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DIGITAL PLATFORMS AND SOCIAL MEDIA FOR WASTE MANAGEMENT: A NARRATIVE REVIEW OF CURRENT TRENDS, CHALLENGES, AND FUTURE PROSPECTS

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Abstract:

Rapid urbanisation and the generation of large amounts of municipal solid waste present serious operational and ecological challenges for modern cities and require a shift toward digitally mediated circular economies. This narrative review synthesises the multidisciplinary scholarly landscape on the role of digital platforms and social media networks in promoting waste management operations, public communication, and citizen engagement. This paper analyses peer-reviewed literature indexed in the Scopus database in the period 2015-2025 to explore how emerging digital technologies and platforms, such as sensors of the Internet of Things (IoT), artificial intelligence (AI), and interactive social networks, can provide a substantial shift in waste governance from a reactive disposal model to proactive data-driven resource recovery ecosystems. Although digital solutions are increasingly adopted, existing research has focused mainly on technical features, while socio-behavioural, social, and governance dimensions remain less integrated. This review synthesises the current literature to address this gap across four key domains: innovations in smart infrastructure, technology-enabled collaboration, behavioural interventions in social media, and structural barriers to implementation. Key findings reveal that digital platforms can greatly reduce communication costs, enable local civic engagement, and improve collection logistics. However, regional digital divides, organisational siloes, data privacy issues, and overreliance on short-term self-reported performance indicators (e.g., reported participation instead of long-term

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operational or environmental benefits) constrain the capacity to deploy at scale across municipal systems. The review therefore further develops an integrated socio-technical framework through a critical evaluation of these tensions linking technical engineering models with socio-cognitive behavioural theories and multi-level governance frameworks. In practice, this study provides evidence-based recommendations to municipal authorities and platform developers to design digital applications that are data-transparent and user-centred. Ultimately, this paper suggests that technology itself is not the solution to waste management. Instead, digital innovation must be combined with inclusive governance, citizen engagement, integration of the informal sector and measurable long-term outcomes.

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Keywords:

Digital Platforms, Social Media, Waste Management, Circular Economy, Smart City Infrastructure, Citizen Engagement, Narrative Review

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Introduction

The world is generating more municipal solid waste than ever before, fuelled by rapid urbanisation, population growth, and changing linear consumption patterns that endanger public health, ecological integrity, and urban infrastructure. These urgent environmental pressures have led circular economy models to focus more on resource recovery, waste minimisation, and decentralised recycling frameworks (Seyyedi et al., 2024; Sharma et al., 2025). Meanwhile, the wide proliferation of Information and Communication Technologies (ICTs) and Internet of Things (IoT) architecture has also augmented the use of digital platforms and social media applications in waste management ecosystems (Gulyamov, 2024; Migliore et al., 2020). These digital instruments enable real-time data collection, optimise reverse logistics, and generate new communication channels between local authorities, industry actors, and civil society (Mersico et al., 2025; Mumba et al., 2021). As such, digital technology is evolving from a tool for operational efficiency to a central driver of participatory environmental governance and sustainable urban transformation.

The existing academic literature on digital platforms and social media in waste management is scattered across many axes, despite growing institutional enthusiasm. Most importantly, the main research gap is that the literature studies digital waste management almost exclusively from a technical perspective, with behavioural, social, and governance aspects far less integrated. The conceptual integration is particularly narrow as scholars often evaluate technological tools such as artificial intelligence and blockchain in isolation from the socio-behavioral dynamics that drive platform adoption (Gaikwad & Gund, 2025; Rayhan et al.,

2026). Sectoral evidence is also fragmented. For example, the academic focus is on consumer e-waste recycling and urban food waste communication, whereas industrial scraps and agricultural waste streams are addressed in a patchy manner (Barbosa & Gomes, 2025; Kasonta et al., 2025; Ramasamy et al., 2025). In addition, the inconsistent terminology hampers the academic debate, since terms such as "digitalisation," "smart waste systems," and "virtual waste communities" are often used interchangeably without standardised operational definitions (Onur et al., 2024; Redyantanu et al., 2022). Moreover, the implementation models vary across geographical and socio-economic jurisdictions, leading to considerable operational bottlenecks due to the digital divide, infrastructure financing gaps, and different local governance structures (Firmansyah & Sadono, 2025; Seyyedi et al., 2024).

These empirical and theoretical gaps point to important gaps in policy, in academic knowledge, and in frontline practice. Politically, the absence of a common framework to regulate the integration of digital platforms, data privacy and multi-stakeholder coordination hinders the smooth collaboration between government, enterprise and civil society (Mersico et al., 2026; Mumba et al., 2021). In practice, municipal operators and platform developers deal with user engagement, public trust and equitable access across different demographic groups (Firmansyah & Sadono, 2025; Rayhan et al., 2026). This lack of a systematic synthesis prevents scholars from understanding how digital devices shape citizen behaviour change and co-create value in different municipal contexts (Mersico et al., 2026; Onur et al., 2024). Therefore, a narrative review is urgently needed to synthesise the scattered multidisciplinary research, to clarify ambiguous terminology, to evaluate operational challenges and to delineate scalable governance trajectories.

In this narrative review, we seek to systematically synthesise contemporary trends, persistent operational challenges and emerging prospects for the integration of digital platforms and social media in global waste management systems to remedy these important intellectual shortcomings. This paper discusses the role of digital interfaces in enabling citizen engagement, collaborative resource recovery and circular economy transitions and unpacks the structural barriers to implementing such digital interfaces including the digital divide, resistance to user adoption and coordination gaps among municipal stakeholders. Hence the rest of this article is structured in four major sections to help achieve this objective. 2.0 Methodology of the narrative review and selection criteria of the literature are described. Section 3.0 provides the conceptual definitions and the theoretical background. Section 4.0 provides a synthesis of themes across smart infrastructure innovations, technology-enabled collaboration, social media behavioural interventions and structural barriers to implementation, along with a critical discussion of findings. Finally, Section 5.0 presents the action-oriented recommendations and future research directions. Section 6.0 concludes the study.

Review Approach

The article uses a structured narrative review design to provide an authoritative, comprehensive and conceptually rigorous synthesis of the scholarly landscape of digital media applications in urban sustainability. The interpretive flexibility of narrative reviews allows for linking different theoretical levels (socio-technical systems, environmental communication, paradigms of waste management) while keeping a critical eye on new thematic patterns. Explicit structural parameters were followed in the identification, screening and selection of the relevant literature. Narrative flexibility was balanced with academic rigour and methodological transparency while ensuring high standards of reproducibility and analytical clarity.

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Summary of Search Strategy and Selection Parameters

Component	Description
Parameter	Operational Specification
Database	Scopus (Sole Database)
Search Strings	("digital platform" OR "online platform" OR "web platform" OR "e-platform") AND ("social media" OR "social network" OR "online community" OR "digital communication") AND ("waste management" OR "waste disposal" OR "waste treatment" OR "refuse management") AND ("recycling" OR "upcycling" OR "resource recovery" OR "circular economy") AND ("engagement" OR "participation" OR "involvement" OR "interaction") AND ("information sharing" OR "data exchange" OR "communication" OR "collaboration")
Publication Years	January 1, 2015 – December 31, 2025
Inclusion Criteria	• It explores waste management in digital platforms, social media or online networks. • Examine public engagement, behaviour change, communication or circular economy practices. • • Provides empirical evidence, theoretical frameworks or policy analysis in the 2015-2025 period.
Exclusion Criteria	• Non-peer-reviewed material (gray literature, editorials, news items, blog posts). • Studies that are based only on chemical/industrial processes at the backend, without interaction with the public or platform. • • Publications outside the target timeframe or in languages other than English.

Conceptual Background

Establishing clear conceptual definitions and framing the discourse within the existing theoretical frameworks is necessary to understand the deployment and impact of digital technologies on contemporary waste management. The shift from conventional linear models of waste governance to technologically mediated participatory systems requires defining key constructs and mapping relevant theoretical lenses for rigorous analytical synthesis.

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Definitions

Digital Platforms in Waste Management

Digital platforms consist of software architectures, mobile applications, web portals, and cloud-based systems integrated to enable interaction, data exchange, and operational coordination among heterogeneous stakeholders in the waste management ecosystem (Mersico et al., 2025; Migliore et al., 2020). In waste management, these platforms include smart collection applications, municipal dashboards, decentralised marketplaces for recyclables, and sensor-based monitoring using the IoT and artificial intelligence (Gulyamov, 2024; Seyyedi et al., 2024).

Social Media

Social media refers to interactive platforms on the Internet (e.g., microblogging sites, virtual community channels, and social networking services) that enable user-created content, multi-directional communication, and real-time information dissemination (Barbosa & Gomes, 2025; Firmansyah & Sadono, 2025). Social media has a dual role in sustainable waste management as a socio-technical device for civic engagement and a communication channel to mobilise local champions, raise environmental awareness, and shape pro-environmental norms (Redyantanu et al., 2022; Wang et al., 2024).

Smart Waste Management

Smart waste management is an innovative operational paradigm that integrates emerging digital technologies such as big data analysis, automated sensors, machine learning, and blockchain technology into solid waste collection, sorting, transport, and resource recovery (Gaikwad & Gund, 2025; Singh et al., 2024). Unlike traditional municipal solid waste systems based on fixed routes and schedules, smart waste management relies more on dynamic, data-driven decision-making to improve logistics, reduce operational costs, and increase resource recovery rates (Seyyedi et al., 2024).

Value Co-Creation in Circular Economy

Value co-creation is a process through which service providers (e.g., municipal authorities, waste management companies) and service recipients (e.g., citizens, households, local communities) collaboratively generate mutual environmental, economic, and social value through actively engaging and sharing resources (Mersico et al., 2026). Value co-creation corresponds to circular economy principles to keep the material loop and reduce waste generation by converting consumers from passive participants to active co-producers of circular practices through platform-mediated waste segregation, recycling efforts, and community waste bank activities (Sharma et al., 2025; Ulhasanah et al., 2025).

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Key Theories or Frameworks

Extended Unified Theory of Acceptance and Use of Technology (UTAUT2) and Technology Acceptance Model (TAM)

Socio-cognitive models of technology acceptance are often used to conceptualise the adoption and sustained use of digital platforms for environmental actions. According to TAM, Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) determine an individual's behavioural intention to adopt a new digital tool (Rayhan et al., 2026). Based on this framework, UTAUT2 includes constructs such as social influence, facilitating conditions, hedonic motivation, and habit, which offer a comprehensive perspective for evaluating consumer trust and adoption intention toward digital e-waste and recycling platforms (Onur et al., 2024; Rayhan et al., 2026). UTAUT2 and TAM allow researchers to identify socio-psychological and structural barriers that lead to low user adoption and retention, even when the platform is available.

Socio-Technical Systems (STS) Theory and Service-Dominant (S-D) Logic

The Socio-Technical Systems theory offers an integrative analytical lens that conceptualises waste management not merely as a physical or mechanical process. Instead, it is a complex interplay between social networks (citizens, municipal policies, social norms) and technical artefacts (digital interfaces, IoT sensors, mobile software) (Mumba et al., 2021; Seyyedi et al., 2024). STS theory is enhanced by Service-Dominant (S-D) logic that re-conceptualises citizens from passive recipients of public disposal services into active value co-creators (Mersico et al., 2026). Citizens' interactions with each other are transformed from isolated, compliant behaviours to active collaboration that enables effective knowledge exchange, civic feedback loops, and co-designed municipal recycling programs, when mediated by digital platforms and social media tools (Kasonta et al., 2025; Mersico et al., 2025).

Behavioral Change Models and Multi-Level Governance Frameworks

The explanation of the impact of social media on household waste sorting and zero-waste lifestyles is mainly based on behavioural theories, such as, for instance, the Theory of Planned Behaviour (TPB) and nudge theory. Social media, peer influence, and local digital champions can enhance subjective norms and perceived behavioural control that can turn environmental awareness into real-life routines of household sorting (Firmansyah & Sadono, 2025; Wang et al., 2024). At the macro level, Multi-Level Governance (MLG) frameworks consider the institutional coordination required among state actors, private platform operators, and civil society (Kryuchkova et al., 2023; Mumba et al., 2021). The MLG frameworks emphasise the need for multi-level alignment to tackle the challenges of fragmentation, regulatory ambiguity and the digital divide and to ensure the effective and equitable working of digitally enabled waste management systems (Ivanyan & Afyan, 2026; Ramasamy et al., 2025).

Thematic Review of Literature

Instead of summarising the literature reviewed study by study, this section adopts a thematic approach to better synthesise the literature reviewed, highlighting conceptual intersections, empirical divergences, and systemic trends across the field. The chosen research is structured around four inter-connected themes encompassing the socio-technical ecosystem of contemporary waste management. Technological Innovation and Smart Waste Infrastructure

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starts with hardware and data architectures, the IoT networks, artificial intelligence, and blockchain systems that undergird today's waste operations. The second, Digital Platforms, Value Co-Creation and Circular Economy, addresses the transformation of passive consumers into active players in resource recovery networks, using web-based interfaces and multi-stakeholder applications. Third, Social Media, Public Awareness and Behavioural Modification examines the communicative processes through which social media and digital advocates shape civic attitudes by providing environmental information and promoting domestic sorting behaviours. Finally, Socio-Technical Bottlenecks, Digital Divide, and Governance Frameworks offers a critical review of structural barriers, regional inequities, and multi-level policy challenges that impede scalable and equitable deployment of digital waste management systems.

Theme 1: Smart Infrastructure Innovations

The integration of cutting-edge digital technologies into municipal and industrial waste infrastructure represents a groundbreaking paradigm shift: from disposal to proactive data-driven resource recovery. The convergence of IoT, artificial intelligence (AI), machine learning, and blockchain architectures fosters intelligent waste ecosystems enabling real-time monitoring and dynamic route optimisation (Gaikwad & Gund, 2025; Gulyamov, 2024; Singh et al., 2024). These technological infrastructure layers substitute static, schedule-based collection models with predictive networks that track fill levels, automate material sorting and verify waste transactions across decentralised supply chains (Seyyedi et al., 2024; Solimun et al., 2026). Thus, operationalisation of circular economy principles at scale is enabled by hardware and software integration (Sharma et al., 2025).

The literature converges on operational benefits of AI and IoT sensors for improving system efficiency but diverges on the feasibility and scalability of emerging technologies such as blockchain. According to Gulyamov (2024) and Singh et al. (2024) the use of blockchain and advanced analytics can greatly improve the transparency of the ledger and the confidence of stakeholders in waste processing. Instead, Seyyedi et al. (2024) and Gaikwad and Gund (2025) highlighted that automated sorting systems and simulation models have heavy operational bottlenecks when handling heterogeneous waste streams. While macro-level frameworks praise the integration of digital technology, empirical studies show a clear tension between the ideal technological capacity and the physical realities of municipal waste processing.

A critical review of this theme shows that much of the present work is stuck in the theoretical platform design and algorithmic proofs of concept, often ignoring the capital-intensive nature of hardware maintenance. Moreover, there is a substantial research gap on the interaction of smart infrastructure with non-digital legacy systems in developing urban contexts (Ivanyan & Afyan, 2026; Ramasamy et al., 2025). This is the gap that the narrative review needs to fill, as technological innovation cannot be assessed in isolation from the socio-spatial contexts in which smart platforms are embedded.

Theme 2: Technology-Enabled Collaboration and Circular Economy

Digital platforms are increasingly becoming the socio-technical intermediaries that facilitate value co-creation and operationalise circular economy business models. Web-based interfaces, mobile applications and online marketplaces connect consumers, informal waste pickers, corporate recyclers and municipal authorities in collaborative networks rather than waste

management being a linear public service (Mersico et al., 2025, 2026; Rayhan et al., 2026). These platforms facilitate resource recovery, particularly from complex waste streams like e-waste and recyclable scrap, by decreasing transaction costs and promoting participation with transparent pricing mechanisms and gamified feedback loops (Migliore et al., 2020; Rayhan et al., 2026; Sharma et al., 2025).

While the literature agrees on the role of digital platforms in stakeholder collaboration, there is no consensus on the main determinants of user retention and platform adoption. Using cognitive adoption models such as TAM and UTAUT2, Rayhan et al. (2026) indicated that technical utility and perceived ease of use are the main drivers of consumer willingness to adopt e-waste platforms. Conversely, Mersico et al. (2025, 2026) argued that structural platform architecture is not enough. Value co-creation is highly dependent on institutional trust, community governance and perceived civic duty . Similarly, the research of Ulhasanah et al. (2025) found that physical accessibility, such as the placement of waste bank platforms at public transport nodes, is much more effective in encouraging participation than digital features alone.

While the theoretical potential of platform-mediated value co-creation is well documented in the literature, it suffers from geographical and socioeconomic bias. Much of the empirical work to date has focused on structured European municipalities or formal urban centers, providing little insight into the performance of platform models in decentralised, informal economies (Ivanyan & Afyan, 2026; Mumba et al., 2021). This gap demonstrates the importance of this review to critically assess the adaptability of digital platform architectures to various socio-economic realities and informal waste sectors.

Theme 3: Social Media and Behavioral Interventions

Social media networks have emerged as powerful communication catalysts for enhancing environmental awareness, shaping social norms and motivating household waste segregation. Interactive platforms like microblogs, media-sharing networks and virtual communities have facilitated the rapid dissemination of educational content on reducing food waste, composting and living a zero-waste life (Barbosa & Gomes, 2025; Kasonta et al., 2025; Redyantanu et al., 2022). In addition, local digital champions and social media influencers are instrumental in framing sustainable habits as desirable social norms, and in turning passive environmental concern into active civic participation (Firmansyah & Sadono, 2025; Wang et al., 2024).

While there is general consensus about the reach of social media, scholars disagree about its long-term effects on sustained behavioural change. Firmansyah and Sadono (2025) and Wang et al. (2024) revealed that social media interactions positively influenced subjective norms significantly with a subsequent tangible household sorting, especially when led by local community leaders. In contrast, the studies by Barbosa and Gomes (2025) and Onur et al. (2024) found that social media engagement is often hindered by “slacktivism,” where awareness and positive sentiments on social media such as Twitter do not necessarily translate to tangible waste reduction efforts.

It is important to point out that the literature relies heavily on self-reported survey data and digital sentiment analysis, which overestimate actual physical compliance. Still, there is a lack of longitudinal empirical research measuring whether digital campaigns lead to long-term reductions in municipal waste tonnage over extended periods (Kasonta et al., 2025; Utama,

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2019). This thematic gap represents the main goal of this review, to know if social media is a mechanism for transformation for the urban sustainability or only a superficial channel of information.

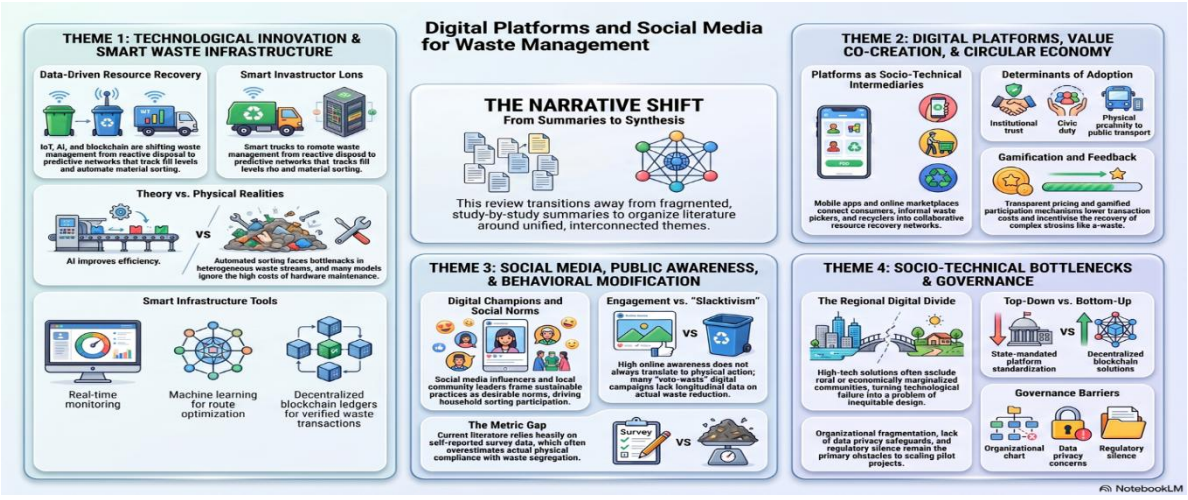
Theme 4: Structural Implementation Barriers and Governance Frameworks

There are systemic socio-technical challenges in the deployment of digital platforms and social media tools for waste management. These include infrastructural disparities, organisational fragmentation, and regulatory ambiguities. High-tech solutions often face serious barriers due to regional digital divides, financial restrictions, and lack of public infrastructure, which tend to marginalise rural and poor communities (Ivanyan & Afyan, 2026; Ramasamy et al., 2025; Wang et al., 2024). Furthermore, multi-stakeholder coordination remains a critical bottleneck since municipal governments, private technology vendors and civil society organisations often operate in silos with conflicting operational incentives (Kryuchkova et al., 2023; Mumba et al., 2021).

Researchers have several ideas as to how to overcome these implementation bottlenecks. Policy-oriented researchers such as Mumba et al. (2021) and Kryuchkova et al. (2023) have championed top-down digital governance structures and state-led platform standardisation to ensure compliance among actors. However, technology-oriented researchers such as Gulyamov (2024) and Seyyedi et al. (2024) contended that bottom-up technological solutions such as decentralised blockchain ledgers and automated AI workflows can bypass institutional inefficiencies and build user trust directly. Moreover, scholars are divided on the pace of digital transformation in the public sector, with concerns relating to data privacy, security, and regulatory silence (Ivanyan & Afyan, 2026; Singh et al., 2024).

A central blind spot in this literature is viewing technological failure as a problem of user resistance rather than one of institutional design. Little has been said about the policy and legal mechanisms that would be needed to protect public data and to ensure that different demographic groups have equal access to the platform (Ramasamy et al., 2025). One of the key objectives of this narrative review is to map the structural preconditions of digital waste management beyond isolated pilots to inclusive, large-scale urban infrastructure and to address these systemic governance barriers.

Thematic Review of Literatur



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In this Critical Discussion section, rather than merely depicting the studies available, the synthesised literature is critically interrogated along four interconnected analytical dimensions. It first describes broad consensus themes that unify the current literature on the utility of digital platforms and social media for contemporary waste governance. Second, it considers fundamental disagreements and theoretical tensions, particularly around the drivers of technology adoption, the operational scalability of emerging tools, and top-down versus bottom-up models of implementation. Third, it identifies general methodological and empirical weaknesses, highlighting reported participation, as opposed to long-term operational data, and the neglect of informal waste sectors. Finally, it sketches the actionable theoretical, practical, and policy implications needed to move digitally mediated waste management from patchy, localised pilot initiatives to resilient, equitable, large-scale circular infrastructure.

Critical Discussion

Agreements in the Literature

There is a wide consensus in the literature reviewed on the integration of digital platforms and social media channels as a fundamental improvement of today's waste management operations and public communication. Scholars widely agree that the implementation of IoT sensors, AI, and automated decision-support systems changes municipal solid waste management from inefficient, reactive collection schedules to dynamic, data-driven resource recovery ecosystems (Gaikwad & Gund, 2025; Gulyamov, 2024; Seyyedi et al., 2024). Meanwhile, researchers agree that interactive social media networks and localised digital platforms serve as important socio-technical mechanisms for increasing environmental awareness, fostering community engagement, and enabling value co-creation among citizens, private waste operators, and municipal authorities (Firmansyah & Sadono, 2025; Mersico et al., 2025, 2026). The literature presents the relevance of digitalisation as an enabler for the implementation of circular economy principles and urban sustainability across different geographical and sectorial contexts (Onur et al., 2024; Sharma et al., 2025).

Importantly, this consensus is a shared understanding that social and technical innovation cannot be separated in current waste governance. Researchers agree that digital communication tools are important because they are changing the way we think about waste. Waste management is no longer just an engineering or public works problem. Rather, it is a socio-technical system that is interlinked and relies on human participation and flow of real-time data (Mumba et al., 2021; Redyantanu et al., 2022). Literature shows that platform-mediated interactions greatly reduce communication barriers and improve efficiency of resource allocation, providing a strong foundation to assess the role of digital interventions in the important modernisation of public service delivery. However, this consensus, while affirming the strategic importance of digital transformation, frequently relies on an overly optimistic baseline that obscures operational frictions and implementation failures in context.

Disagreements in the Literature

While the macro-level advantages of digitalisation are widely accepted, much theoretical and empirical debate remains about the key drivers of technology adoption and the structural design of digital waste systems. There is one major disjuncture between the socio-cognitive researchers and the structural institutionalists. Rayhan et al. (2026) stated that the main factors affecting individual behavioural intentions are platform usability, functional utility and

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perceived ease of use as in adoption models such as TAM and UTAUT2. However, scholars focused on institutions and communities argue that ease of use of interfaces is a less important consideration, arguing that sustained citizen engagement depends much more on institutional trust, local leadership, physical accessibility, and deeply embedded social norms (Mersico et al., 2026; Ulhasanah et al., 2025; Wang et al., 2024). The second big debate is on governance architecture: a clash between top-down state standardisation and bottom-up decentralised blockchain solutions (Gulyamov, 2024; Kryuchkova et al., 2023).

These conceptual divisions capture a basic tension between the techno-deterministic perspectives and socio-institutional realities. This debate over adoption drivers emphasises the necessity of recognising that technical optimisations often ignore the complex socio-economic incentives that influence everyday human behaviour. The computer science and engineering literature generally assumes that smooth digital user experiences will lead to high civic compliance. However, social science perspectives suggest that digital resources can become substantially obsolete if they conflict with existing community structures or lack public trust (Ivanyan & Afyan, 2026; Ramasamy et al., 2025). Moreover, the operational tension between centralised regulatory enforcement and decentralised, peer-to-peer platform architectures echoes an unresolved governance dilemma: whether public waste infrastructure should be governed via strict state oversight or open, market-driven digital exchanges (Mumba et al., 2021; Singh et al., 2024).

Gaps in the Literature

A systematic critical review of the literature reveals important gaps in empirical, methodological and contextual terms, which limit the generalisability of existing research. Most studies on social media and digital campaign effectiveness are methodologically based on self-reported participation, rather than long-term operational cross-sectional surveys, online sentiment analysis or self-reported behavioural metrics (Barbosa & Gomes, 2025; Firmansyah & Sadono, 2025). There is a critical lack of long-term longitudinal studies that measure the direct impact of digital interventions on physical waste reduction tonnages and long-term recycling contamination rates (Utama, 2019; Kasonta et al., 2025). Existing studies are geographically and contextually restricted to formal municipal systems in developed urban centers, systematically underrepresenting rural communities, low-income regions, and the informal waste pickers who handle a large share of waste in emerging economies (Ramasamy et al., 2025; Solimun et al., 2026; Wang et al., 2024).

The implications of these omissions are dire for the validity and relevance of the existing academic frameworks. The heavy reliance on self-reported survey data creates persistent social desirability bias, where researchers confuse online participation ("slacktivism") with real-world physical adherence to household waste segregation (Barbosa & Gomes, 2025; Onur et al., 2024). Furthermore, existing platform models may exacerbate the digital divide and alienate the very human actors that drive waste recovery in developing countries by ignoring the informal waste sector and marginalised populations (Ivanyan & Afyan, 2026). The literature will be ill-equipped to guide inclusive policy development in diverse global settings without rigorous, longitudinal empirical research that bridges high-tech digital systems with informal, real-world sorting environments.

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Implications

The integrated findings have important theoretical, practical, and policy implications for the future of digitally enabled waste management. In theory, this review stresses the need to move beyond isolated adoption models and toward more integrated socio-technical theoretical frameworks, such as Service-Dominant logic combined with Multi-Level Governance, that consider both platform dynamics and systemic institutional constraints (Mersico et al., 2026; Mumba et al., 2021). In fact, municipalities and software developers must move away from generic, high-tech platform rollouts and embrace user-centric designs that include gamification, clear economic feedback, and local community champions to guarantee long-term user retention (Firmansyah & Sadono, 2025; Rayhan et al., 2026; Redyantanu et al., 2022).

At the policy level, governments need to develop strong regulatory structures to tackle data privacy, cybersecurity, and platform interoperability, while actively supporting the creation of digital infrastructure to minimise regional digital gaps (Ivanyan & Afyan, 2026; Singh et al., 2024). Policies should encourage public-private partnerships that include informal waste workers into formal platform ecosystems, turning fragmented informal labour into recognised, digitally connected circular economy networks (Kryuchkova et al., 2023; Sharma et al., 2025). Ultimately, the decision-makers can turn digital waste management from isolated pilot projects into resilient, equitable and scalable urban infrastructure by blending technological innovation with inclusive governance mechanisms and empirical accountability.

Recommendations and Future Directions

Recommendations for Practice

To achieve maximum operational impact from digital platforms and social media in waste management, practitioners need to shift from generic digital outreach to tailored, user-centred implementation strategies. Operators and software developers for waste management need to create user interfaces that are intuitive and mobile-first, incorporating behavioural nudges, transparent economic incentives, and gamified feedback systems to improve long-term user retention (Firmansyah & Sadono, 2025; Rayhan et al., 2026). Municipal practitioners should not rely only on automated communication channels, but should work together with trusted local community leaders, environmental non-governmental organisations (NGOs) and digital champions to co-design hyper-local awareness campaigns that are consistent with local socio-cultural norms (Firmansyah & Sadono, 2025; Redyantanu et al., 2022). Operators need to consider investing in strong predictive maintenance protocols and staff training to combat operational bottlenecks caused by hardware wear and heterogeneous waste contamination, as well as smart infrastructure such as IoT sensors and AI sorting hubs (Gaikwad & Gund, 2025; Seyyedi et al., 2024).

Recommendations for Policy or Organisational Use

Public authorities must create enabling regulatory environments that foster inter-agency collaboration, data transparency, and equitable technological access from a policy and organisational governance perspective. Open data standards and application programming interfaces (APIs) should be developed by municipalities and national regulatory bodies to enable data interoperability among the private platform vendors, recycling companies and

public waste authorities (Kryuchkova et al., 2023; Mumba et al., 2021). Policymakers also need to address systemic socio-technical inequities by enacting targeted digital inclusion policies, such as subsidising digital infrastructure in low-income and rural areas, to ensure marginalised populations are not excluded from smart waste services (Ivanyan & Afyan, 2026; Ramasamy et al., 2025). In addition, governments should develop legal structures that formally include informal waste collectors in official platform networks, transforming scattered labour into formal, digitally coordinated circular economy ecosystems, and providing strong cybersecurity and data privacy protections for citizen participation data (Ivanyan & Afyan, 2026; Sharma et al., 2025; Singh et al., 2024).

Future Research Directions

Future research should address major methodological and structural shortcomings that have constrained the literature on digital waste management. Longitudinal empirical studies are needed that go beyond self-reported survey data and social media sentiment analysis to measure the long-term impact of platform interventions on actual physical waste diversion rates and contamination metrics (Barbosa & Gomes, 2025; Kasonta et al., 2025; Utama, 2019). Furthermore, it is essential for researchers to broaden the geographical scope of empirical studies to investigate the deployment of platforms, integration of informal sectors, and socio-economic adoption dynamics in developing economies and rural areas (Solimun et al., 2026; Wang et al., 2024). Finally, future theoretical work should pursue the development of integrated socio-technical frameworks, which combine technology acceptance models (TAM/UTAUT2) with Service-Dominant logic and Multi-Level Governance to systematically assess the performance of emerging technologies such as decentralised blockchain ledgers and automated machine learning workflows within complex multi-stakeholder governance environments (Mersico et al., 2026; Rayhan et al., 2026; Singh et al., 2024).

Conclusion and Limitations

This narrative review synthesises the emerging socio-technical ecosystem of digitally enabled waste management and demonstrates how digital platforms and social media networks fundamentally alter municipal solid waste governance and public sustainability practices. This study examines the convergence of Internet of Things (IoT) infrastructure, artificial intelligence, and interactive social networks. It also highlights how digitalisation shifts waste governance from traditional linear disposal to dynamic, data-driven resource recovery (Gaikwad & Gund, 2025; Seyyedi et al., 2024). This review argues that technology alone cannot transform waste management. Digital innovation must be accompanied by inclusive governance, active citizen participation, integration of the informal sector, and measurable long-term empirical outcomes. The key contribution of this review is the introduction of an integrated, multi-layered framework linking hardware capabilities and algorithmic optimisation to social media communication, civic value co-creation, and institutional policy design (Mersico et al., 2026; Mumba et al., 2021). This paper bridges the gap between engineering-focused infrastructure models and socio-cognitive behavioural theories by critically evaluating socio-technical bottlenecks together with technological advances (Rayhan et al., 2026; Wang et al., 2024). The long-term success of smart waste management will depend on software innovation and governments' and practitioners' ability to create equitable, transparent, and inclusive digital environments that connect technological systems with human behaviour and multi-level policy governance.

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This review comprehensively synthesises trends, challenges, and prospects, although it has methodological and structural limitations that warrant acknowledgement. The search strategy was strictly limited to the Scopus database in a particular 10-year period (2015–2025), which may have missed relevant peer-reviewed studies indexed only in other bibliographical databases such as Web of Science, IEEE Xplore, or PubMed (Baas et al., 2020; Mongeon & Paul-Hus, 2016). Second, excluding non-English publications and grey literature (e.g., government policy briefs, municipal technical reports, white papers) from the selection criteria may have missed localised implementation knowledge and new regional platform deployments (Rethlefsen et al., 2021). Third, the corpus of analysed literature presents a high degree of sectoral and geographic bias, with a focus on formal municipal solid waste systems in high-income urban contexts and limited coverage of rural areas, agricultural waste streams, and informal recycling sectors in developing economies (Ivanyan & Afyan, 2026; Ramasamy et al., 2025; Solimun et al., 2026). Fourth, the rapid convergence of technologies has created conceptual overlap among terms like "smart waste management," "digital platforms," and "e-governance," which may blur boundaries across interdisciplinary studies. Finally, as is inherent to narrative review methods, the thematic synthesis relies on interpretive analysis and qualitative appraisal, not quantitative meta-analysis, and thus carries the risk of subjective bias in grouping the literature and in critical interpretation (Snyder, 2019).

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References

Baas, J., Schavenmaker, M., & Kouam, A. (2020). Scopus coverage expansion and data quality enhancement: Implications for bibliometric analysis. *Journal of Informetrics*, *14*(4), Article 101092. https://doi.org/10.1016/j.joi.2020.101092

Barbosa, M. W., & Gomes, A. (2025). Themes and sentiments in conversations about food waste on Twitter: Proposal of a framework using neural topic modeling. *Food Quality and Preference*, *122*, Article 105311. https://doi.org/10.1016/j.foodqual.2024.105311[cite: 1]

Firmansyah, A., & Sadono, D. (2025). Driving sustainable waste management: The role of local champions and social media engagement. *BIO Web of Conferences*, *171*, Article 04010. https://doi.org/10.1051/bioconf/202517104010[cite: 1]

Gaikwad, N., & Gund, G. S. (2025). Future aspects of machine learning/automation for the waste management. In *Harnessing Automation and Machine Learning for Resource Recovery and Value Creation: From Waste to Value* (pp. 461–474). Elsevier. https://doi.org/10.1016/B978-0-443-27374-2.00019-4[cite: 1]

Gulyamov, S. (2024). Intelligent waste management using IoT, blockchain technology and data analytics. *E3S Web of Conferences*, *501*, Article 01010. https://doi.org/10.1051/e3sconf/202450101010[cite: 1]

Ivanyan, A., & Afyan, N. (2026). Sustainable waste management solutions in the 21st century. In *Springer Proceedings in Business and Economics* (pp. 145–160). Springer. https://doi.org/10.1007/978-3-031-55000-0_12

Kasonta, A. A., Thakur, S. S., Sharma, J. B., & Bhardwaj, R. (2025). Integrating media and information tools for enhanced management of food and agricultural waste. *Bulgarian Chemical Communications*, *57*, 180–184. https://doi.org/10.34049/bcc.57.B.A0014[cite: 1]

Kryuchkova, I., Vasileva, N., Fomenko, N., & Belyantseva, O. (2023). Methodological techniques for clustering waste processing industry based on platform solutions. *AIP Conference Proceedings*, *2888*(1), Article 020014. https://doi.org/10.1063/5.0165488

Mersico, L., Aureli, S., & Foschi, E. (2026). Exploring the role of digital platforms in promoting value co-creation: Evidence from the Italian municipal solid waste management system. *Sustainability Accounting, Management and Policy Journal*, *17*(1), 233–266. https://doi.org/10.1108/SAMPJ-03-2024-0317[cite: 1]

Mersico, L., Aureli, S., & Paletta, A. (2025). Contribution of digital transformation in municipal solid waste management: Insights from a case study. *World Sustainability Series*, *Part F409*, 165–182. https://doi.org/10.1007/978-3-031-84959-6_8[cite: 1]

Migliore, M., Talamo, C., & Paganin, G. (2020). Information and communication technologies (ICTs) for advanced scraps/waste management. In *Springer Tracts in Civil Engineering* (pp. 191–222). Springer. https://doi.org/10.1007/978-3-030-30318-1_8[cite: 1]

Mongeon, P., & Paul-Hus, A. (2016). The journal coverage of Web of Science and Scopus: A comparative analysis across domains. *Scientometrics*, *106*(1), 213–228. https://doi.org/10.1007/s11192-015-1765-5

Mumba, J. K., Yakovlev, A. A., & Milkina, I. V. (2021). Concerning the need for digital transformation of cooperation between the state, society and companies in the field of solid waste disposal. *Studies in Systems, Decision and Control*, *314*, 939–945. https://doi.org/10.1007/978-3-030-56433-9_99[cite: 1]

Onur, N., Alan, H., Demirel, H., & Köker, A. R. (2024). Digitalization and digital applications in waste recycling: An integrative review. *Sustainability*, *16*(17), Article 7379. https://doi.org/10.3390/su16177379[cite: 1]

Ramasamy, S. P., Mishra, S., & Oumabady, S. (2025). From farm to bytes: Sustainable strategies to manage new age wastes. In *Transformation of Liquid Waste to Energy: Methods, Challenges, and Opportunities* (pp. 167–205). Elsevier. https://doi.org/10.1016/B978-0-443-33683-6.00006-1[cite: 1]

Rayhan, G. S., Karuppiah, K., & Sankaranarayanan, B. (2026). Usage of digital platforms for e-waste management with circular economy: An integrated model of extended unified theory of acceptance and use of technology and technology acceptance model. *Process Integration and Optimization for Sustainability*. Advance online publication. https://doi.org/10.1007/s41660-026-00827-5[cite: 1]

Redyantanu, B. P., Yatmo, Y. A., & Atmodiwirjo, P. (2022). Virtual waste community: Sustainable living in digital era. *IOP Conference Series: Earth and Environmental Science*, *1098*(1), Article 012070. https://doi.org/10.1088/1755-1315/1098/1/012070[cite: 1]

Rethlefsen, M. D., Kirtley, S., Waffenschmidt, S., Ayala, A. P., Moher, D., Page, M. J., & Koffel, J. B. (2021). PRISMA-S: An extension to the PRISMA Statement for Reporting Literature Searches in Systematic Reviews. *Systematic Reviews*, *10*(1), Article 39. https://doi.org/10.1186/s13643-020-01542-z

Seyyedi, S. R., Kowsari, E., Gheibi, M., Chinnappan, A., & Ramakrishna, S. (2024). A comprehensive review integration of digitalization and circular economy in waste management by adopting artificial intelligence approaches: Towards a simulation model. *Journal of Cleaner Production*, *460*, Article 142584. https://doi.org/10.1016/j.jclepro.2024.142584[cite: 1]

Sharma, D., Sharma, A., & Sharma, S. (2025). Circular waste management through decentralized recycling in the digital era. In *Effects of Digitalization and Circular Economy on Sustainable Policy and Climate Change Prevention* (pp. 265–292). IGI Global. https://doi.org/10.4018/979-8-3693-9909-5.ch010[cite: 1]

Singh, S., Chhabra, R., & Arora, J. (2024). A systematic review of waste management solutions using machine learning, Internet of Things and blockchain technologies: State-of-art, methodologies, and challenges. *Archives of Computational Methods in Engineering*, *31*(4), 2215–2241. https://doi.org/10.1007/s11831-023-10022-7

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, *104*, 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039

Solimun, Rinaldo Fernandes, A. A., Junianto, F. H., & Amirullah, K. I. (2026). Extraction of waste economic variables through cluster analysis from web scraping results and latent Dirichlet allocation. *Waste Management Bulletin*, *4*(1), 78–92. https://doi.org/10.1016/j.wmb.2025.100045

Ulhasanah, N., Suhardono, S., Lee, C.-H., & Suryawan, I. W. K. (2025). Modelling participation in waste bank initiatives at public transport hubs to advance circular economy development. *Discover Sustainability*, *6*(1), Article 42. https://doi.org/10.1007/s43621-025-00180-2

Utama, D. N. (2019). Media social based smart DSM for strategic decision making: Waste management case. *International Journal of Recent Technology and Engineering*, *8*(3), 3210–3215. https://doi.org/10.35940/ijrte.C5482.098319

Wang, X., Bravo, L. M. R., Cosio Borda, R. F., & Khan, N. A. (2024). The role of internet and social interactions in advancing waste sorting behaviors in rural communities. *Resources*, *13*(5), Article 62. https://doi.org/10.3390/resources13050062