

THE NEW FRONTIERS OF E-LEARNING: SHAPING THE FUTURE OF EDUCATION

VOLUME 10, 2025

e-ISBN : 978-629-98755-7-4



**SIG CS@e-Learning
Unit Penerbitan**

**Jabatan Sains Komputer & Matematik
Universiti Teknologi MARA Cawangan Pulau Pinang**

SOCIAL AND BEHAVIORAL FACTORS INFLUENCING E-WASTE RECYCLING PRACTICES IN MALAYSIA

*Mawardi Omar¹, Norshuhada Samsudin², Fuziatul Norsyihah Ahmad Shukri³ and Sharifah Sarimah Syed Abdullah⁴

*mawardio@uitm.edu.my¹, norsh111@uitm.edu.my², fuziatul@uitm.edu.my³,
sh.sarimah@uitm.edu.my⁴

^{1,2,3,4}Jabatan Sains Komputer & Matematik (JSKM),
Universiti Teknologi MARA Cawangan Pulau Pinang, Malaysia

**Corresponding author*

ABSTRACT

Electronic waste (e-waste) is a rapidly growing environmental challenge in Malaysia, driven by digitalization, rising incomes, and shorter product lifecycles. Despite established recycling infrastructure, formal collection rates remain low. This conceptual paper explores the social and behavioral factors influencing e-waste recycling participation, drawing on existing literature. Social determinants include cultural norms, peer influence, community engagement, public education, and socioeconomic status, which shape collective attitudes toward recycling. Behavioral factors, such as individual attitudes, habits, perceived convenience, trust in recycling systems, awareness, and economic incentives, directly affect participation rates. These influences operate interactively, highlighting the need for integrated strategies that combine accessible infrastructure, targeted education, incentive schemes, and community norm-building. The paper proposes a conceptual model to guide future research and policymaking, with the aim of bridging the gap between policy targets and actual recycling behavior, contributing to Malaysia's transition toward sustainable e-waste management.

Keywords: *e-waste recycling, Malaysia, social behavior, sustainability, waste management*

Introduction

Electronic waste (e-waste) refers to all items of electrical and electronic equipment (EEE) and their components discarded without the intent of reuse (ITU, 2024). Globally, e-waste has emerged as the fastest-growing solid waste stream, with the *Global E-waste Monitor* estimating a record 62 million tons generated in 2022. In Malaysia, the problem is acute: approximately 411,000 tons of e-waste, equivalent to 12 kg per capita, were produced in the same year, yet only a small fraction was recovered through formal channels (Tommy, 2024). The trend is driven by rapid digitalization, rising incomes, and shorter product life cycles, which together create an escalating environmental and public health challenge.

E-waste contains valuable secondary resources such as gold, copper, and rare-earth metals, but also hazardous substances like lead, mercury, and cadmium. Informal or improper disposal allows these toxics to leach into soil and water, posing threats to both ecosystems and human health, while valuable materials are lost to the linear economy (Yiswaree, 2025). Recognizing this challenge, Malaysia's *12th Malaysia Plan* targets a household waste recycling rate, including e-waste, of 40 per cent (Yiswaree, 2025). Yet, while the country has over 50 licensed recovery facilities, the success of such policies

depends heavily on social and behavioral engagement, particularly whether households are willing and able to separate, store, and return obsolete devices (Muhammad, 2025).

Despite official campaigns and the availability of Department of Environment (DoE) drop-off points, participation remains very low. In 2021, formal collection channels managed only 2,459 tons of household e-waste, less than one per cent of the estimated volume (Yiswaree, 2025). Surveys reveal that just five per cent of consumers use approved disposal methods, and adoption of tools like the MyEwaste locator app has been minimal. Much of the research on Malaysia's e-waste problem has focused on technical and regulatory solutions, leaving socio-cultural and behavioral factors relatively underexplored, despite their central importance in shaping public participation.

The existing literature underscores the importance of awareness, knowledge, and social norms in driving recycling behavior. Rodzi et al. (2023) highlight that awareness, knowledge, and risk perception significantly influence household recycling habits, while Akhtar et al. (2014) confirm a positive relationship between understanding e-waste issues and favorable recycling attitudes. Social influences also play a decisive role. Mokhtar and Shamsuddin (2024) reveal that social norms and perceived behavioral control influence recycling practices among Malaysian online shoppers, while Noor et al. (2023) show that peer behaviors and community initiatives shape individuals' intentions to recycle. Yusoff and Asmuni (2021) similarly emphasize the importance of community participation in effective waste management.

Convenience is another critical determinant. Puzzo and Prati (2024) found that the accessibility and proximity of recycling facilities directly affect willingness to participate, while Hussin et al. (2023) argue that established collection systems encourage community involvement. Finally, intrinsic motivations, rooted in environmental consciousness and personal values, are central to recycling intention. Nadarajan et al. (2023) reveal that individuals with strong sustainability values are more committed to e-waste recycling, a finding echoed by Mohamad et al. (2022), who demonstrate the predictive power of environmental attitudes through the Extended Theory of Planned Behavior. Together, these studies illustrate that Malaysia's e-waste recycling landscape is shaped by a dynamic interplay of knowledge, social norms, perceived convenience, and intrinsic motivations, reinforcing the need for strategies that address both structural and behavioral dimensions.

Social Factors Affecting E-Waste Recycling

Social factors, encompassing cultural norms, peer influence, community engagement, and socioeconomic conditions, play a decisive role in shaping e-waste recycling behaviors. In Malaysia, cultural attitudes toward waste disposal often prioritize convenience over environmental responsibility, with many households still discarding obsolete electronics alongside general waste. While such habits persist, peer influence and community norms can positively shift behavior, as individuals are more

likely to recycle when they observe friends, neighbors, or respected community figures engaging in responsible disposal. Public education campaigns, particularly those delivered through schools, local councils, and religious institutions, have proven effective in reframing recycling as a civic duty.

Convenience emerges as a particularly influential factor. Research by Puzzo and Prati (2024) demonstrates that accessible and user-friendly collection points, whether through proximity, strategic placement, or ease of use, significantly increase recycling participation. Similarly, Nowakowski et al. (2021) highlight that providing appropriate disposal options, such as dedicated containers for small e-waste items, reduces the perceived effort and encourages proper recycling practices.

Psychological and social dynamics further shape recycling intentions. Drawing on the Theory of Planned Behavior, Soomro et al. (2022) and Bhutto et al. (2023) show that individual attitudes, subjective norms, and perceived behavioral control strongly influence willingness to recycle. Communities where recycling is seen as the norm often witness collective action, a point echoed by Zhao (2023), who stresses that consumer perceptions can determine the success of broader recycling strategies.

Awareness and knowledge of e-waste hazards and disposal methods are also critical. Studies by Nuwematsiko et al. (2021) reveal that low awareness among vulnerable populations hinders recycling, while incentive-based programs, such as mobile phone take-back schemes in the UK, both educate and motivate consumers (Owusu-Twum et al., 2022). Educational initiatives that address not only the dangers of improper disposal but also the practical steps for participation are vital (Munir & Daud, 2024).

Cultural beliefs and socioeconomic status further influence attitudes toward recycling. Delcea et al. (2020) and Yu & Mangmeechai (2023) note that perceptions of e-waste value, shaped by cultural understandings of material worth, can either encourage or deter responsible disposal. Tailored campaigns that address specific cultural contexts are therefore essential, particularly in communities with low baseline awareness. Governmental support and policy frameworks underpin these social dimensions. As Azlan et al. (2021) argue, strong enforcement, systematic policy design, and collaboration among stakeholders are necessary to promote participation. Incentives, whether financial benefits for consumers and businesses or reduced costs for recycling, can further boost engagement (Fadhullah et al., 2022).

In the Malaysian context, generational differences also emerge as relevant. Millennials and younger consumers, influenced by normative social pressures (Bhutto et al., 2023; Noor et al., 2023), often align their recycling behavior with societal expectations. However, despite growing awareness of e-waste hazards, many Malaysians still lack knowledge of the practical steps required to recycle effectively (Mohamad et al., 2022). Moral obligation, or feelings of guilt for not recycling, can motivate action, but insufficient guidance from authorities often leads to inaction (Nasir & Yaacob, 2022).

Socioeconomic disparities further complicate participation, as lower-income groups may face barriers to accessing formal recycling services (Deshpande et al., 2024).

Behavioral Factors Affecting E-Waste Recycling

Behavioral factors, encompassing individual attitudes, habits, perceived convenience, and trust in recycling systems, are central to shaping participation in e-waste recycling. Positive attitudes toward recycling, often rooted in environmental concern and awareness of health risks, can significantly motivate individuals to engage in proper disposal practices. Conversely, entrenched habits, such as storing unused electronics indefinitely or discarding them with general waste, act as substantial barriers. In this context, convenience is a decisive element: when recycling facilities are readily accessible, well-located, and simple to use, participation increases substantially (Mohamad et al., 2022; Nadarajan et al., 2023). Structural arrangements that reduce the time and effort required to recycle, such as strategically placed collection points, have been shown to be powerful enablers of sustainable behavior.

Emotional and psychological motivations also influence recycling intentions. Feelings of guilt for not recycling, combined with a sense of moral obligation, often encourage individuals to act (Allison et al., 2022; Swanson & Ferrari, 2022). Personal norms and values (particularly those aligned with environmental stewardship) strongly predict positive recycling intentions (Yu & Mangmeechai, 2023; Ang et al., 2023). Social influences play a complementary role: when recycling is seen as socially endorsed, by peers, family members, or community networks, individuals are more likely to adopt similar practices (Swanson & Ferrari, 2022; Kassim et al., 2023). The Theory of Planned Behavior supports this perspective, highlighting how subjective norms interact with attitudes and perceived behavioral control to shape intentions (Kassim et al., 2023; Bhutto et al., 2023).

Perceived behavioral control, or confidence in one's ability to recycle effectively, is another strong determinant. When individuals believe they have the necessary knowledge, skills, and access to facilities, they are more inclined to participate. Educational initiatives that build this confidence, by providing clear instructions and demystifying recycling procedures, can significantly improve engagement rates (Leng & Arif, 2022). Conversely, when recycling processes are seen as complicated, inconvenient, or time-consuming, willingness to participate diminishes (Yuriev et al., 2020; Yu et al., 2021).

Awareness of environmental issues and knowledge of proper recycling methods are critical enablers of behavioral change. Studies show that while many people understand that e-waste poses risks, fewer know the correct procedures for safe disposal (Abdul et al., 2023; Mokhtar et al., 2024). Targeted public education campaigns that combine hazard awareness with practical guidance can help close this gap (Delcea et al., 2020). Without this combination, even well-intentioned individuals may fail to act effectively.

Economic incentives can also serve as powerful behavioral triggers. Financial rewards, discounts, or buy-back programs provide tangible motivation for recycling, reinforcing sustainable behavior and encouraging repeat participation (Mohamad et al., 2022; Siddiqua et al., 2022). When such incentives are paired with supportive infrastructure and community engagement, their impact is magnified, creating a positive feedback loop that normalizes recycling within society (Sabbir et al., 2023).

Conclusion

Malaysia's e-waste challenge is not solely a matter of technology or infrastructure but is deeply rooted in social and behavioral dimensions. Awareness, social norms, and cultural values shape the willingness to engage, while convenience, trust, and personal motivation determine the consistency of participation. Policies that integrate these factors, through targeted education, community engagement, and user-friendly collection systems, are more likely to succeed in bridging the gap between policy goals and public action. Future research should empirically test integrated models that capture the interplay between social and behavioral influences, ensuring that strategies are not only technically sound but also socially resonant and behaviorally sustainable.

References:

- Abdul, W., Singh, A., Siddiqua, A., Gamal, M., & Laeequddin, M. (2023). E-waste recycling behavior in the united arab emirates: investigating the roles of environmental consciousness, cost, and infrastructure support. *Sustainability*, 15(19), 14365. <https://doi.org/10.3390/su151914365>
- Akhtar, R., Masud, M., & Afroz, R. (2014). Household perception and recycling behaviour on electronic waste management: a case study of kuala-lumpur, malaysia. *Malaysian Journal of Science*, 33(1), 34-41. <https://doi.org/10.22452/mjs.vol33no1.5>
- Allison, A., Lorencatto, F., Michie, S., & Miodownik, M. (2022). Barriers and enablers to food waste recycling: a mixed methods study amongst uk citizens. *International Journal of Environmental Research and Public Health*, 19(5), 2729. <https://doi.org/10.3390/ijerph19052729>
- Ang, Y., Mohammad, N., & Shobri, N. (2023). The effects of environmental values on gen z's e-waste recycling intention. *Information Management and Business Review*, 15(4(SI)I), 27-37. [https://doi.org/10.22610/imbr.v15i4\(si\)i.3574](https://doi.org/10.22610/imbr.v15i4(si)i.3574)
- Azlan, R., Razak, S., & Indiran, L. (2021). Knowledge, attitude and practices on e-waste management among business students in a public university. *International Journal of Academic Research in Business and Social Sciences*, 11(8).
- Bhutto, M., Rüteliönè, A., Šeinauskienè, B., & Ertz, M. (2023). Exploring factors of e-waste recycling intention: the case of generation y. *Plos One*, 18(10), e0287435. <https://doi.org/10.1371/journal.pone.0287435>

- Delcea, C., Crăciun, L., Ioanăș, C., Ferruzzi, G., & Cofas, L. (2020). Determinants of individuals' e-waste recycling decision: a case study from romania. *Sustainability*, 12(7), 2753. <https://doi.org/10.3390/su12072753>
- Deshpande, A., Ramanathan, V., & Babu, K. (2024). Assessing the socio-economic factors affecting household waste generation and recycling behavior in chennai: a survey-based study. *International Journal of Science and Research Archive*, 11(2), 750-758. <https://doi.org/10.30574/ijstra.2024.11.2.0487>
- Fadhullah, W., Imran, N., Ismail, S., Jaafar, M., & Abdullah, H. (2022). Household solid waste management practices and perceptions among residents in the east coast of malaysia. *BMC Public Health*, 22(1). <https://doi.org/10.1186/s12889-021-12274-7>
- Hussin, N., Ali, N., & Khalil, N. (2023). E-waste management systems in shah alam city: household awareness and behavior. *International Journal of Academic Research in Business and Social Sciences*, 13(4). <https://doi.org/10.6007/ijarbss/v13-i4/16320>
- ITU (2024). The Global E-Waste Monitor 2024. ITU GSR, <https://www.itu.int/en/ITU-D/Environment/Pages/Publications/The-Global-E-waste-Monitor-2024.aspx>
- Kassim, E., Hassan, M., Nor, F., & Lee, T. (2023). To recycle e-waste or not: understanding consumers' intention from the lens of behavioral theories. *Information Management and Business Review*, 15(1(I)SI), 72-85. [https://doi.org/10.22610/imbr.v15i1\(i\)si.3409](https://doi.org/10.22610/imbr.v15i1(i)si.3409)
- Leng, Y. and Arif, A. (2022). E-waste recycling behaviour with reference to consumers in kuantan city. *International Journal of Academic Research in Business and Social Sciences*, 12(12). <https://doi.org/10.6007/ijarbss/v12-i12/16019>
- Mohamad, N., Chin, T., & Tat, H. (2022). The determinants of consumers' e-waste recycling behavior through the lens of extended theory of planned behavior. *Sustainability*, 14(15), 9031. <https://doi.org/10.3390/su14159031>
- Mokhtar, N. and Shamsuddin, M. (2024). E-commerce packaging waste in malaysia – where does it all end up?. *PaperASIA*, 40(4b), 254-265. <https://doi.org/10.59953/paperasia.v40i4b.138>
- Mokhtar, N., Mokhlis, S., Shamsuddin, M., & Hamid, S. (2024). The antecedents of recycling behaviour among online consumers concerning e-commerce packaging waste. *PaperASIA*, 40(6b), 1-14.
- Muhammad Basir Roslan (2025, April 29). Rewiring Malaysia's E-waste: The Erth Revolution. *Bernama*. Retrieved from <https://www.bernama.com/en/bfokus/news.php?id=2417807>
- Nadarajan, P., Zadeh, A., Hanifah, H., & Thurasamay, R. (2023). Sustaining the environment through e-waste recycling: an extended valence theory perspective. *Aslib Journal of Information Management*, 76(6), 1059-1087. <https://doi.org/10.1108/ajim-10-2022-0475>
- Nasir, Z. and Yaacob, M. (2022). Social and religious influences on environmentally ethical behavior of muslim community in malaysia. *Creative Education*, 13(12), 3996-4016.
- Noor, N., Soleman, N., & Azuan, A. (2023). *To recycle or not to recycle? factors affecting malaysian residents' intention for recycling e-waste*. *Malaysian Journal of Social Sciences and Humanities (Mjssh)*, 8(2), e002102. <https://doi.org/10.47405/mjssh.v8i2.2102>

- Nowakowski, P., Kuśnierz, S., Płoszaj, J., & Sosna, P. (2021). Collecting small-waste electrical and electronic equipment in poland—how can containers help in disposal of e-waste by individuals?. *Sustainability*, 13(22), 12422. <https://doi.org/10.3390/su132212422>
- Nuwematsiko, R., Oporia, F., Nabirye, J., Halage, A., Musoke, D., & Buregyeya, E. (2021). Knowledge, perceptions, and practices of electronic waste management among consumers in kampala, uganda. *Journal of Environmental and Public Health*, 2021, 1-11.
- Owusu-Twum, M., Kumi-Amoah, G., Heve, W., Lente, I., Owusu, S., Larbi, L., ... & Amfo-Otu, R. (2022). Electronic waste control and management in ghana: a critical assessment of the law, perceptions and practices. *Waste Management & Research the Journal for a Sustainable Circular Economy*, 40(12), 1794-1802.
- Puzzo, G. and Prati, G. (2024). Unraveling the influence of convenience situational factors on e-waste recycling behaviors: a goal-framing theory approach. *Sustainable Development*, 33(1), 1174-1191. <https://doi.org/10.1002/sd.3164>
- Rodzi, Z., Hazri, A., Azri, N., Rhmdan, N., Zaharudin, Z., & Uttungadewa, S. (2023). Uncovering obstacles to household waste recycling in seremban, malaysia through decision-making trial and evaluation laboratory (dematel) analysis. *Science & Technology Indonesia*, 8(3), 422-428. <https://doi.org/10.26554/sti.2023.8.3.422-428>
- Sabbir, M., Taufique, K., & Nomi, M. (2023). Consumers' reverse exchange behavior and e-waste recycling to promote sustainable post-consumption behavior. *Asia Pacific Journal of Marketing and Logistics*, 35(10), 2484-2500. <https://doi.org/10.1108/apjml-07-2022-0647>
- Siddiqua, A., Gamal, M., Abdul, W., Mahmoud, L., & Howari, F. (2022). E-device purchase and disposal behaviours in the uae: an exploratory study. *Sustainability*, 14(8), 4805. <https://doi.org/10.3390/su14084805>
- Soomro, Y., Hameed, I., Bhutto, M., Waris, I., Baeshen, Y., & Batati, B. (2022). What influences consumers to recycle solid waste? an application of the extended theory of planned behavior in the kingdom of saudi arabia. *Sustainability*, 14(2), 998.
- Swanson, H. and Ferrari, J. (2022). Predictors of e-waste: considerations for community psychology prevention and intervention. *Journal of Community Psychology*, 51(5), 2001-2009. <https://doi.org/10.1002/jcop.22986>
- Tommy Lim Kwok Kwang (2024, September 28). 'Re-booting' to reduce e-waste. *The Star*. Retrieved from <https://www.thestar.com.my/business/insight/2024/09/28/re-booting-to-reduce-e-waste>
- Yiswaree Palansamy (2025, February 7). The growing e-waste crisis in Malaysia: What you need to know and how to act. *Malay Mail*. Retrieved from https://www.malaymail.com/news/malaysia/2025/02/07/the-growing-e-waste-crisis-in-malaysia-what-you-need-to-know-and-how-to-act/164970#google_vignette
- Yu, B., Wang, J., Liao, Y., Wu, H., & Wong, A. (2021). Determinants affecting purchase willingness of contractors towards construction and demolition waste recycling products: an empirical study in shenzhen, china. *International Journal of Environmental Research and Public Health*, 18(9), 4412.

- Yu, X. and Mangmeechai, A. (2023). Shaping e-waste recycling intentions through psychological motivation: an integrated study of the theory of planned behavior and the theory of value-belief-norm. *Environment and Social Psychology*, 9(3).
- Yuriev, A., Dahmen, M., Paillé, P., Boiral, O., & Guillaumie, L. (2020). Pro-environmental behaviors through the lens of the theory of planned behavior: a scoping review. *Resources Conservation and Recycling*, 155, 104660. <https://doi.org/10.1016/j.resconrec.2019.104660>
- Yusoff, S. and Asmuni, S. (2021). Waste management behavior of households in klang valley, malaysia. *Journal of International Business Economics and Entrepreneurship*.
- Zhao, W. (2023). An overview of emerging trends in consumer e-waste disposal behavior in the context of carbon neutrality. *SHS Web of Conferences*, 163, 02012.



9 786299 875574

SIG CS@e-Learning
Unit Penerbitan
Jabatan Sains Komputer & Matematik
Universiti Teknologi MARA Cawangan Pulau Pinang

e-ISBN : 978-629-98755-7-4

Design of the cover powered by
<https://www.free-powerpoint-templates-design.com/>