



ADDRESSING CONSUMER HESITATION IN E-WASTE RECYCLING DIGITAL PLATFORMS: A REVIEW

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Abstract:

The continued exponential growth of electronic waste has major environmental, social, and economic consequences. Today, modern e-waste treatment procedures incorporate a wide range of information technology approaches and digital platforms. However, consumer adoption of these platforms remains low. This study fills up the void by investigating the primary barriers that prevent consumers from using digital platforms for e-waste recycling. Based on Innovation Resistance Theory (IRT), this study employs a dual-method approach; a PRISMA-guided systematic literature review and a qualitative web content analysis of digital platform operations and user feedback. The findings indicate that functional barriers, specifically usage, value, and risk, are the most significant barriers to adoption, with poor usability and system disruption being the most prominent. Psychological barriers, such as tradition and image, have a lesser but nonetheless substantial impact. This insight emphasizes the crucial importance of user-centred platform design, transparent processes, and personalized interaction techniques. Future research should include empirical and region-specific investigations, such as surveys and behavioural experiments, to validate these findings and suggest effective intervention strategies. This research indicates that bridging the gap between digital innovation and user behaviour is critical to fostering engagement in sustainable e-waste management.

Keywords:

E-waste, Hindrance, Behaviour, Digital Platform, Recycling, Consumer

Introduction

The rapid growth of electronic devices has resulted in an unprecedented surge in e-waste. Over time, the surge has developed into environmental, sociological, and economic concerns. Thus, e-waste has emerged as one of the world's fastest-growing waste streams, with over 50 million metric tons produced annually (Forti et al., 2020). Globally, e-waste or Waste from Electrical and Electronic Equipment (WEEE) is considered one of the fastest-growing waste streams, growing at about 4% a year (Awasthi et al., 2023; Ghulam & Abushammala, 2023; Minashkina & Happonen, 2022). The exponential growth of e-waste has placed significant load on landfills, intensified pollution (Ismail & Hanafiah, 2021; Islam et al., 2021) and contributed to the reduction of valuable natural resources (Nunes et al., 2021). These consequences, highlights a need for an efficient and sustainable e-waste management and recycling solutions.

In response to these issues, digital platforms have emerged as effective e-waste management and recycling tools. They provide organized ways to improve recycling rates, speed waste collection, and increase customer participation. These platforms offer a potential solution by providing convenient and transparent disposal channels (Huang et al., 2023; Lyu et al., 2023; Shevchenko et al., 2021; Ramzan et al., 2021; Wang et al., 2020). They leverage digital tools to streamline the recycling process, connecting consumers with certified recyclers, and supporting e-waste collection through crowd-sourced initiatives and digitalized systems that allow consumers to plan collections while offering financial incentive (Lee et al., 2024; Vorobeva et al., 2022; Яфень & Шевченко, 2021). Online platforms also enhance user convenience by providing pick-up services, collection processes, real-time price evaluations, and trade-in options, reducing the conflict associated with traditional recycling channels (Weilage et al., 2024; Soesanto et al., 2022; Arain et al., 2020). Eventually, the current growth of information communication technology (ICT) allows consumers to support recycling activities and improve their contribution in the e-waste management towards a more sustainable outcome (Sozoniuk et al., 2022).

China, in particular, has emerged as a market leader in integrating digital waste management technologies, with platforms like Aihuishou, Huishouge, Zaishenghou, and Aifou Recycling. Regardless of the emergence and potential of these digital platforms, one major obstacle to the successful implementation of digital e-waste management platforms is a lack of general participation, acceptability, and acknowledgment. Unlike its traditional counterpart, e-waste management digital platforms encounter significant consumer disagreement and limited participation. While promotional efforts have primarily focused on the benefits of these platforms, little emphasis has been made to understanding why users resist adoption (Tang & Chen, 2022). Most current and past research explores factors influencing e-waste recycling in offline contexts, with few studies investigating these factors in the online context (Lyu et al., 2023). Despite advances in research on digital recycling adoption, there is still a need of a comprehensive study of why consumers are hesitant to use these online platforms. Identifying these resistance characteristics is essential for improving future innovation and allowing the use of digital e-waste management platforms (Dedehayir et al., 2017). In addition, there is also a need to study the adaptation of digital e-waste management platforms in local settings as suggested by previous studies (Liu et al., 2022; Zheng et al., 2022; Gu et al., 2019; Wang et al., 2018).

Therefore, this study aims to investigate the major challenges to consumer acceptance of digital e-waste recycling alternatives. Applying Innovation Resistance Theory (IRT), the research question is: what are the key factors that hinder consumers from using digital platforms to manage their e-waste. The aim is to highlight the significant barriers to effective utilization of digital platforms to manage electronic waste by reviewing existing literature as a theoretical framework and evaluating current platforms as practical components.

Methodology Use

The study employs a dual-method approach to thoroughly investigate the factors hindering the use of digital e-waste management platforms. This approach combines two distinct but complementary methods: a systematic literature review and a qualitative content analysis specifically reviewing existing and operational digital platforms such as websites, web-based applications, and mobile applications. The combination of both methods allows for a comprehensive knowledge of both theoretical and practical barriers, facilitating the connection between academic research and real-world user experiences. It also improves the study's validity by comparing and confirming results from both scholarly sources and genuine consumer feedback.

The first method, a systematic literature review, aims to identify existing research on barriers to the adoption of digital platforms in the context of managing e-waste. This review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) approach (Moher et al, 2009). A data search was conducted on February 25, 2025, using the Google Scholar database. The search was limited to the period between 2010 and 2025 and includes only relevant, peer-reviewed documents published in English. The literature search used specific title keywords “barriers factors” OR “resistance factors” OR “hindrance factors” AND “adoption”, AND “digital platform” AND “to dispose e-waste” AND “to recycle e-waste”. Thematic analysis was applied to extract common hindrance factors discussed in the identified literature. Figure 1 depicts the data search procedure.

To complement the systematic review, web content analysis is conducted to examine at the roles of digital platforms, notably websites (Nosenko, 2022) and mobile apps (Moltene & Orsato, 2021), in aiding e-waste management. This review adopted exploratory descriptive qualitative research approach (Polit & Beck 2012). Google search engine and Play Store platform are used to find the relevant platforms. Keyword use is like ‘e-waste recycling digital platform’, ‘digital platform for e-waste’, ‘e-waste recycling apps’, and ‘electronic waste management websites’. Only operational and timely platform offering collection, recycling, disposing e-waste formally were included for analysis. The primary goal was to identify practical limitation and user challenges that may not be fully captured in the review. Each platform is assessed only through active and existing digital platforms dedicated to e-waste recycling in terms of functional capabilities, accessibility, and user interaction mechanisms.

The process of web content analysis is divided into five steps (Luo A, 2022). The first step is selecting the content for analysis. This research focuses on websites, web applications, and mobile apps that feature user reviews and comments on digital platform for managing e-waste. The second step is defining the units of analysis and setting conceptual categories. Units of analysis included frequencies of specific words and phrases, while categories were conceptual groupings such as inconvenience and information lacking. The third step required developing a set of rules for coding the data. Coding involved organizing the units of analysis into the

specified categories to ensure the method was transparent and reliable. An example provided is coding phrases like “buttons don’t work” or “can’t login” under the category of functionality failure. The fourth step was manually coding the texts, phrases, or words. This manual approach was necessary due to the scarcity of negative reviews and comments found (as most recyclers tend to ensure only positive comments appear) and because the researcher did not participate in any member-only conversations. The final step was analyzing the results and drawing conclusions. Statistical analysis can be utilized in this stage to identify patterns or relationships within the data, interpret the findings, and drawing conclusions about the content and its context.

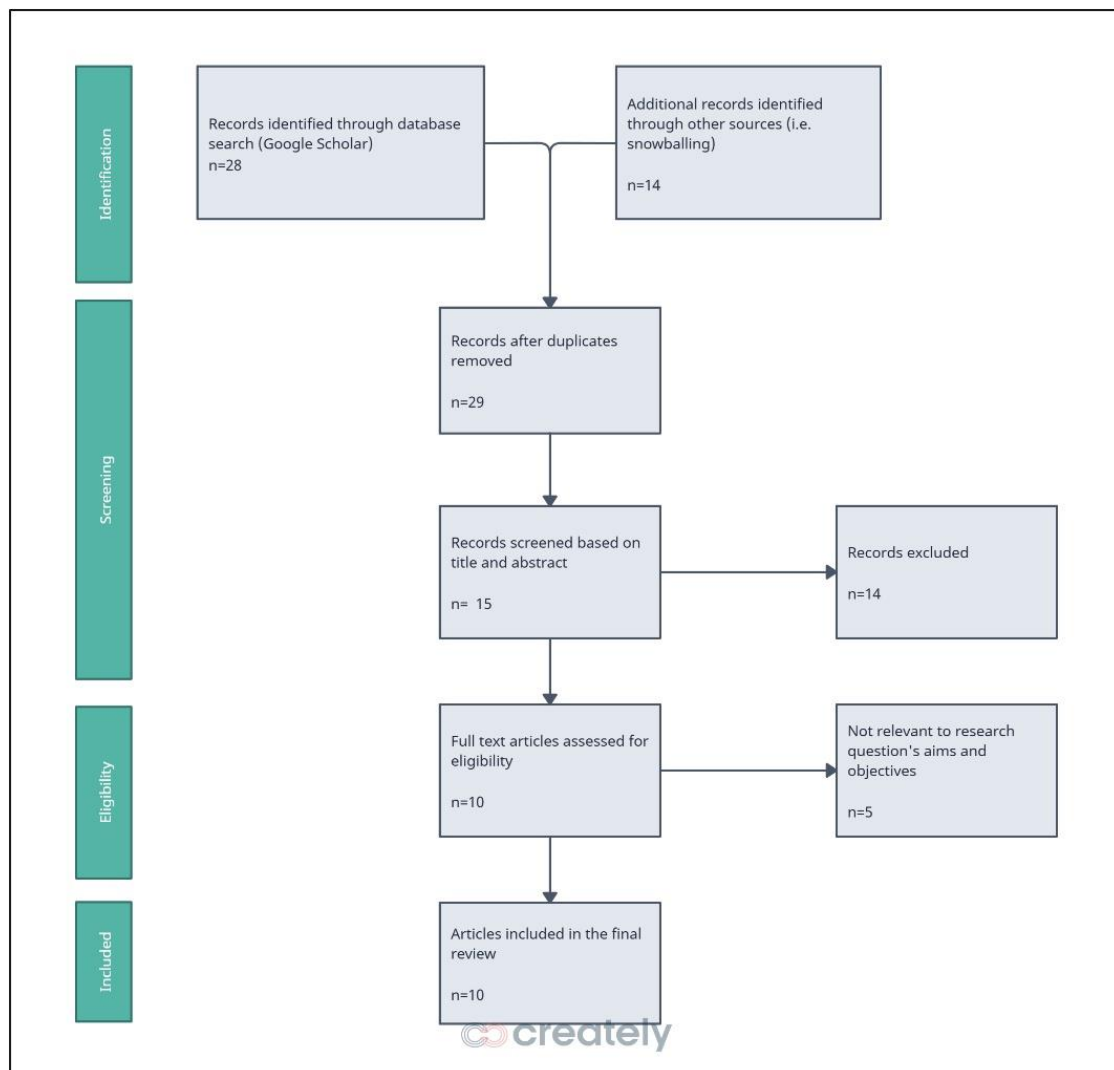


Figure 1: Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)

Barrier Factors in Adopting Digital Platform in Managing E-waste

Digital platforms have emerged as revolutionary solutions for tackling the e-waste challenge by engaging consumers and expediting recycling procedures. Several papers (Sun et al., 2024; Fang et al., 2023; Lyu et al., 2023; Tang & Chen, 2022; Yee, 2021; Sun et al., 2018; Tibken,

2015) were found in relation to Internet recycling or online recycling in China and in USA that examined the services and information provided on these platforms. These papers discussed the challenges in e-waste management platforms such as Aihoushou, Huishaubao, Huishouge (Sun et al., 2024; Fang et al., 2023; Lyu et al., 2023; Sun et al., 2018), Gazelle (Tang & Chen, 2022; Tibken, 2015) and Decluttr (Yee, 2021). These digital platforms were also stated to provide solutions to improve environmental sustainability by supporting formal recycling channels and implementing reverse supply chain models that are coordinated with consumer demands (Zheng et al., 2022; Ramzan et al., 2021). Despite these developments, consumer participation with digital platforms remains low due to functional barriers (Sajid & Zakkariya, 2023).

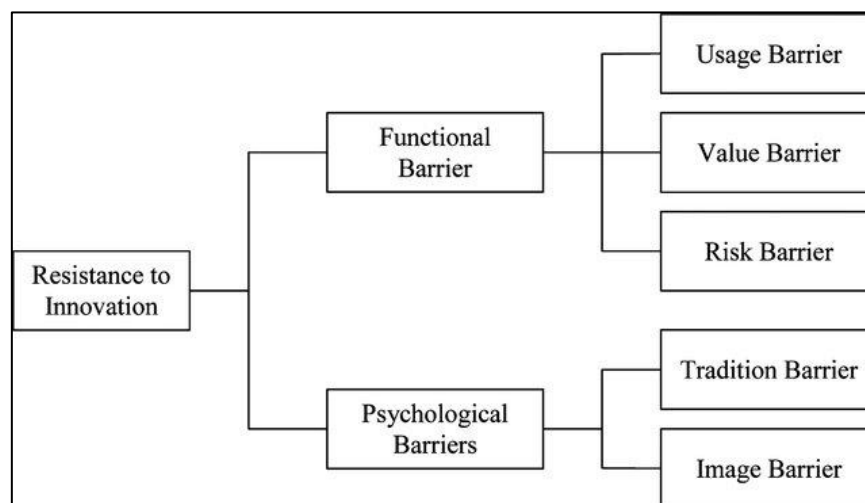


Figure 1.0: Innovation Resistance Theory (Source: Ram & Sheth, 1989, Luo et al., 2012)

This research uses Innovation Resistance Theory (IRT) to identify and analyze the functional and psychological barriers that contribute to resistance against adopting digital platforms for managing e-waste (Luo et al., 2012). Functional barriers consist of usage barrier, value barrier, and risk barrier. These constraints hinder the transition from recycling intention to real recycling behavior via digital technologies. A lack of understanding about the environmental benefits of recycling often contributes to the view that e-waste recycling is a low-priority task (Jaiswal & Mukti, 2025; Chaudhary & Vrat, 2019). Furthermore, these beliefs create usage and value barriers, whereas risk and tradition obstacles are linked to worries about data security, privacy issues, and resistance resulting from established recycling behaviors and unfamiliarity with digital technologies. Meanwhile, psychological barrier is comprised of two components; tradition barrier and image barrier. Eventually, these two barriers are the reason why consumers viewed digital platforms as confusing and only provide minimum immediate benefits to them.

The Functional Barriers

Despite the numerous advantages of online e-waste recycling platforms, their adoption remains relatively low (Elizabeth Shirley et al., 2024; Liu et al., 2022). This section will be divided to three coded themes according to IRT theory. Digital platforms can raise awareness about e-waste's environmental impact and promote proper disposal by offering information and incentives that encourage consumer participation in recycling (Wang et al., 2021; Shan et al., 2020).

From the usage barriers perspective, there is a study revealed that there are quite a number of available application and the user ratings are predominantly positive, however they are rarely used thus indicates the awareness and diffusion of the applications are still low (Brauer et al., 2016). This is reinforced by another study, which found that a lack of understanding about the benefits of waste management technology or how to use them efficiently can be the barrier. This lack of awareness might result in misunderstandings and opposition to adoption (Dursun et al., 2024; Brauer et al., 2016). Perhaps the most significant barrier to adoption is insufficient public awareness and education about online e-waste recycling (Ramzan et al., 2021). Furthermore, it is driven by the limited acceptability of informatization methods by the recycling companies participating in the collection (Wang et al., 2018). Excessively complicated registration processes demanding substantial personal information could hinder user adoption, as customers frequently abandon technology viewed as difficult to use, even when the potential benefits are significant (Dursun et al., 2024). The lack of flexibility and convenience in Internet-based e-waste collecting contributes to users' reluctance to act (Wang et al., 2019; Saphores et al., 2012). All of this is supported by a study revealing that the perceived complexity of waste management technology could deter people from using them. Another study argue that many waste recycling apps lack user-centred design, resulting in poor user engagement. Among the propose key features to improve this, such as updated collection calendars, timely reminders, clear recycling guides, and the ability to locate nearby bins and drop-off points with relevant details (Bonino et al., 2016).

Another barrier to discuss is risk barrier. Perceived risk acts as a crucial barrier in shaping behavioural (Sadiq et al., 2021). A major factor affecting consumer participation is the concern over data security and the potential for fraud. Many users are unsure about the credibility of recycling service providers and how their personal data will be handled (Michael et al., 2024; Khan & Ahmad, 2022). These concerns undermine users' confidence in the data security and privacy concern perspective (Zhang et al., 2021). As a result, individuals are reluctant to engage with these platforms, fearing that the process may not be trustworthy or secure (Huang et al., 2023; Wang et al., 2020; Kianpour et al., 2017). Improper handling of data on discarded electronic devices poses serious privacy risks, as many users are unaware that their data can be recovered (Liu et al., 2019). Additionally, the absence of strict data security regulations in some regions undermines user confidence in safe e-waste disposal (Raj & Vanaraj, 2024; Патер et al., 2024). Furthermore, the use of sensors and data collecting in smart waste bins may raise privacy concerns, leading to disagreement from consumers who are uncomfortable with the thought of having their waste disposal habits tracked (Vorobeve et al., 2023).

In terms of trust and data breaches, a lack of consumer confidence and concerns about potential data breaches remain significant obstacles to the adoption of digital solutions for e-waste management. The risk of data breaches and mismanagement of personal information undermines trust in e-waste recycling organizations. This is worsened by the absence of transparency and accountability in the data disposal process (Патер et al., 2024; Chen & Yuan, 2023). Consumers are frequently suspicious of the efficiency of data removal procedures (Bai et al., 2018)(Tang & Chen, 2022), which may discourage them from using digital platforms for e-waste management. Even conscientious individuals are not likely to recycle their waste phone when they perceive high risk of information security (Y. Zhang et al., 2020).

The management of e-waste via digital platforms has a number of value barriers that prevent user adoption. Value barrier comes into light when consumer compares the performance-to-price ratio of the innovation (Khanra et al., 2021). Studies on circular economy models additionally reveal that the willingness of individuals to participate in recycling activities is influenced by their perception of the economic and sustainability benefits (Dhir et al., 2021). Regulatory support and funding are essential for incentive systems. Without proper frameworks, even effective incentives may struggle to sustain participation (Shevchenko et al., 2019). Competition from informal recyclers reduces participation in formal systems, highlighting the need for stronger incentives (Яфень & Шевченко, 2021). Consequently, if consumers think that participating in formal e-waste recycling involves additional costs, their tendency to engage in such practices may be significantly reduced (Dwivedy & Mittal, 2013). This is reinforced by findings that show when customers bear the cost of e-waste recycling, it reduces their intention to recycle, which is further hampered by user complaints about inaccurate or unclear pricing (Wang et al., 2022; Wang et al., 2019). Given this fact, people may prefer to dispose of their e-waste through informal channels due to higher price offered, or even dump it with ordinary garbage or to store it at home. These factors suggest that the value barrier is one of the most important components of 'reasons against' in our framework (Wang et al., 2016).

The Psychological Barriers

Psychological barriers in utilizing waste management technology are diverse and can be broadly divided into cognitive, emotional, and social issues. Individual views, attitudes, and thoughts regarding technology and its impact on daily life are frequently the source of these impediments. Social support and cultural alignment significantly boost the acceptability of e-waste recycling apps, stressing the importance of culturally adapted solutions (Verma et al., 2025). In addition to these psychological barriers, however, cultural attitudes and regulatory uncertainties play a significant role in limiting adoption. Addressing these challenges requires standardized regulations, improved infrastructure, and stronger public awareness (Borthakur & Govind, 2017). The fear of change is a significant tradition barrier to the adoption of new technologies. Individuals may resist adopting waste management technologies due to a preference for familiar practices like traditional waste disposal procedures, thus perceive no reason to modify their behavior and feel reluctance to learn new systems (Khanra et al., 2021). A study support this saying that a better facilities and system to handle e-waste responsibly is crucial (Kim, 2022). When formal recycling is seen as costly or inconvenient, many prefer informal methods or choose not to recycle at all, often opting to discard or store e-waste at home (Wang et al., 2016). Individuals may regard certain waste management technology to be harmful or compromising to the environment. This view may lead to resistance and unwillingness to use e-commerce for household e-waste recycling because peers and relative do not use or lack of experience with these technologies (Zhang et al., 2019).

Image barriers address an unfavorable perception of an innovation resulting from the perceived level of complexity associated with its use or origin (Lian and Yen, 2013). Past study has identified image as a barrier that has a detrimental impact on user behavior regarding various digitization initiatives. For example, image has a negative relationship with users' adoption-related intents toward mobile services (Joachim et al., 2018). Prior studies have shown that consumers often perceive e-waste recycling as time-consuming, particularly when it involves long mailing collection waiting time (Wang et al., 2019) and transporting electronic devices to distant collection centers. Additionally, when recycling facilities are not easily accessible or

the online reward evaluation process for discarded mobile phones is overly complex, individuals with high proactive personalities are more likely to seek alternative solutions and persist in recycling. In contrast, those with lower levels of proactivity may be discouraged by these external barriers and opt out of recycling altogether (Ran & Zhang, 2023). Furthermore, it is widely assumed that shipping or moving large objects, such as refrigerators and washing machines, from homes to certified recycling facilities requires a great amount of work. Both of these may be perceived as image barriers.

The Web Content Analysis Findings

This section examines the findings from an analysis of numerous digital platforms like websites, web-based apps and mobile applications that manage e-waste globally, as well as the unfavourable reviews that discourage consumers from continuing to use the digital platform for managing, recycling, and disposing of e-waste. Total number of negative comments found are 54 directly from the reviews on the currently active varies of digital platforms.

An Analysis of Users Negative Review Across Countries

The statistical research (Figure 2.0) identifies five major themes that influence customer hesitation to use digital platforms for e-waste management. The most commonly stated barriers is usage (42%), indicating substantial concerns with platform usability and technical functionality. Value barriers (28%) follow, indicating dissatisfaction with incentives and a perceived lack of benefits. Risk barriers (17%) include worries about trust, privacy, and platform trustworthiness. In contrast, tradition barriers (8%) and image barriers (5%) are less frequently stated, implying that they play a limited role in leading to consumer hesitancy.

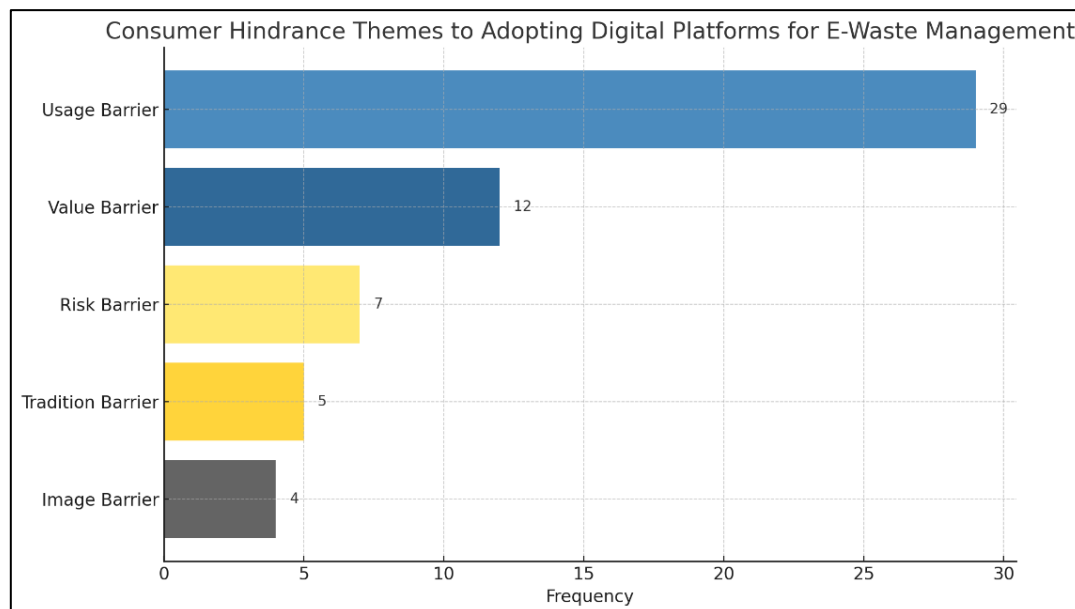


Figure 2.0: Consumer Hindrance Themes to Adopting Digital Platforms for E-Waste Management

From the Table 1 below, it can be summarized that the adoption of digital platforms for e-waste recycling is hindered by several challenges that necessitate further research. Digital platforms provide potentially new opportunities for e-waste management, but consumer participation remains low. User reviews indicate key adoption hurdles and reveal multiple layers of friction

that impede the effective use of these digital technologies. Addressing these gaps is vital, making this research timely and relevant.

Among the five categories of adoption barriers, usage barriers emerge as the most prominent and tangible challenge, directly affecting the consumer's ability to engage with digital e-waste platforms. These barriers relate to the functionality, usability, and overall user experience of the platforms, which are fundamental to initial and continued adoption. Users frequently encounter malfunctioning apps, non-responsive buttons, login and registration failures, difficulties uploading images or documents, and lagging system responses. Additionally, many report delayed processing of submissions, poor customer support, and a lack of timely updates, all of which erode trust and discourage continued use. These technical and usability flaws not only frustrate users but also prevent them from progressing to other stages of adoption where they might appreciate the platform's benefits. For many, the expectation of convenience and efficiency in managing e-waste digitally is unmet, leading them to abandon the platform entirely. Thus, usage barriers act as the most immediate and foundational obstruction, rendering all other value propositions irrelevant if users cannot effectively access or operate the service.

Value barriers emerge as the second most critical hindrance after usage barriers because even when users manage to overcome technical or usability issues, their continued engagement hinges on the perceived benefit or return from the platform. Many users' express disappointment with the financial compensation offered through digital platforms, citing discrepancies between the initially promised value and the final payout. This gap in expectation versus reality diminishes user trust and satisfaction. Moreover, when informal recyclers offer immediate cash or more attractive deals with fewer steps involved, the formal digital platforms struggle to compete. The absence of compelling incentives such as vouchers, loyalty points, or other tangible benefits further erodes the platform's appeal. For users investing time and effort navigating slow or malfunctioning systems, the lack of a worthwhile return makes the entire process feel futile. Therefore, once users overcome access or operational challenges, their decision to continue depends heavily on the perceived value, making it a significant but secondary obstacle to widespread adoption.

Risk barriers emerge as the third most critical factor discouraging consumers from using digital platforms for e-waste management due to persistent concerns over trust, privacy, and security. Trust is a fundamental element in any digital engagement, and when it is compromised, even the most convenient or rewarding platforms fail to retain users. Many user reviews reflect fears of identity theft, data misuse, and unreliable service, especially when users are asked to submit personal information or sensitive device details. Experiences such as receiving no payment after recycling, being ignored following collection requests, or facing platforms that disappear after initial contact led users to question the legitimacy of these services. Descriptions of apps as sketchy or untrustworthy highlight a growing discomfort and skepticism. The lack of transparency, poor customer support, and unmet expectations collectively reinforce the perception of risk. These negative experiences erode consumer confidence, making individuals less willing to adopt digital platforms for e-waste recycling, regardless of their usability or promised benefits.

Table 1.0: The Hesitation Adoption of Digital Platform Codebook

Theme	Code	Description	Reviews
Usage Barrier (n=29)	System/Functionality Failure	Difficulty accessing, navigating, or using the platform/app	"Buttons don't work properly"; "When I sign up and log in, it only shows bad gateway"; "Can't login"
	Lack of Technical Support	Poor or no customer support, slow response	"No response through customer support"; "Emails never come", "No more working. When I try reset password, it says invalid email. When I try to sign up again, it tells that email exists. So, what I need to do?"
	App Bugs & Glitches	Errors such as upload failure, blank screen, or broken pages	"App seriously needs polishing"; "Can't upload photos from gallery"
	Lack of Guidance	Instructions are misleading or unavailable	"There was a bit of hassle in shipping because their instructions say you can just drop it in a blue mailbox which is not true"
	Inconvenient Process	Tedious steps to register, request, or schedule pick-up	"Too many steps just to submit a request", "The app is hard to navigate and use."
	Limited Service Coverage	Service not available in certain areas or categories	"Limited area covered"; "Limited type of e-waste listed"
	Delayed Processing	Long waiting times for confirmation or payment	"Lengthy process for payments, taking a week at least"
Value Barrier (n=12)	Low Return or Incentive	No cash, reward, or insufficient value offered for items	"No clear benefit from recycling"; "Offer was much lower than promised"
	Poor Performance-to-Price Ratio	High pricing shown, then changed or reduced upon collection	"They show the prices high and then claim faults later"
	Alternative Offers Seem Better	Other platforms or scrap dealers perceived to give better deals	"Better to trade in to Best Buy or Apple"; "Local scrap guy offers more"
Risk Barrier (n=7)	Privacy Concerns	Users' data exposed, privacy not guaranteed	"Zero privacy. All contact details are accessible"
	Security Uncertainty	Fear of scams, misuse, or lack of data handling transparency	"I don't know what happens to my device after submission"; "Seems sketchy"
	Mistrust in Platform	General distrust or fear of being scammed	"This looks like a scam, not sure if it's legit"
Tradition Barrier (n=5)	Preference for Manual Methods	Users prefer traditional, physical or manual ways of recycling	"I've always recycled manually, not online"
	Ease of Informal Recycling	Informal collectors seen as simpler or more accessible	"It's easier to just give it to a nearby recycler"
Image Barrier (n=4)	Poor Platform Reputation	App or service seen as unreliable, poorly managed	"Company has nonexistent customer service"; "No accountability" "Very less user using this app I guess."
	Negative Perceptions	Service perceived as untrustworthy, shady, or lacking credibility	"Seem very sketchy and untrustworthy" "Other apps offer better deals for the same device."

Tradition and image barriers are the least significant in this study due to their limited presence in user feedback. The tradition barrier, reflecting resistance to change, appeared only in a few reviews where users preferred familiar methods like informal collectors. However, this preference seemed driven more by convenience than strong cultural habits. Similarly, the image barrier, which involves negative perceptions of digital platforms, was rarely mentioned and often overlapped with concerns about trust and performance. Image barrier particularly mentioned that such behavior is not normalized within one's community or peer group. These findings suggest that tradition and image issues are secondary and less influential compared to more critical factors such as usability, perceived value, and security.

Discussion

This study is among the first to identify the barriers that prohibit consumers from using digital platforms for electronic waste management through web and apps content analysis. Despite the positive and good reviews from the consumers that written all over the digital platforms mentioned above, there are as well bad and negative reviews on managing e-waste digitally though the numbers are not huge due to company reputation. The review of e-waste digital platforms reveals a number of important impediments to consumer adoption. This study is consistent with previous study which concluded that user resistance to innovation technology is driven by the usage, value and risks barriers (Ajina et al., 2024; Sajid & Zakkariya, 2023; Tang & Chen, 2022). Understanding these barriers is critical for developing effective digital interventions that can increase user engagement, improve recycling behaviour, and support the development of sustainable e-waste management systems, especially in regions with low participation rates and limited digital infrastructure.

Although these platforms are designed to provide simplicity, traceability, and real-time feedback, their actual performance frequently falls short of user expectations. The study reveals an ongoing gap between the way digital platforms for e-waste management are designed and how users actually engage with them, highlighting that technological innovation must be accompanied by careful attention to user behavior, experience design, and social factors. Based on a qualitative examination of user feedback, this study identifies various obstacles that digital platforms confront when driving consumer adoption of e-waste management. While these barriers are classified as usage, value, risk, tradition, and image, the underlying issue is that most platforms are not intended to meet the needs and habits of their users. This discrepancy highlights a critical and current research gap in environmental and engineering fields.

This study is crucial due to escalating global e-waste volumes and the urgent need for digital transformation in waste management. As many cities are transitioning toward smart and sustainable frameworks, it is vital to identify barriers to public participation through digital platforms. Technologically advanced solutions will fail unless they address user engagement, usability, and behavioral insights. This study connects environmental goals, engineering design, and human-computer interaction, calling for multidisciplinary approaches that prioritize functionality and user experience in e-waste management platforms.

Limitation and Future Research

Despite the meaningful insights derived from this study, several limitations must be acknowledged. First, the research relied heavily on qualitative data obtained through web content analysis, particularly from user reviews and feedback on existing e-waste digital platforms. While this approach captures authentic user experiences, it is inherently limited by the subjectivity of such reviews, which often emphasize dissatisfaction more than neutral or positive experiences. Consequently, the findings may reflect a disproportionate focus on negative user sentiment. Second, the review examines global trends but does not fully consider regional differences in regulations, infrastructure, and user demographics, such as digital literacy and socioeconomic status. This review lacks primary data, such as surveys or interviews, limiting insights into consumer behaviours and barriers. Thus, findings may not fully apply to regions with weak e-waste policies or low digital adoption, where local factors play a key role. Lastly, the exploratory and descriptive nature of the methodology, while suitable for identifying key themes, does not allow for empirical testing or measurement of the strength or statistical significance of the observed barriers. This restricts the ability to establish

causality or predictive insights that might guide specific interventions. The absence of research and relevant content on digital platforms emphasizes the importance of strategic, persuasive content for effectively influencing and internalizing recycling behaviour (Sujata et al., 2019).

Future research should aim to address these limitations by adopting more comprehensive and methodologically diverse approaches. Quantitative studies, such as large-scale surveys or structured interviews, would help validate the thematic barriers identified and allow researchers to measure the prevalence and impact of each barrier across different user groups. Future research should incorporate empirical studies, experimental designs, and region-specific case studies to further validate and expand on these findings. These approaches would also enable statistical generalization, enhancing the robustness of the findings. Comparative studies across regions or countries would offer insight into how contextual variables such as public policy, infrastructure readiness, or cultural norms may affect digital platform adoption for e-waste management. Moreover, future investigations could explore how user trust, usability, reward systems, and platform transparency influence participation rates.

Further interdisciplinary collaboration between environmental engineers, system designers, and social scientists would enrich the understanding of how digital solutions can be more effectively designed and deployed. Such research is vital to improving user engagement, enhancing platform functionality, and ultimately supporting the broader goals of circular economy and sustainable waste management. Researchers should concentrate on consumer-centred methods to technology adoption and interventions to increase user involvement in digital e-waste platforms. While information systems research has extensively examined digital platforms, those integrating social purpose remain underexplored. From an IS perspective, advancing platform functionality will require a systematic integration of information system models with behavioural analytics to better anticipate and enhance user engagement.

Furthermore, extending the technological adoption model is critical for understanding the key factors that influence user intention to use a system and actually use it. Addressing these gaps will result in the creation of more user-friendly, efficient, and commonly used e-waste recycling technologies.

Conclusion

This study explores into the challenges to consumer adoption of digital e-waste management platforms, highlighting major gaps between platform design and user expectations. A qualitative investigation of user-generated reviews reveals persistent issues, such as poor usability, low perceived value, and trust deficits, which hinder engagement. While digital solutions show potential for promoting sustainability, their performance is dependent on matching technology characteristics to real-world user behaviors and needs.

By exposing the gap between innovation and adoption, this research advocates for human-centered design and behavioral considerations in future digital interventions. This study emphasizes the importance of multidisciplinary exploration and collaboration, encompassing environmental engineering, system design, policy, and social science, in developing solutions that are not only technically sound but also user-centric, accessible, and aligned with circular economy aims.

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