3390/su14095324>.
- Etikan, I., 2016. Comparison of Convenience Sampling and Purposive Sampling. *American Journal of Theoretical and Applied Statistics*, [online] 5(1), p.1. <https://doi.org/10.11648/j.ajtas.20160501.11>.
- Eurostat, 2020. *Waste statistics electrical and electronic equipment. European Commission Report, 2020*, [online] Available at: <https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Waste_statistics__electrical_and_electronic_equipment#Electrical_and_electronic_equipment_.28EEE.29_put_on_the_market_and_WEEE_collected_by_country> [Accessed 09 December 2022].
- Evertoys, 2022. Evertoys. [online] Available at: <<https://ever.toys>> [Accessed 09 December 2022].
- Forti, V., Balde, C.P., Kuehr, R. and Bel, G., 2020. *The global E-waste Monitor 2020: Quantities, Flows and the circular economy potential*. [pdf] Available at: <https://www.itu.int/en/ITUDE/Environment/Document/Toolbox/GEM_2020_def.pdf> [Accessed 09 December 2022].
- Gheorghe, I.R., Purcărea, V.L. and Gheorghe, C.M., 2019. Pro-Environmental Behavior and Bioeconomy: Reflections on Single-Bottled Water Consumption. *Amfiteatru Economic*, 21(50), pp.105-120. doi: 10.24818/EA/2019/50/105.
- Gu, F., Guo, J., Yao, X., Summers, P.A., Widijatmoko, S.D. and Hall, P., 2017. An investigation of the current status of recycling spent lithium-ion batteries from consumer electronics in China. *Journal of Cleaner Production*, [online] 161, pp.765-780. <https://doi.org/10.1016/j.jclepro.2017.05.181>.
- Gupta, V. and Kumar, A., 2014. E-waste status and management in India. *Journal of Information Engineering and Applications*, 4(9), pp.41-48.
- Harrington, D., 2009. *Confirmatory factor analysis. Pocket guides to social work research methods*. Oxford; New York: Oxford University Press.
- Hu, L. and Bentler, P.M., 1999. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, [online] 6(1), pp.1-55. <https://doi.org/10.1080/10705519909540118>.
- Islam, M.T. and Huda, N., 2018. Reverse logistics and closed-loop supply chain of Waste Electrical and Electronic Equipment (WEEE)/E-waste: A comprehensive literature review.

- Resources, Conservation and Recycling*, [online] 137, pp.48-75. <https://doi.org/10.1016/j.resconrec.2018.05.026>.
- Islam, M.T., Huda, N., Baumber, A., Shumon, R., Zaman, A., Ali, F., Hossain, R. and Sahajwalla, V., 2021. A global review of consumer behavior towards e-waste and implications for the circular economy. *Journal of Cleaner Production*, [online] 316, no.128297. <https://doi.org/10.1016/j.jclepro.2021.128297>.
- Kataria, M. and Larsén, K., 2009. Effects of social marketing on battery collection. *Resources, Conservation and Recycling*, [online] 53(8), pp.429-433. <https://doi.org/10.1016/j.resconrec.2009.03.003>.
- Kirchherr, J., Reike, D. and Hekkert, M., 2017. Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling*, [online] 127, pp.221-232. <https://doi.org/10.1016/j.resconrec.2017.09.005>.
- Kumar, A., 2017. Extended TPB model to understand consumer “selling” behaviour: Implications for reverse supply chain design of mobile phones. *Asia Pacific Journal of Marketing and Logistics*, [online] 29(4), pp.721-742. <https://doi.org/10.1108/APJML-09-2016-0159>.
- Lee, Y.-J., Haley, E. and Yang, K., 2019. The Role of Organizational Perception, Perceived Consumer Effectiveness and Self-efficacy in Recycling Advocacy Advertising Effectiveness. *Environmental Communication*, [online] 13(2), pp.239-254. <https://doi.org/10.1080/17524032.2017.1308407>.
- Liu, J., Bai, H., Zhang, Q., Jing, Q. and Xu, H., 2019. Why are obsolete mobile phones difficult to recycle in China? *Resources, Conservation and Recycling*, [online] 141, pp.200-210. <https://doi.org/10.1016/j.resconrec.2018.10.030>.
- Lucache, G., Turcanu, A., Lucache, D. and Nuca, I., 2017. Comparative study of the level of awareness of e-waste management in Romania and Republic of Moldova. In: *2017 International Conference on Electromechanical and Power Systems (SIELMEN)*. [online] Iasi: IEEE. pp.431-436. <https://doi.org/10.1109/SIELMEN.2017.8123363>.
- Martinho, G., Magalhães, D. and Pires, A., 2017. Consumer behavior with respect to the consumption and recycling of smartphones and tablets: An exploratory study in Portugal. *Journal of Cleaner Production*, [online] 156, pp.147-158. <https://doi.org/10.1016/j.jclepro.2017.04.039>.
- Mihai, F.-C., 2020. Electronic waste management in Romania: pathways for sustainable practices. In: *Handbook of Electronic Waste Management*. [online] Elsevier. pp.533-551. <https://doi.org/10.1016/B978-0-12-817030-4.00024-3>.
- Milovantseva, N., 2016. Are American households willing to pay a premium for greening consumption of Information and Communication Technologies? *Journal of Cleaner Production*, [online] 127, pp.282-288. <https://doi.org/10.1016/j.jclepro.2016.04.001>.
- Momete, D.C., 2020. A unified framework for assessing the readiness of European Union economies to migrate to a circular modelling. *Science of The Total Environment*, [online] 718, no.137375. <https://doi.org/10.1016/j.scitotenv.2020.137375>.
- Nduneseokwu, C., Qu, Y. and Appolloni, A., 2017. Factors Influencing Consumers’ Intentions to Participate in a Formal E-Waste Collection System: A Case Study of Onitsha, Nigeria. *Sustainability*, [online] 9(6), p.881. <https://doi.org/10.3390/su9060881>.

- Nobre, G.C. and Tavares, E., 2021. The quest for a circular economy final definition: A scientific perspective. *Journal of Cleaner Production*, [online] 314, no.127973. <https://doi.org/10.1016/j.jclepro.2021.127973>.
- Pandebesie, E.S., Indrihastuti, I., Wilujeng, S.A. and Warmadewanthi, I., 2019. Factors influencing community participation in the management of household electronic waste in West Surabaya, Indonesia. *Environmental Science and Pollution Research*, [online] 26(27), pp.27930-27939. <https://doi.org/10.1007/s11356-019-05812-9>.
- Parajuly, K., Kuehr, R., Awasthi, A.K., Fitzpatrick, C., Lepawsky, J.E.S., Widmer, R. and Zeng, X., 2019. *Future e-waste scenarios*. [online] Available at: <<https://wedocs.unep.org/bitstream/handle/20.500.11822/30809/FutEWSc.pdf?sequence=1&isAllowed=y>> [Accessed 2 December 2022].
- Păcesilă, M., Ciocoiu, C., Colesca, S.E. and Burcea, S., 2016. Current trends in WEEE Management in Romania. *Theoretical and Empirical Researches in Urban Management*, 11(4), pp.46-60.
- Pérez-Belis, V., Bovea, M.D. and Gómez, A., 2013. Waste electric and electronic toys: Management practices and characterisation. *Resources, Conservation and Recycling*, [online] 77, pp.1-12. <https://doi.org/10.1016/j.resconrec.2013.05.002>.
- Saphores, J.-D.M., Ogunseitan, O.A. and Shapiro, A.A., 2012. Willingness to engage in a pro-environmental behavior: An analysis of e-waste recycling based on a national survey of U.S. households. *Resources, Conservation and Recycling*, [online] 60, pp.49-63. <https://doi.org/10.1016/j.resconrec.2011.12.003>.
- Shevchenko, T., Laitala, K. and Danko, Y., 2019. Understanding Consumer E-Waste Recycling Behavior: Introducing a New Economic Incentive to Increase the Collection Rates. *Sustainability*, [online] 11(9), p.2656. <https://doi.org/10.3390/su11092656>.
- Strat, V.A., Teodor, C. and Săseanu, A.S., 2018. The characterization of the Romanian circular economy's potential, at country level. *Amfiteatru Economic*, 20(48), pp.278-293.
- Sujata, M., Khor, K.-S., Ramayah, T. and Teoh, A.P., 2019. The role of social media on recycling behaviour. *Sustainable Production and Consumption*, [online] 20, pp.365-374. <https://doi.org/10.1016/j.spc.2019.08.005>.
- Tan, Q., Duan, H., Liu, L., Yang, J. and Li, J., 2018. Rethinking residential consumers' behavior in discarding obsolete mobile phones in China. *Journal of Cleaner Production*, [online] 195, pp.1228-1236. <https://doi.org/10.1016/j.jclepro.2018.05.244>.
- Vermeșan, H., Mangău, A. and Tiuc, A.-E., 2020. Perspectives of Circular Economy in Romanian Space. *Sustainability*, [online] 12(17), p.6819. <https://doi.org/10.3390/su12176819>.
- Viscusi, W.K., 1992. *Smoking: making the risky decision*. New York: Oxford University Press.
- Wang, Z., Guo, D., Wang, X., Zhang, B. and Wang, B., 2018. How does information publicity influence residents' behaviour intentions around e-waste recycling? *Resources, Conservation and Recycling*, [online] 133, pp.1-9. <https://doi.org/10.1016/j.resconrec.2018.01.014>.
- Wieser, H. and Tröger, N., 2018. Exploring the inner loops of the circular economy: Replacement, repair, and reuse of mobile phones in Austria. *Journal of Cleaner Production*, [online] 172, pp.3042-3055. <https://doi.org/10.1016/j.jclepro.2017.11.106>.

Annex: The items of the questionnaire

Attitude

1. Recycling electronic toys is part of a responsible citizen's life with respect to environmental protection.
2. I believe that my recycling behaviour of electronic toys contributes significantly to the protection of the environment.
3. Electronic toys recycling behavior is necessary given the current development conditions.
4. I feel good when I recycle electronic toys.

Awareness

1. I am aware of the benefits recycling electronic toys has.
2. I know that electronic toys may contain potentially toxic substances to the environment.
3. I know that electronic toys can cause pollution of the environment.
4. I know that the way we manage the recycling of electronic toys can harm human health.

Self-efficacy

1. I know which are the electronic toys that should be recycled in a suitable recycling process.
2. I know where to take my electronic toys for recycling.
3. I find it easy to participate in recycling activities of electronic toys.

Social norms

1. My family expects me to participate in electronic toys recycling behavior.
2. My friends expect me to participate in recycling of electronic toys.
3. Other people with whom I am in contact expect me to engage in electronic toys recycling behavior.

Social influence/

1. Family/ friends/ people around me recommend that I participate in electronic toys recycling activities.
2. Family/ friends/ people around me would appreciate my participation in the electronic toys recycling activities.
3. The opinions of my family/ friends/ people regarding the electronic toys recycling activities matter to me.

Government and NGOs' actions

1. The actions taken by the government and/or NGOs to encourage the collection of electronic toys make me happy.
2. The methods offered by the government ease the electronic toys recycling process.
3. NGOs are one of the main actors that promote the electronic toys recycling process.
4. A program initiated by the local authorities to collect and recycle electronic toys from people's homes would be useful.

e-waste recycling intention

1. Although it will not necessarily be too easy, I plan on recycling more electronic toys.
2. I plan to participate in the electronic toys recycling activities advocated on social media.
3. intend to put more effort into everything related to recycling the electronic toys.
4. In the future, I intend to buy electronic toys that can be easily recycled.