ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 12| Issue: 3| March2026|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2026: 8.753 || ISI Value: 1.188

A STUDY ON SMART AND TECH-DRIVEN WASTE SOLUTION-CONSUMER AWARENESS AND PERCEPTION IN COIMBATORE

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ABSTRACT
The rapid growth of urbanization and consumerism has intensified solid waste generation, creating significant environmental and public health challenges worldwide. Smart and technology-driven waste management solutions – such as Internet of Things (IoT)-enabled smart bins, artificial intelligence (AI)-based waste sorting systems, mobile recycling applications, and data-driven monitoring platforms – offer innovative approaches to improving efficiency, transparency, and sustainability in waste handling processes. However, the success of these technologies largely depends on consumer awareness, acceptance, and behavioural adaptation. The research underscores the importance of targeted awareness campaigns, educational programs, and improved accessibility to encourage wider adoption. By enhancing consumer understanding and engagement, smart waste solutions can play a pivotal role in achieving sustainable urban waste management, reducing environmental pollution, and promoting circular economy practices.

KEYWORDS: *Smart Waste Management, Technology-Driven Waste Solutions, Recycling Technologies.*

INTRODUCTION

Smart and technology-driven waste management solutions have emerged as transformative responses to these challenges. Leveraging advanced technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), machine learning, big data analytics, cloud computing, blockchain, and mobile communication platforms, smart waste systems aim to optimize collection processes, improve segregation accuracy, enhance recycling rates, and reduce operational costs. IoT-enabled smart bins equipped with sensors can detect fill levels and transmit real-time data to centralized monitoring systems. AI-powered sorting technologies can automatically classify recyclable materials with higher precision. GPS-based route optimization systems reduce fuel consumption and carbon emissions, while digital platforms facilitate citizen reporting, awareness campaigns, and incentive-based recycling programs.

The success of these technologies depends not only on infrastructure but also on consumer awareness and perception. Awareness influences individuals' understanding of smart waste solutions, while perception shapes their acceptance and willingness to adopt these technologies.

STATEMENT OF THE PROBLEM

The rapid increase in municipal solid waste generation due to urbanization, industrialization, and changing consumption patterns has created serious environmental, economic, and public health challenges. Conventional waste management systems are increasingly inefficient, characterized by poor waste segregation, inadequate recycling practices, lack of real-time monitoring, and limited public participation. In response, smart and technology-driven waste management solutions—such as IoT-enabled smart bins, AI-based waste sorting systems, and digital monitoring platforms—have been introduced to enhance operational efficiency, transparency, and sustainability.

REVIEW OF LITERATURE

Year	Title	Author	Research methodology	Findings
2024	Smart Waste Management and Awareness System	Vaishnavi Agre et al.	Conceptual analysis and case-study review of smart waste systems	IoT-based smart bins and awareness programs improve waste management efficiency and encourage proper waste segregation.
2022	Consumer Awareness and Perceptions about E-Waste Management	Boopathy Nisha et al.	Survey using questionnaires	Consumers have moderate awareness of e-waste but lack knowledge about proper disposal methods.

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2021	Consumers' Behaviour for Electronic Waste Management	Md. M. Rahman et al.	Large-scale survey and statistical analysis	Environmental awareness and social influence affect participation in e-waste recycling.
2019	Consumer Awareness towards E-Waste Management	Ambika Bhatia et al.	Descriptive survey research	Consumers know about e-waste hazards but lack information about recycling systems.

OBJECTIVES OF THE STUDY

- To examine the customer awareness and adoption of smart and tech-driven waste solutions
- To assess the impact of technology on improving customer trust towards smart and tech- driven waste solutions.
- To identify factors influencing customer awareness of smart and tech-driven waste solutions.

RESEARCH METHODOLOGY

Area of Study: Coimbatore City
Sampling Technique: Convenient sampling technique
Sample Size: 113 respondents
Period of Study: December 2025 – February 2026.

RESULTS & DISCUSSION

DEMGRAPHIC PROFILE OF THE RESPONDENTS

The following table 4.1 predicts the demographic profile of the respondents

Table 4.1

Personal factor	Category	No. of Respondent	Percentage
Age	Below 18 years	14	12.4
	Between 18-25 years	52	46.0
	Between 26-35 years	26	23.0
	Above 40 years	21	18.6
	Total	113	100
Gender	Male	66	58.4
	Female	47	41.6
	Total	113	100
Educational Qualification	School level	12	10.6
	Undergraduate	51	45.1
	Postgraduate	26	23.0
	Professional Degree	24	21.2
	Total	113	100
Occupational	Students	40	35.4
	Private Employee	20	17.7
	Govt Employee	24	21.2
	Business\Self-Employee	19	16.8
	Others	10	8.8
	Total	113	100
Area of Residence	Urban	48	42.5
	Semi Urban	30	26.5
	Rural	35	31.0
	Total	113	100

Age: The majority of respondents (46%) belong to the 18–25 years age group, indicating that young adults form the largest portion of the sample. About 23% are between 26–35 years, while 18.6% are above 40 years. Only 12.4% are below 18 years.

Gender: Out of 113 respondents, 58.4% are male and 41.6% are female. This indicates that male respondents slightly outnumber female respondents in the survey.

Educational Qualification: Most respondents are undergraduates (45.1%), followed by postgraduates (23%) and those with professional degrees (21.2%). Only 10.6% have school-level education, indicating that the majority of respondents are relatively well educated.

Occupation: The largest group of respondents are students (35.4%), followed by government employees (21.2%), private employees (17.7%), and business/self-employed individuals (16.8%). About 8.8% fall into other occupational categories. This suggests that students form the major portion of the respondents.

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Area of Residence: Among the respondents, 42.5% live in urban areas, 31% in rural areas, and 26.5% in semi-urban areas. This indicates that most participants are from urban locations, though the sample also includes respondents from rural and semi-urban areas.

GENDER AND BIGGEST BARRIER TO AWARENESS OF THE RESPONDENTS

The following table 4.11 predicts Gender and Biggest Barrier to Awareness if Smart Waste Solutions Group of the Respondents.

TABLE NO.1
CROSS TABULATION- GENDER AND BIGGEST BARRIER TO AWARENESS IF SMART WASTE SOLUTIONS OF THE RESPONDENTS

Gender of the Respondents			Biggest barrier to awareness of smart waste solutions				Total
			Lack of Information	Low Digital Literacy	Limited Availability	Lack of Interest	
Gender	Male	No	21	14	19	12	66
		%	31.8%	21.2%	28.8%	18.2%	100%
	Female	No	17	8	18	4	47
		%	36.2%	17.0%	38.3%	8.5%	100%
Total		No	38	22	37	16	113
		%	33.6%	19.5%	32.7%	14.2%	100%

INTERPRETATION

The table shows that lack of information (33.6%) and limited availability (32.7%) are the main barriers to awareness of smart waste solutions. Male respondents mostly reported lack of information, while female respondents identified limited availability as the biggest barrier.

HYPOTHESIS

There exists no significant relationship between gender and the perceived biggest barrier to awareness of smart waste solutions.

TABLE NO.2
CHI-SQUARE TESTS- GENDER AND BIGGEST BARRIER TO AWARENESS GROUP OF THE RESPONDENTS

	VALUE	DF	ASYMPTOTIC SIGNIFICANCE (2-SIDED)
Pearson Chi-Square	2.974	3	.396
Likelihood Ratio	3.082	3	.379
Linear-by-Linear Association	.474	1	.491
N of Valid Cases	113		

INTERPRETATION

From the significance value of .396, it is clear that there is no significant relationship between gender and the biggest barrier to awareness among the respondents. As the value is greater than 0.05. Therefore, the null hypothesis is accepted.

HYPOTHESIS

There exists no significant relationship between gender and the biggest barrier to awareness among the respondents.

CONCLUSION

The study highlights the critical role of consumer awareness and perception in the adoption of smart and technology-driven waste management solutions. Findings indicate that while a portion of consumers is aware of such innovations, overall awareness remains limited, with barriers including lack of information, insufficient promotion, and low technological exposure. Despite these challenges, consumer perception toward smart waste solutions is generally positive, recognizing their potential for improving efficiency, convenience, and environmental sustainability.

The research underscores that enhancing awareness through targeted campaigns, educational initiatives, and increased accessibility is essential to promote wider adoption.

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