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Factors Influencing the Adoption of Digital Waste Banks: A Systematic Literature Review

Nur Isni Nirwan[1]*, Dana Indra Sensuse[2]
[1,2]Faculty of Computer Sciences, Universitas Indonesia, Indonesia

Abstract.
Purpose: This study aims to identify and analyze the factors influencing the adoption of digital waste banks, considering the gap between their potential to improve waste management and their limited implementation in many regions.
Methods/Study design/approach: This research use a Systematic Literature Review (SLR) approach by analyzing 22 selected studies published between 2020 and 2025 from reputable databases. The study follows structured stages, including planning, literature selection based on inclusion and exclusion criteria, quality assessment, data extraction, and data synthesis using the PICOC framework.
Result/Findings: The results show that there are 26 factors influencing the adoption of digital waste banks, which are grouped into four main categories: technology, organization, environment, and people. Technological factors include ease of use, transparency, system quality, and security. Organizational factors involve infrastructure, innovation, and human resources. Environmental factors include regulations, social influence, environmental awareness, and economic incentives. Meanwhile, people-related factors include age, education, income, and training. These factors are interconnected and play an important role in determining adoption success.
Novelty/Originality/Value: This study provides a comprehensive classification of factors influencing digital waste bank adoption based on recent literature. The findings offer practical insights for policymakers and practitioners in designing strategies to increase community participation and improve sustainable waste management through digital innovation.

Keywords: Adoption, Waste Bank, Digitization, Waste management, SLR

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INTRODUCTION

Waste is an increasingly urgent global problem, with the world's solid waste production expected to increase from 2.01 billion tonnes in 2016 to 3.4 billion tonnes by 2050 if there is no significant change in its management [1] . Waste comes from a variety of sources such as households, industry, agriculture, and commercial activities, and if not managed properly can cause soil, water, and air pollution and harm human health [2]. The increasingly complex waste problem has indeed encouraged the birth of community-based management innovations, one of which is through the concept of a waste bank.

A waste bank is a dry waste management system that adopts banking principles, where people can save inorganic waste that has been sorted to then get economic incentives, such as money or basic necessities[3]. The application of the *Reduce, Reuse, Recycle* (3R) principles is indeed the main focus of the government in waste management, but its implementation in the field still faces various obstacles so that it has not run optimally)[5] . The waste bank program also encourages community participation and collaboration, strengthens the local economy, and fosters a sustainable lifestyle [6][3] .

To overcome these limitations, digital waste banks have been introduced in several countries, such as Nigeria, Uganda, Zambia, and India. Previous studies show that digital technologies can improve waste collection, sorting, recycling, transaction recording, and community participation [7][8]. Digitalization can

[1]*Corresponding author.
Email addresses: nur.isni31@ui.ac.id (Nirwan), dana@cs.ui.ac.id (Sensuse)
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also increase waste sorting efficiency and reduce the amount of waste disposed of in landfills [9][10]. Nevertheless, the adoption of digital waste banks remains limited and uneven across different regions.

Existing studies have mainly discussed the implementation of digital waste banks, technological features, and user behavior in specific contexts. However, there is still limited understanding of the broader factors influencing digital waste bank adoption across different settings. In addition, previous review studies remain limited and have not systematically synthesized adoption factors from multiple perspectives [11][12].Based on previous studies on the adoption of community-based information and social technology systems, factors such as ease of use (*perceived ease of use*), perceived benefits (*perceived usefulness*), government support, infrastructure availability, public education, and user participation are important aspects in encouraging or inhibiting adoption [13] .

This study differs from previous research because it provides a more comprehensive synthesis of the determinants of digital waste bank adoption across various contexts using a Systematic Literature Review (SLR) approach. The findings are expected to contribute to the development of a more structured understanding of digital waste bank adoption and provide useful insights for researchers, practitioners, and policymakers in designing more effective digital waste management systems. Therefore, a study is needed that aims to find out what factors affect the adoption of digital waste banks**.** To better understand this adoption rate, it is necessary to examine the various factors that affect the adoption of digital waste banks. These factors can come from the side of technology, organization, users, or the external environment. This study aims to identify and classify various factors influencing the adoption of digital waste banks from a wide range of relevant scientific literature using the *Systematic Literature Review* (SLR) approach and to fill this gap by systematically identifying and classifying the factors influencing digital waste bank adoption from technological, organizational, environmental, and user-related perspectives.

Theoretical Framework

Waste bank concept

The basic concept of a waste bank adopts banking principles, where waste that has been sorted, especially inorganic waste, can be "saved" and exchanged for economic incentives such as money or goods [15][14]. Waste banks play an important role in improving environmental quality by reducing waste that ends up in landfills and encouraging recycling practices at the household level, which are major waste producers [16][3] . In addition to environmental benefits, waste banks also have an economic impact, especially for community groups such as housewives, by increasing income and savings through the proceeds of waste sales [15][14]. This concept can also be extended to e-waste management, supporting the circular economy, and engaging various stakeholders such as government, industry, and society [17].

Digital transformation in waste management

Technological developments have encouraged significant innovations in waste management, one of which is through the concept of waste banks. Today, waste banks not only serve as a place to save waste, but have also adopted various digital technologies to increase efficiency, transparency, and community participation[18][19]. The implementation of web- and Android-based applications, management information systems, and integrations *of the Internet of Things* (IoT) and gamification, as applied in the *Circonomy*, has been proven to facilitate the process of sorting, recording, and educating the public[12], [20].

Initially, waste banks emerged as a community-based solution to manage waste through a system of sorting and providing economic incentives. Over time, this concept has developed globally by adopting various digital technologies to improve the efficiency and transparency of waste management. Transformation towards a digital waste bank includes the integration of technologies such as *the Internet of Things (IoT)*, *mobile* and web applications, artificial intelligence (AI), and *blockchain*. The application of this technology aims to improve the process of recording transactions, weighing, and reporting, so that it can minimize manual errors while strengthening system transparency [21].

Then, in the modern digital era, waste management is increasingly advanced with the integration of technologies such as *the Internet of Things (IoT)* through sensors or *Smart Bin*, artificial intelligence (AI) for sorting automation, and *Blockchain* which ensures transaction transparency. This process is also supported by gamification and *mobile* applications that motivate and educate the community. As a result, waste management is now more measurable, fast, and auditable *in* real-time[22], [23].

Best practice waste banks in the world

Countries have different ways of managing waste, demonstrating that there is no single perfect model, but each country finds its own way to get people involved. In African countries such as Nigeria, Uganda, and Zambia, the approach used departs from the daily needs of people. Through simple digital innovations such as *mobile* applications for picking up garbage to giving digital points as an award for residents. Recycling programs in Africa are growing not because of technology alone, but because of a sense of mutual help. Residents feel that their small contributions are appreciated and bring immediate benefits [8]. The United States, particularly New Jersey, takes a different approach. This country does not have the concept of a waste bank, such as a system for saving waste or exchanging waste for credits. However, the digital practices used share the same spirit, which is to make it easier for the community to participate in waste management [24].

China is a highly relevant country for the development of digital waste banks. The country has developed a waste bank such as *the Online e-waste collection platform*, a digital model that allows citizens to schedule pick-up of used electronics, check purchase prices, see the level of danger *E-waste*, and choose an official recycling company. Platforms such as *Love Recycling*, *Baidu Recycle*, or *Household* show how the Internet, *Big Data*, and IoT are used to ensure *E-waste* is collected from residents' homes and processed in the formal sector for collectors [25].

Technology adoption process

The technology adoption process is a stage undertaken by individuals, organizations, and communities when they begin to accept and apply new technology in their lives or operational activities. Understanding this process is important to assess the potential success of a technology and develop a strategy that supports innovation so that it can be well integrated[26] .In general, the process consists of several phases:

a) Knowledge
   At this early stage, a person begins to discover that there is a new technology that may be beneficial to them. This information can come from anywhere, from the media, casual chat, to word-of-mouth from the people closest to you.
b) Persuasion
   Once a person learns about a new technology, they enter the Persuasion stage. In this phase, potential users begin to really weigh whether the technology is worth trying.
c) Decision
   At the Decision stage, a person begins to really decide whether or not they are going to use the technology. In this phase, they weigh the perceived benefits against the potential risks that may arise, then compare them with the costs and effort that must be expended to implement them.
d) Implementation
   Once the decision to use technology has been made, the next step is how it is actually applied in practice. At the implementation stage, users or organizations begin to prepare all the necessary requirements. Starting from hardware, software, to other supporting resources so that the technology can function properly.
e) Confirmation
   Confirmation is the final stage in the technology adoption process. In this phase, users begin to assess the real results of using the technology.

Technology adoption model: technology acceptance model (TAM)

TAM is one of the most well-known and widely used theories to understand and predict how a person accepts and begins to use new technologies. This theory was developed by Fred Davis in the late 1980s [13] , and provide a clear picture of the factors that influence users' interest in adopting a technology. There are two main concepts in TAM, namely perceived utility (PU) and perceived ease of use (PEOU), which form the foundation of this approach[27]. When users feel that a technology can improve their performance, make them more productive, or provide personal benefits, they are more likely to use it [28]. The same is true when the technology is considered easy to understand, easy to use, and can be quickly adapted to existing work routines. In its implementation, researchers and organizations typically collect data through surveys, interviews, or other methods to assess and predict the extent to which users are willing to adopt new technologies. Related user perceptions Utility and Usability Technology is very helpful for stakeholders in recognizing obstacles that may arise and designing strategies to make technology more readily accepted[29], [30] .

Table 1. Definition of variables used in TAM

Name of Variables	Definition
Perceived Usefulness	A person's perception that using an IT system will improve job performance.
Perceived Ease of Use	A person's perception that using an IT system will be effort-free.
Attitude toward Using	An evaluative assessment of a person's behavior on a dimension (e.g., good/bad, harmful/profitable, pleasant/unpleasant).
Behavioral Intention	A person's motivation or willingness to put in the effort to perform the target behavior.
Use	One specific behavior that is of interest and carried out by individuals related to an information technology (IT) system.

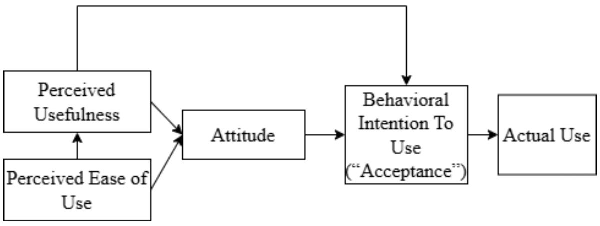

Figure 1. Technology acceptance model (TAM)

Technology adoption model: unified theory of acceptance and use of technology (UTAUT)

To understand how people intend to accept and use technology, the researchers then developed UTAUT. This model was introduced by Venkatesh and his colleagues in 2008 [28] , and combines elements from many previous theories of technology adoption into one clearer, more comprehensive, and trustworthy framework. In UTAUT, there are four main factors that are considered to be very influential in determining whether someone will use technology or not.

The first factor is *Performance Expectation*, i.e. the extent to which a person believes that the technology can help them get the job done better, easier, or more efficiently[32][32]. The second factor is *Effort, Expectation* which has to do with the belief that technology is easy to use and not complicated to learn[33]. The third factor, *Social Influence*, is how the views of people around us, such as colleagues, superiors, or friends, can influence a person's decision to try new technology[34][35] . Sometimes, support or recommendations from trusted people are also very decisive[36], adequate training, technical assistance, and availability of resources can greatly influence a person's decision to start using and implementing technology.

Table 2. Definition of variables used in UTAUT[37]

Name of Variables	Definition
Performance Expectancy	The degree to which a person believes that using the system will help him achieve an improvement in job performance.
Effort Expectancy	The level of convenience associated with using the system.

Social Influence	The degree to which a person feels that the other significant party believes that he or she should use the new system.
Facilitating Conditions	The degree to which one believes that the organizational and technical infrastructure is in place to support the use of the system.
Behavioral Intention to Use	A measure of the strength of a person's intention to perform a certain behavior.

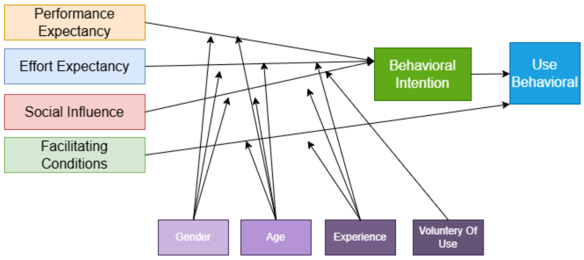

Figure 2. Unified theory of acceptance and use of technology (UTAUT)

TOE framework

The TOE *Framework* is a widely used model to help understand the factors that influence how an organization adopts and integrates technology. This framework was introduced by Tornatzky and Fleischer in the 1990s [38] , and offers a holistic view by looking at how technology, organizational characteristics, and the outside environment interact with each other (Figure 3).

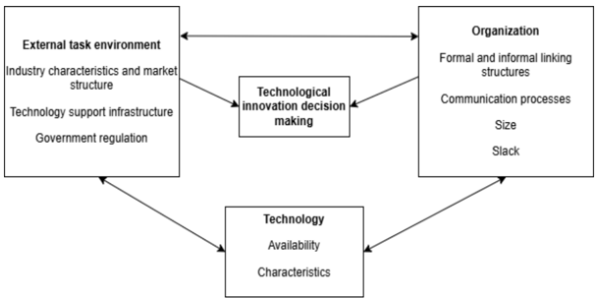

Figure 3. TOE framework

On the *Technology* dimension, *the* TOE *Framework* highlights the various characteristics of the technology to be used [39] . Some of the things assessed include the level *of Complexity*, suitability or *Compatibility* with systems and processes that are already running, and *Trialability*, which is the extent to which the technology can be tried first before it is actually widely applied [40]. In addition, *Observability,* or the ability to see the real benefits of technology, is also an important factor in the adoption decision-making process[41]. Dimensions *organization* focus on internal factors that can affect the success of technology adoption[39] .

To strengthen the theoretical contribution of this study, TAM, UTAUT, and TOE are integrated into a unified framework for explaining digital waste bank adoption. TAM explains adoption from the user perspective through perceived usefulness and perceived ease of use. UTAUT complements this by including social influence and facilitating conditions, which reflect the role of community support, infrastructure, and technical readiness. Meanwhile, TOE explains adoption from the organizational and environmental perspectives, including technological readiness, organizational support, and external factors such as government policies and stakeholder collaboration.Using *the* TOE *Framework* helps organizations assess the technology adoption process in a more structured manner. Both researchers and practitioners can leverage this framework to identify important factors that can support or hinder successful technology implementation. By understanding the interconnectedness between technology, organizational, and environmental aspects, decision-makers can design technology implementation strategies that are more targeted[41], [42] .

Various case studies and empirical studies show that *the* TOE *Framework* can be used in many technological contexts and different types of industries[39] . This model is able to explain the complexity of the adoption process starting from the use of *Cloud Computing* and *Artificial Intelligence* in the business world [43] , to the application of *Electronic Health Records* in the health sector[44]. *The* MORE *Framework* also pays attention to the diversity of technology users, both in terms of cultural differences, age group[45] as well as the size of the organization[44], [45], [47].

METHODS

Research Approach

This study employed a Systematic Literature Review (SLR) approach to identify, evaluate, and synthesize previous studies related to digital waste bank adoption. The review process followed the PRISMA guidelines and Kitchenham framework (versions 1.0 and 2.3), which consist of three main stages: planning, conducting, and reporting. The use of PRISMA improves transparency and reproducibility in the literature selection process.

To provide a clearer overview of the research procedure, this study presents a flowchart of the SLR process, including the stages of identification, screening, eligibility, and final inclusion of the selected studies as shown as Figure 4.

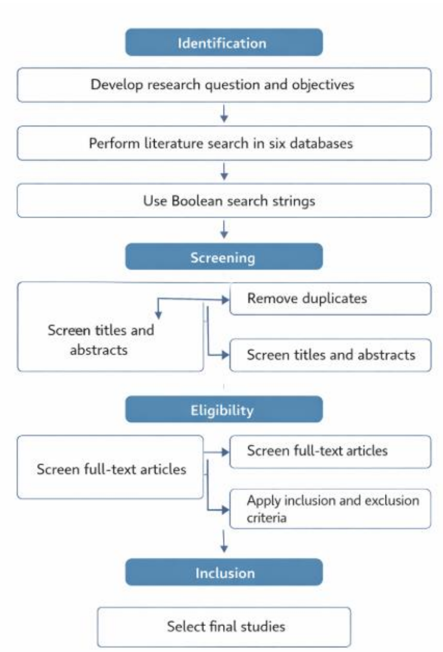

Figure 4. Flowchart of the systematic literature review process

Planning and Protocol Review Stage

At this stage, a review protocol is prepared to maintain the consistency of the literature search through the following criteria:

a) PICOC Criteria: Used to formulate research questions with the elements *of Population* (waste bank), *Intervention* (influence factor), *Outcome* (list of factors and trends), and *Context* (digital waste bank).

b) Research Questions:
   1. RQ1: What are the factors influencing the adoption of waste banks?
   2. RQ2: What are the trends in digital waste banks?

Data Source Search Strategy
Literature searches were conducted using Boolean Search strategies (a combination of keywords such as Digital Waste Bank, Adoption, etc.) on six reputable academic databases, namely Proquest, Scopus, IEEE explore, Science Direct, Taylor & Francis, and ACM Digital Library. The literature search was conducted using Boolean operators, namely “AND” and “OR”, to combine keywords related to digital waste banks, technology adoption, and influencing factors. The search strings were adapted to the characteristics of each database.

In this stage, assess the quality of the paper. Papers were assessed based on eight criteria. Papers are considered to be of good quality if they meet 7 of the 8 criteria provided. A description of the quality test criteria can be seen in Table 3.

Table 3. Quality test checklist

Checklist	*Checklist* Questions
C1	Does the article clearly describe the purpose of the research?
C2	What does the article say about the literature review, background, and context of the research?
C3	Does the article feature related work from previous research to show the main contribution of the research?
C4	Does the article describe the proposed architecture or methodology used?
C5	Does the article have research results?
C6	Does the article present conclusions that are relevant to the purpose of the research?
C7	Does the article recommend future work or improvements for the future?
C8	Indexed in Scopus (Q1/Q2/Q3/Q4/unindexed)

Inclusion and Exclusion Criteria
Data from literature that passed the selection were collected using Microsoft Excel. The data synthesis process is carried out by summarizing the findings of factors and trends into a table to answer the research questions that have been asked previously. To ensure the relevance and quality of the selected studies, this review applied predefined inclusion and exclusion criteria. These criteria were used during the title, abstract, and full-text screening stages to determine whether an article was suitable for further analysis. The detailed inclusion and exclusion criteria used in this study are presented in Table 4.

Table 4. Inclusion and Exclusion Criteria for Literature Selection

Criteria Type	Criteria
Inclusion	Articles published between 2020 and 2025
Inclusion	Articles written in English
Inclusion	Studies focusing on digital waste banks, online recycling systems, or digital waste management
Inclusion	Studies discussing technology adoption factors, user behavior, organizational readiness, or environmental influences
Inclusion	Articles published in peer-reviewed journals or conference proceedings
Exclusion	Articles not related to digital waste management or waste bank systems
Exclusion	Articles focusing only on technical system development without discussing adoption factors
Exclusion	Non-English articles
Exclusion	Editorials, book chapters, reports, theses, and non-peer-reviewed documents
Exclusion	Articles with incomplete full text or insufficient methodological information

PRISMA Literature Selection Process
The literature selection process followed the PRISMA flow. Initially, 549 articles were identified from six databases. After duplicate removal and title–abstract screening, 103 articles were retained. Full-text screening was then conducted based on the inclusion and exclusion criteria, resulting in 22 final studies for analysis. The literature selection process was carried out systematically using the PRISMA approach to ensure transparency and reproducibility. PRISMA presents the stages of identification, screening, eligibility assessment, and final inclusion of the selected studies.

RESULT AND DISCUSSION

Results of Literature Selection

The literature selection process was conducted through identification, screening, eligibility, and inclusion stages following the PRISMA approach. Initially, 549 articles were identified from six databases, namely ProQuest, Scopus, IEEE Xplore, ScienceDirect, Taylor & Francis, and ACM Digital Library. After removing duplicate records, 466 articles remained for screening. At the title and abstract screening stage, 363 articles were excluded because they were not relevant to the topic. Subsequently, 103 full-text articles were assessed for eligibility, and 81 articles were excluded because they did not meet the inclusion criteria. Finally, 22 studies were included in the qualitative synthesis.

Table 4 shows that ProQuest contributed the largest number of final studies, with 12 articles, followed by ScienceDirect with 7 articles, Scopus with 2 articles, and Taylor & Francis with 1 article. No articles from IEEE Xplore and ACM Digital Library met the inclusion criteria. This distribution indicates that research on digital waste bank adoption is still dominated by studies in sustainability, environmental management, and social innovation rather than technical system development.

Table 4. Articles of literature selection

Database	Identified Records	Screened Records	Final Included Studies
ProQuest	232	53	12
Scopus	113	8	2
IEEE Xplore	251	4	0
ScienceDirect	240	25	7
Taylor & Francis	15	4	1
ACM Digital Library	178	9	0
Total	549	103	22

The selected studies were published between 2020 and 2025. The number of publications increased from 2 studies in 2020 to 5 studies in 2022, showing growing interest in digital waste management. Although the number of publications slightly fluctuated after 2022, the topic continues to receive attention due to the increasing use of digital technology in waste collection, recycling, and community participation systems. The literature selection process was conducted systematically using the PRISMA approach to improve transparency and reproducibility. Figure 5 illustrates the stages of identification, screening, eligibility assessment, and final inclusion of the selected studies.

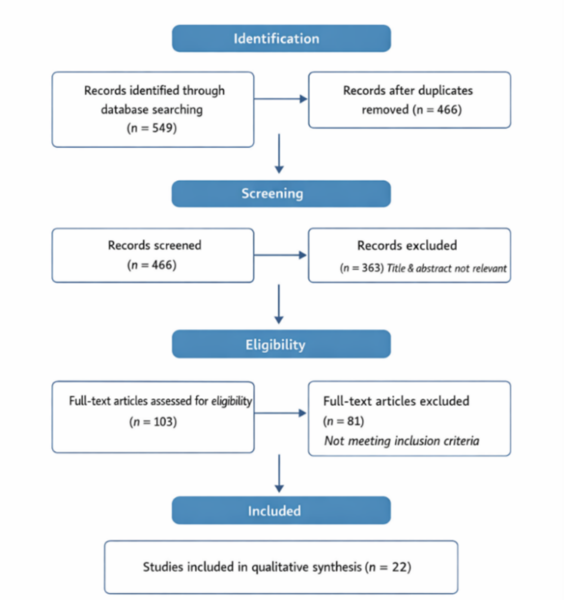

Figure 5. PRISMA Flow diagram of literature selection process

The literature selection process followed the PRISMA approach to ensure transparency and reproducibility. Initially, 549 records were identified from six databases. After duplicate removal, 466 records remained for screening. A total of 363 records were excluded during the title and abstract screening stage because they were not relevant to digital waste bank adoption. Furthermore, 103 full-text articles were assessed for eligibility, and 81 articles were excluded because they did not meet the inclusion criteria. Finally, 22 studies were included in the qualitative synthesis. These selected studies became the basis for identifying the dominant factors influencing digital waste bank adoption, technology trends, and country mapping in the research field.

Data Synthesis Results

The synthesis of the 22 selected studies identified 26 factors that influence the adoption of digital waste banks. These factors can be grouped into four categories: technology, organization, environment, and people. Technology-related factors include transaction transparency, ease of use, digital facilities, design, payment security, data security, quality of service, data transparency, and efficiency. Based on Tables 5, ease of use, transaction transparency, and digital facilities are the most frequently mentioned factors. Ease of use is closely related to effort expectancy in UTAUT and perceived ease of use in TAM. Users are more likely to adopt digital waste bank systems when the applications are simple, easy to understand, and compatible with their daily activities.

Table 5. Factors Influencing Digital Waste Bank Adoption Based on The Model/Training Framework.

No	Category / Model	Factors	References
1	Performance Expectancy (PE)	Transaction transparency	[7], [47], [48], [49], [50], , [52]
2	Effort Expectancy (EE)	Ease of use	[10], [12], [47], [50], [52], [53], [54]
3	Effort Expectancy (EE)	Digital facilities	[8], [12], [25], [47], [53], [56], [57]
4	Effort Expectancy (EE)	Design	[10], [58]
5	Perceived Risk (PR)	Payment security	[58]
6	Perceived Risk (PR)	Data security	[7], [9], [54], [58]
7	Performance Expectancy (PE)	Quality of service	[10], [49], [57], [58], [59]
8	Performance Expectancy (PE)	Data transparency	[7], [10], [48], [49], [60]
9	Performance Expectancy (PE)	Efficiency	[7], [25], [52]
10	Organization	Infrastructure	[8], [12], [47]
11	Organization	Integration of formal and informal sectors	[56]
12	Organization	Innovation	[8]
13	Organization	Human resources	[8]
14	Performance Expectancy (PE)	Environmental benefits	[24], [25], [49], [54], [56]
15	Social Influence (SI)	Social encouragement	[47], [49], [54], [60]
16	Facilitating Conditions (FC)	Environmental awareness	[48], [60], [61]
17	Organization	Regulation	[8], [12], [50], [57]
18	Organization	Policy	[57], [61]
19	Price Value (PV)	Pricing	[58], [59]
20	Social Influence (SI)	Stakeholder support	[9], [10], [47], [52]
21	Price Value (PV)	Economic incentives	[8], [9], [12], [24], [25], [47], [49], [50], [53], [49], [56], [59], [61]
22	Moderator/Demographics (UTAUT)	Age	[24], [47], [59], [61]
23	Moderator/Demographics (UTAUT)	Education	[24], [47], [59], [60], [61]
24	Moderator/Demographics (UTAUT)	Revenue	[59], [60], [61]
25	Moderator/Demographics (UTAUT)	Domicile	[25], [61]
26	Facilitating Conditions (FC)	Education/training	[8], [24], [47], [48], [52], [59], [60]

Based on Table 5, the most dominant factors influencing digital waste bank adoption are ease of use, transaction transparency, economic incentives, and infrastructure readiness. Ease of use is strongly associated with users' willingness to adopt digital platforms because systems that are simple and easy to understand reduce barriers to technology acceptance. Similarly, transaction transparency and data security are essential to build trust, particularly in systems involving digital payments and online transaction records. Economic incentives also emerged as one of the strongest drivers because users are more likely to participate when they receive direct financial benefits from waste collection and recycling activities. In addition, infrastructure readiness, stakeholder support, and government regulations play an important role in ensuring that digital waste bank systems can operate effectively. These findings indicate that successful adoption depends not only on technological features but also on organizational support, social influence, and environmental conditions. The findings are consistent with TAM, UTAUT, and TOE theories. TAM explains the importance of perceived usefulness and ease of use, while UTAUT emphasizes social influence, facilitating conditions, and performance expectancy. Meanwhile, the TOE framework complements both theories by highlighting the role of organizational readiness and environmental support in technology adoption.

Country Mapping in Digital Waste Bank Research

The geographical distribution of studies shows that China is the most dominant country in digital waste bank research, contributing 12 publications. This finding indicates that China has become the leading country in implementing e-waste platforms, online recycling systems, and smart city-based waste management. India contributed 2 studies, while Indonesia, Bangladesh, Malaysia, Norway, and several other regions contributed one study each.

Table 8 shows that e-waste platforms, recycling applications, smartphone-based systems, and online recycling services are the most common technology trends in digital waste bank research. E-waste platforms are particularly dominant because they allow users to schedule waste collection, monitor recycling transactions, and receive economic incentives digitally. The integration of mobile applications, IoT, and digital payment systems suggests that future digital waste bank systems will become more interactive, transparent, and user-oriented.

Table 6. Technology type trends

Trends of Technology Types	References
Smartphone apps, food waste	[10], [50]
E-waste platform	[25], [51]–[56]
Smart recycling	[57]
Digital recycling	[8], [9], [12], [52]
Internet recycling platform	[7]
Recycling system	[9]
Waste management	[58]
Commercial waste bank	[59]
Online recycling	[60]
Recycling app	[24], [61]

Table 6 shows that e-waste platforms are the most dominant technology trend in digital waste bank research, appearing in seven studies. This indicates that researchers increasingly focus on online platforms that facilitate waste collection, transaction recording, and recycling activities. Smartphone applications and digital recycling systems are also commonly discussed because they improve user accessibility and encourage community participation. The findings suggest that technologies integrated with mobile applications, digital payment systems, and IoT are more likely to support digital waste bank adoption because they provide convenience, transparency, and efficiency. In contrast, technologies with more complex features may face barriers related to usability, infrastructure, and digital literacy.

The dominance of e-waste platforms in China reflects the country's strong focus on formal recycling systems and smart city initiatives. Meanwhile, studies from countries such as Indonesia, Malaysia, and

Norway tend to focus more on smartphone applications, gamification, and community-based recycling systems. This comparison indicates that technology trends vary depending on local infrastructure, policy support, and user characteristics.

CONCLUSION

This study concludes that the adoption of digital waste banks is influenced by 26 factors grouped into four categories: technology, organization, environment, and people. Among these factors, ease of use, transaction transparency, economic incentives, infrastructure readiness, and data security emerged as the most dominant determinants of adoption. Technology-related factors play an important role in building trust, efficiency, and convenience, while organizational readiness, government support, and user characteristics determine the success of implementation. Theoretically, this study contributes by integrating TAM, UTAUT2, TOE, and Perceived Risk perspectives into a more comprehensive framework for explaining digital waste bank adoption. TAM and UTAUT2 explain user perceptions and behavioral intentions, while TOE highlights the role of organizational and environmental readiness. Perceived Risk complements these theories by emphasizing the importance of privacy, payment security, and trust.

Practically, the findings suggest that policymakers should provide stronger regulations, incentives, and public awareness programs to encourage adoption. Waste bank managers should improve infrastructure, transaction transparency, and technical support, while technology developers should design applications that are simple, secure, and user-friendly. Future research can further examine the relationships among these factors through empirical methods such as surveys, SEM, or regression analysis. Future studies may also compare adoption patterns across countries, investigate the role of digital literacy, and explore the integration of emerging technologies such as IoT, blockchain, and artificial intelligence in digital waste bank systems.

REFERENCES

[1] P. Agamuthu dan H. J. Law, "Do we need landfills?," *Waste Manag. Res.*, vol. 38, no. 10, hal. 1075–1077, 2020, doi: 10.1177/0734242X20943036.

[2] H. I. Abdel-Shafy dan M. S. M. Mansour, "Solid waste issue: Sources, composition, disposal, recycling, and valorization," *Egypt. J. Pet.*, vol. 27, no. 4, hal. 1275–1290, 2018, doi: 10.1016/j.ejpe.2018.07.003.

[3] D. Wulandari, S. H. Utomo, dan B. S. Narmaditya, "Waste bank: Waste management model in improving local economy," *Int. J. Energy Econ. Policy*, vol. 7, no. 3, hal. 36–41, 2017.

[4] D. C. Hestiriniah dan T. Austin, "The Effectiveness of the Implementation of the Program 3R (Reduce, Reuse, Recycle) In Waste Treatment In the District We the City of Palembang," *J. Public Adm. Stud.*, vol. 7, no. 1, hal. 15–20, 2022, doi: 10.21776/ub.jpas.2022.007.01.3.

[5] S. B. Sabihi, W. Husain, dan S. M. Wantu, "THE EFFECTIVENESS OF THE 3R (REDUCE, REUSE, AND RECYCLE) PROGRAM IMPLEMENTED THROUGH WASTE BANKS IN EMPOWERING THE COMMUNITY ECONOMY IN GORONTALO (A Case Study of Parent Waste Bank in Wongkaditi Timur Kota Utara Gorontalo)," *Public Policy J.*, vol. 1, no. 2, hal. 75–84, 2021, doi: 10.37905/ppj.v1i2.481.

[6] A. Abdillah, I. Widianingsih, R. A. Buchari, dan H. Nurasa, "Trends community-based waste management practice through waste bank in Indonesia: towards local environmental resilience," *Local Environ.*, vol. 29, no. 8, hal. 1004–1007, 2024, doi: 10.1080/13549839.2024.2353043.

[7] T. Liu *et al.*, "Factors Influencing Residents' Behavior in Internet Recycling: From the Perspective of the Adoption of New Technology," *Int. J. Environ. Res. Public Health*, vol. 19, no. 10, hal. 6166, 2022, doi: https://doi.org/10.3390/ijerph19106166.

[8] M. Oyinlola *et al.*, "Digital innovations for transitioning to circular plastic value chains in Africa," *Africa J. Manag.*, vol. 8, no. 1, hal. 83–108, 2022, doi: 10.1080/23322373.2021.1999750.

[9] T. Chu, J. Zhang, Y. Zhong, W. Jia, dan B. Zhang, "An approach to formalization of WEEE informal collectors: Collection model under a membership-based community," *Heliyon*, hal. e38992, 2024, doi: https://doi.org/10.1016/j.heliyon.2024.e38992.

[10] N. M. Tuah, S. K. A. Ghani, S. Darham, dan S. Sura, "A Food Waste Mobile Gamified Application Design Model using UX Agile Approach in Malaysia," *Int. J. Adv. Comput. Sci. Appl.*, vol. 13, no. 5, 2022, doi: https://doi.org/10.14569/IJACSA.2022.0130526.

[11] D. W. Sukma Nirad, A. D. Kartika, A. K. Vadreas, W. Amelia, S. Rahmah, dan H. Andre, "Design of Socio-Technopreneur Platform Model as Innovative Solution to Environmental and Economic Problems," in *2022 International Symposium on Information Technology and Digital Innovation*

(ISITDI), 2022, hal. 96–100, doi: 10.1109/ISITDI55734.2022.9944530.
[12] V. Tundjungsari, B. P. D. Putranto, M. B. Ulum, dan N. Anwar, "An Integrated Model for Circular Waste Management Using the Internet of Things, Semantic Web, and Gamification (Circonomy): Case Study in Indonesia," *JMIR Serious Games*, vol. 13, 2025, doi: https://doi.org/10.2196/66781.
[13] F. D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Q. Manag. Inf. Syst.*, vol. 13, no. 3, hal. 319–339, 1989, doi: 10.2307/249008.
[14] A. Nugroho, "WASTE BANK CONCEPT: Having Savings and Income from Waste," *Akad. J. Mhs. Humanis*, vol. 2, no. 2, hal. 46–54, 2022, doi: 10.37481/jmh.v2i2.468.
[15] N. A. A. Abus, A. Suriadi, T. Lubis, A. A. Abus, dan A. F. Abus, "Waste Bank management as an alternative community-based waste management strategy in Langsa City, Aceh Province," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 1375, no. 1, hal. 12007, Jul 2024, doi: https://doi.org/10.1088/1755-1315/1375/1/012007.
[16] A. Budiyarto, B. Clarke, dan K. Ross, "Overview of waste bank application in Indonesian regencies," *Waste Manag. Res.*, vol. 43, no. 3, hal. 306–321, 2025, doi: 10.1177/0734242X241242697.
[17] D. Rimantho, S. Syaiful, Nurfaida, dan U. Sulandari, "Electronic waste bank model as a solution for implementing circular economy: Case study DKI Jakarta-Indonesia," *Front. Built Environ.*, vol. 8, no. October, hal. 1–13, 2022, doi: 10.3389/fbuil.2022.1030196.
[18] S. R. Hasanah dan E. Purwanda, "Waste Bank Innovation Management Using Digital Innovation System Management in Cicadas Village, Gunung Putri District, Bogor Regency," *Maj. Bisnis IPTEK*, vol. 17, no. 1, hal. 10–22, 2024, doi: 10.55208/askzds15.
[19] M. N. Utomo, S. R. Pratiwi, dan F. H. Setyawan, "Improving Economic Efficiency Through Waste Recycling And Modernizing Waste Bank Management," *Int. J. Community Serv.*, vol. 4, no. 1, hal. 43–46, 2024, doi: 10.51601/ijcs.v4i1.249.
[20] K. A. P. Zeva, M. Hasibuan, F. Firmansyah, dan S. Sutedi, "Revolutionizing Waste Management: The Garbage Bank Solution and Its IT-Driven Implementation for Eco-Friendly Hygiene," *PIKSEL Penelit. Ilmu Komput. Sist. Embed. Log.*, vol. 11, no. 2, hal. 349–360, 2023, doi: 10.33558/piksel.v11i2.6951.
[21] D. A. Kristiyanti *et al.*, "Digital transformation in waste management : Enhancing financial transaction efficiency at a waste bank," vol. 9, no. August, hal. 459–471, 2024.
[22] N. Onur, H. Alan, H. Demirel, dan A. R. Köker, "Digitalization and Digital Applications in Waste Recycling: An Integrative Review," *Sustain.*, vol. 16, no. 17, hal. 1–26, 2024, doi: 10.3390/su16177379.
[23] A. Maiurova *et al.*, "Promoting digital transformation in waste collection service and waste recycling in Moscow (Russia): Applying a circular economy paradigm to mitigate climate change impacts on the environment," *J. Clean. Prod.*, vol. 354, no. March, hal. 131604, 2022, doi: 10.1016/j.jclepro.2022.131604.
[24] M. Sozoniuk, J. Park, dan N. Lumby, "Investigating Residents' Acceptance of Mobile Apps for Household Recycling: A Case Study of New Jersey," *Sustain.*, vol. 14, no. 17, 2022, doi: 10.3390/su141710874.
[25] S. Ramzan, C. Liu, Y. Xu, H. Munir, dan B. Gupta, "The adoption of online e-waste collection platform to improve environmental sustainability: an empirical study of Chinese millennials TT - Online e-waste collection platform," *Manag. Environ. Qual.*, vol. 32, no. 2, hal. 193–209, 2021, doi: https://doi.org/10.1108/MEQ-02-2020-0028.
[26] D. W. Stacks, M. B. Salwen, dan K. C. Eichhorn, *An Integrated Approach to Communication Theory and Research*. .
[27] V. Venkatesh dan F. D. Davis, "A Theoretical Extension of the Technology Acceptance Model : Four Longitudinal Field Studies," hal. 186–204, 2000.
[28] V. Venkatesh, "Technology Acceptance Model 3 and a Research Agenda on Interventions," vol. 39, no. 2, hal. 273–315, 2008.
[29] A. Granic dan N. Marangunic, "Technology acceptance model : a literature review from 1986 to 2013," hal. 81–95, 2015, doi: 10.1007/s10209-014-0348-1.
[30] H. Taherdoost, "A review of technology acceptance and adoption models and theories A review of technology acceptance and adoption models Costing models for capacity optimization Trade-off between used capacity operational efficiency," *Procedia Manuf.*, vol. 22, hal. 960–967, 2018, doi: 10.1016/j.promfg.2018.03.137.
[31] R. J. Holden dan B. Karsh, "The Technology Acceptance Model : Its past and its future in health care," *J. Biomed. Inform.*, vol. 43, no. 1, hal. 159–172, 2010, doi: 10.1016/j.jbi.2009.07.002.

[32] Y. K. Dwivedi, N. P. Rana, A. Jeyaraj, M. Clement, dan M. D. Williams, "Re-examining the Unified Theory of Acceptance and Use of Technology (UTAUT): Towards a Revised Theoretical Model," hal. 719–734, 2019, doi: 10.1007/s10796-017-9774-y.
[33] A. A. Alalwan, Y. K. Dwived, N. P. Rana, dan Michael D. Williams, "Consumer Adoption of Mobile banking in Jordan: Examining the Role of Usefulness, Ease of Use, Perceived Risk and Self-efficacy," 2016.
[34] S. S. Al-gahtani, G. S. Hubona, dan J. Wang, "Information technology (IT) in Saudi Arabia : Culture and the acceptance and use of IT," vol. 44, hal. 681–691, 2007, doi: 10.1016/j.im.2007.09.002.
[35] M. D. Williams, "The Unified Theory of Acceptance and Use of Technology (UTAUT): A Literature Review," 2015.
[36] V. Venkatesh, J. Y. L. Thong, X. Xu, dan R. Citation, "Unified Theory of Acceptance and Use of Technology A Synthesis Unified Theory of Acceptance and Use of Technology : A Synthesis and the Road Ahead and the Road Ahead," vol. 17, no. 5, 2016, doi: 10.17705/1jais.00428.
[37] V. Venskatesh, M. G. Morris, G. B. Davis, dan F. D. Davis, "User acceptance of information technology toward a unified view," hal. 425–478, 2003.
[38] L. G. Tornatzky dan M. Fleischer, "The processes of technological innovation."
[39] J. Baker, "The Technology–Organization–Environment Framework," no. September 2011, 2018, doi: 10.1007/978-1-4419-6108-2.
[40] T. Oliveira dan M. F. Martins, "Literature Review of Information Technology Adoption Models at Firm Level," no. January 2011, 2014.
[41] Z. Kevin, K. L. Kraemer, S. Xu, dan J. Dedrick, "Information Technology Payoff in E-Business Environments : An International Perspective on Value Creation of E-Business in the Financial Services Industry," no. June, 2004, doi: 10.1080/07421222.2004.11045797.
[42] T. Chu, J. Ma, Y. Zhong, H. Sun, dan W. Jia, "Shared recycling model for waste electrical and electronic equipment based on the targeted responsibility system in the context of China," *Humanit. Soc. Sci. Commun.*, vol. 11, no. 308, 2024, doi: 10.1057/s41599-024-02901-0.
[43] A. Granic, "Technology Acceptance and Adoption in Education ´," hal. 183–197, 2023, doi: 10.1007/978-981-19-2080-6.
[44] P. Y. . Chau dan K. Y. Tam, "Factors affecting the adoption of open systems : An exploratory study," hal. 1–24.
[45] J. Lian dan D. C. Yen, "Online shopping drivers and barriers for older adults : Age and gender differences," *Comput. Human Behav.*, vol. 37, hal. 133–143, 2014, doi: 10.1016/j.chb.2014.04.028.
[46] H. Ongori dan S. O. Migiro, "Information and communication technologies adoption in SMEs : literature review," vol. 2, no. 1, hal. 93–104, 2025, doi: 10.1108/17561391011019041.
[47] D. S. Hidayat, D. I. Sensuse;, D. Elisabeth;, dan L. M. Hasani, "Conceptual model of knowledge management system for scholarly publication cycle in academic institution," *VINE J. Inf. Knowl. Manag. Syst.*, vol. 55, no. 1, 2025, doi: https://doi.org/10.1108/VJIKMS-08-2021-0163.
[48] W. Guo, "Identifying Factors Influencing Consumers ' Choice of Disposal Channels Regarding Children ' s Clothing in China," *Sustain. Artic.*, vol. 15, no. 12628, hal. 1–17, 2023, doi: https://doi.org/10.3390/ su151612628.
[49] I. W. Koko dan C. Lee, "Achieving zero waste for landfills by employing adaptive municipal solid waste management services," *Ecol. Indic.*, vol. 165, no. November 2023, hal. 112191, 2024, doi: 10.1016/j.ecolind.2024.112191.
[50] T. F. Mathisen dan F. R. Johansen, "The Impact of Smartphone Apps Designed to Reduce Food Waste on Improving Healthy Eating, Financial Expenses and Personal Food Waste: Crossover Pilot Intervention Trial Studying Students' User Experiences," *JMIR Form. Res.*, vol. 6, no. 9, Sep 2022, doi: https://doi.org/10.2196/38520.
[51] D. Zhang, X. Cui, X. Fan, dan Y. Wu, "Study on the Factors Affecting Consumers' Participation in Regulated Recycling of Waste Lead-Acid Batteries: Practice Research from China," *Sustainability*, vol. 14, no. 21, hal. 14353, 2022, doi: https://doi.org/10.3390/su142114353.
[52] M. Guo dan W. Huang, "Consumer Willingness to Recycle The Wasted Batteries of Electric Vehicles in the Era of Circular Economy," *Sustainability*, vol. 15, no. 3, hal. 2630, 2023, doi: https://doi.org/10.3390/su15032630.
[53] Q. Sun, H. Yao, C. Wang, Y. Xiang, dan J. Ma, "Why Residents Don't Do What They Say: Exploring the Intention–Behavior Gap in E-Waste Online Recycling Participating," *Sustainability*, vol. 16, no. 19, hal. 8292, 2024, doi: https://doi.org/10.3390/su16198292.
[54] L. Zhang, W. Ran, S. Jiang, H. Wu, dan Z. Yuan, "Understanding consumers' behavior intention

of recycling mobile phone through formal channels in China: The effect of privacy concern," *Resour. Environ. Sustain.*, vol. 5, hal. 100027, 2021, doi: https://doi.org/10.1016/j.resenv.2021.100027.
[55] P. Chakraborty *et al.*, "Electronic waste recycling in South Asia: Overview of associated risks from a cocktail of micro-pollutants and recommendations for sustainable e-waste management," *J. Hazard. Mater. Adv.*, vol. 18, hal. 100715, 2025, doi: https://doi.org/10.1016/j.hazadv.2025.100715.
[56] M. J. Alam, C. Molla, S. M. Misbauddin, M. A. Hossen, dan U. Golder, "Determinants of adopting web-based systems for e-waste management and ensuring sustainable environment: Evidence from Bangladesh," *Clean. Waste Syst.*, vol. 11, hal. 100282, 2025, doi: https://doi.org/10.1016/j.clwas.2025.100282.
[57] J. He, S. Wu, H. Yu, dan C. Bao, "Optimizing Municipal Solid Waste Management in Hangzhou: Analyzing Public Willingness to Pay for Circular Economy Strategies," *Sustainability*, vol. 17, no. 7, hal. 3269, 2025, doi: https://doi.org/10.3390/su17073269.
[58] I. W. K. Suryawan dan C.-H. Lee, "Exploring citizens' cluster attitudes and importance-performance policy for adopting sustainable waste management practices," *Waste Manag. Bull.*, vol. 2, no. 3, hal. 204–215, 2024, doi: https://doi.org/10.1016/j.wmb.2024.07.011.
[59] S. A. Syed Ali, I. M. S. K. Ilankoon, L. Zhang, dan J. Tan, "Packaging plastic waste from e-commerce sector: The Indian scenario and a multi-faceted cleaner production solution towards waste minimisation," *J. Clean. Prod.*, vol. 447, hal. 141444, 2024, doi: https://doi.org/10.1016/j.jclepro.2024.141444.
[60] L. Shen, R. Fan, Z. Yu, dan Y. Wang, "The Service Strategy and Influencing Factors of Online Recycling of Used Mobile Phones," *Mathematics*, vol. 9, no. 21, hal. 2690, 2021, doi: https://doi.org/10.3390/math9212690.
[61] Y. Ma, Y. Zhao, X. Wang, C. Feng, X. Zhou, dan B. Lev, "Integrated BWM-Entropy weighting and MULTIMOORA method with probabilistic linguistic information for the evaluation of Waste Recycling Apps," *Appl. Intell.*, vol. 53, no. 1, hal. 813–836, Jan 2023, doi: https://doi.org/10.1007/s10489-022-03377-8.