

## INFLUENCE OF TECHNOLOGY STRATEGY ON THE PERFORMANCE OF WASTE MANAGEMENT COMPANIES IN NAIROBI COUNTY, KENYA

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**Abstract:** The success of a business is intricately tied to its organizational performance since a well-performing organization aligns its activities with its strategic objectives. Waste management companies in Nairobi County operates in a competitive market where other waste management companies also vie for customers' attention. This study was carried out to determine the influence of technology strategy on the performance of waste management companies in Nairobi County, Kenya. The study was anchored on actor network theory. The study adopted descriptive research design and targeted 298 employees in 23 waste management companies in Nairobi County, Kenya. Sample size was 171 respondents selected using simple random sampling technique. Data was collected using questionnaires and was analyzed using descriptive and inferential statistics. Descriptive results showed that respondents agreed that technology strategy influenced organizational performance. Regression results showed that technology strategy influenced organizational performance positively and insignificantly. The study concluded that a well-implemented technology strategy in waste management companies fosters innovation, cost-effectiveness, and environmental sustainability and recommends that the waste management companies in Nairobi County Kenya need to make sure that automation aligns with the overall operational goals which helps to optimize efficiency and innovation.

**Keywords:** Technology strategy, Waste management companies, Nairobi County Kenya

### 1.0 INTRODUCTION

The success of a business is intricately tied to its organizational performance since a well-performing organization aligns its activities with its strategic objectives (Bashaer, Sanjay & Singh, 2016). Organizational performance is a process that enhances both the efficiency of an organization and the well-being of its members via interventions that are planned (Tseng & Lee, 2014). Organizational performance can be achieved through appropriate coordination of activities that raise the efficacy and efficiency of the organization's performance (Nkemchor & Ezeanolue, 2021). Vitkauskaite (2017) connoted that organizational performance need to be improved for organizational programmes to be efficient. On the other hand, organizational performance result emanates from breakthroughs from the market or when market positions are attained and ultimate variations take place over time (Maher & Andersson, 2017).

Globally, organizational performance in waste management companies plays an important function in dealing with environmental difficulties, enhancing sustainability, and ensuring efficient waste management practices (UNEP, 2015). The ability of the companies to efficiently collect waste from residential, commercial and industrial sources is essential. This includes optimizing collection routes, implementing effective scheduling, and maximizing waste diversion from landfills. Further, waste management companies need to demonstrate effective treatment and processing of waste materials (Hoornweg & Freire, 2013). This involves implementing advanced technologies for waste sorting, recycling, composting, and energy recovery. Companies that successfully recover valuable resources from waste while minimizing environmental impact are considered high performers (JICA, 2014).

In Sweden, waste management companies have achieved remarkable success in environmental sustainability. The country's robust recycling and waste-to-energy infrastructure has resulted in high recycling rates and minimal landfill use. This has been driven by stringent regulations, government incentives, and a strong societal commitment to sustainability. In contrast, the USA has a more diverse waste management landscape. While there are companies committed to sustainability, others may prioritize cost-efficiency. Performance metrics often include operational efficiency, profitability, and compliance with environmental regulations. The US waste management industry faces challenges in terms of inconsistent recycling practices and disparities in regulations among states (Hornweg & Freire, 2013).

In Africa, performance of waste management companies has been poor as a result of the performance challenges in their efforts to effectively manage waste and promote sustainable practices (UNEP, 2015). The rapid growth of urban areas in Africa puts immense pressure on waste management services. Increased population densities and urban sprawl result in higher volumes of waste generation, making it challenging for waste management companies to keep up with the demand (Bandyopadhyay, 2013). The presence of a large informal waste sector poses challenges for formal waste management companies. Informal waste pickers and scavengers often operate outside regulated systems, affecting waste collection efficiency and recycling efforts (JICA, 2014).

In Kenya, the performance of waste management companies has an important function in addressing the nation's waste management challenges, promoting environmental sustainability, and ensuring public health (JICA, 2014). Further, Kenya faces various waste management issues, including rapid urbanization, inadequate infrastructure, and improper waste disposal practices. Investing in the enhancement of waste management infrastructure which includes systems for waste collection, facilities for recycling and sanitary landfill sites is important as adequate infrastructure will enhance waste management efficiency and capacity. According to UNEP (2015), fostering collaboration among government agencies, waste management companies, communities, NGOs, and international organizations will help in addressing the performance challenges of the waste management companies.

The city of Nairobi has had a population burst in the last twenty years which has resulted in a multitude of problems, one of them being waste disposal. Many of Nairobi's residents are left grappling with how to dispose of their garbage since the Nairobi County has become overwhelmed in carrying out this task (UNEP, 2015). Waste management companies provides comprehensive and sustainable solutions for waste collection, recycling, and specialized waste management. With a focus on environmental responsibility and leveraging technology, waste management companies are making significant strides towards creating a cleaner and healthier Nairobi (JICA, 2014).

Technology strategy is a comprehensive plan outlining how a company intends to leverage technology to achieve its business objectives and gain a competitive advantage (Smythe, 2016). It involves aligning technology initiatives with the overall organizational strategy and ensuring that technology investments support and enhance the organization's operations, competitiveness, and innovation (Chai, Koh & Tsai, 2017). Technology strategy focuses on leveraging technology to support business operations and gain a competitive advantage. It involves decisions regarding technology infrastructure, digital transformation, IT systems, data management, cybersecurity, and innovation (Selwyn & Facer, 2014).

## 2.0 THEORETICAL REVIEW

This study was anchored on actor network theory which was advanced by Latour and Callon in the late 1990s. It offers a unique perspective on the interactions between humans and non-human entities, such as technology, objects, and institutions (Lester & Piore, 2004). It posits that both humans and non-human entities are considered "actors" that actively participate in shaping social reality. These actors form "actor-networks," which are dynamic and heterogeneous assemblages of entities that influence and are influenced by one another.

ANT rejects the distinction between human and non-human actors, advocating for "symmetry." This means that both types of actors have agency and contribute equally to the construction of social order. In ANT, human and non-human actors are treated on the same level, breaking away from the traditional anthropocentric view (Orlikowski & Iacono, 2015). One of the central processes in ANT is "translation," which refers to the process through which actors influence each other and become entangled in the network. Translation involves negotiating

interests, meanings, and identities among various actors. ANT critiques the tendency in social sciences to treat certain actors or processes as "black boxes" or taken-for-granted entities. Instead, it seeks to open up these black boxes and examine the complex relationships and negotiations that underlie them (Orlikowski & Iacono, 2015).

ANT's emphasis on symmetry and actor-networks challenges hierarchical and essentialist views of social structures. It offers a "flat ontology," where all actors, whether human or non-human, are considered as having equal influence and significance (Orlikowski & Iacono, 2015). ANT highlights the hybrid nature of actor-networks, emphasizing that social phenomena emerge from the interactions between heterogeneous actors. This approach can be particularly useful when studying complex and dynamic systems. ANT's acknowledgment of non-human agency allows researchers to explore the role of technology, objects, and other non-human entities in shaping social practices and institutions. This has significant implications for understanding the impact of technology on society. ANT's focus on the process of translation encourages researchers to investigate the dynamic nature of social phenomena, rather than focusing solely on fixed structures or outcomes (Lester & Piore, 2004).

Critics argue that ANT's emphasis on the agency of actors, both human and non-human, can lead to reductionism. By reducing complex social phenomena to a network of interactions, important aspects of social life may be overlooked (Orlikowski & Iacono, 2015). While ANT aims to challenge anthropocentrism, some critics argue that it still relies heavily on human-centered perspectives and does not fully account for the experiences and concerns of marginalized human actors. The rejection of traditional social structures in favor of actor-networks has been criticized for neglecting the broader social context and power dynamics that shape social life (Lester & Piore, 2004). ANT's approach to research often involves detailed case studies and a focus on local interactions. Critics argue that this may limit the generalizability of findings and make it difficult to draw broader conclusions about society (Orlikowski & Iacono, 2015). By adopting an ANT perspective, researchers and practitioners can gain a deeper understanding of the dynamics within waste management networks and improve decision-making processes in this critical field.

### 3.0 EMPIRICAL REVIEW

Sukri and Yusoff (2021) studied technology strategy and organizational performance of Malaysian manufacturing organizations. 354 respondents were targeted. Probability sampling was used and data analyzed using SPSS. Technology strategy positively affected organizational performance. Malaysia was the study context while Kenya was the study context. Kariuki (2015) investigated ICT strategy and organizational performance. Descriptive research design was used. 325 staff were targeted and stratified random sampling used to sample 76 respondents. Questionnaires were used. To a moderate extent, the enterprise resource planning system had assisted the organization in integration of all its business enhancing its efficiency. The context of the study was Nairobi bottlers while this study was done at the waste management companies in Nairobi.

Penalba, Guzman and Mojica (2015) determined the effect of information communication technology strategy on innovation level in Panama MSMEs case. A sample of 615 micro, small and medium-sized enterprises in Panama were targeted. The results obtained showed that ICT had a significant positive effect on innovation activities of companies. *However, the current study focused on the organizational performance in waste management companies not on innovation level in MSMEs.* Muthui (2013) studied the effects of ICT strategy in selected SACCOs in Nyeri County, Kenya. Questionnaires were used. The study found out that embracing information communication technology enabled the cooperatives to expedite delivery of services and products to their clients. The context of the study was SACCOs in Nyeri County while this study was done at the waste management companies in Nairobi.

### 4.0 RESEARCH METHODOLOGY

Descriptive research design was adopted. The study targeted 23 waste management companies based in Nairobi City County. The waste management companies are privately owned and professionally run and comprises of 298 employees from the accounts, operations, human resource, fleet, information and communication technology, sales and marketing departments. Sample size was determined using Yamane (1967) formula where 171 respondents were selected for the study. Questionnaires were used. Data analysis was done using SPSS. Both descriptive and inferential statistics were carried out. Data presentation was graphically or in tabular format. A regression model was

$$Y = \beta_0 + \beta_1 X_1 + \epsilon_0$$

Where:

- Y = Organizational performance
- $\beta_0$  = Constant
- $\beta_1$  = Coefficients of technology strategy
- X = Technology strategy
- $\epsilon_0$  = Error term assumed

## 5.0 RESULTS AND DISCUSSION

### 5.1 Regression Analysis

The effect of technology strategy on organizational performance in waste management companies in Nairobi City County, Kenya was sought and the results are shown in Table 1. Technology strategy was conceptualized as user friendliness, extent of automation and new e- applications.

**Table 1: Technology Strategy**

Technology strategy statements	Means	Standard deviations
The technology strategy prioritize user friendliness in the development of digital platforms and applications	3.50	1.24
The technology strategy is used to gather user feedback and continuously enhance the user experience	3.48	1.09
The technology strategy determine the appropriate level of automation across various processes and functions	3.85	0.89
The technology strategy ensures that automation aligns with our overall operational goals	3.86	1.07
The technology strategy prioritizes the development and integration of new e-applications that can enhances business processes	3.65	1.12
The technology strategy helps to anticipate the potential challenges associated with new e-applications	3.69	0.98
<b>Aggregate mean</b>	<b>3.67</b>	

Source: Survey data (2023)

The technology strategy ensures that automation aligns with our overall operational goals had a mean of 3.86 and SD of 1.07. The technology strategy determines the appropriate level of automation across various processes and functions had a mean of 3.85 and SD of 0.89. The technology strategy helps to anticipate the potential challenges associated with new e-applications had a mean of 3.69 and SD of 0.98. The technology strategy prioritizes the development and integration of new e-applications that can enhances business processes had a mean of 3.65 and SD of 1.12. The technology strategy prioritizes user friendliness in the development of digital platforms and applications had a mean of 3.50 and SD of 1.24 while the technology strategy is used to gather user feedback and continuously enhance the user experience had a mean of 3.48 and an SD of 1.09.

Kariuki (2015) connoted that tailoring automation levels in a company's processes through a technology strategy is vital for efficiency, cost-effectiveness, and innovation. Strategic automation optimizes routine tasks, reducing operational costs and increasing overall productivity. It ensures precise and timely data collection, improving decision-making processes (Sukri, & Yusoff, 2021). Additionally, automation enhances safety in waste management operations, mitigating potential risks. Strategic deployment of technology also fosters innovation, positioning the company at the forefront of industry advancements (Zhao, Hao & Liu, 2016). By aligning automation with specific needs and processes, the technology strategy enables a seamless integration of digital solutions, creating a resilient and forward-looking foundation for success in waste management.

### 5.2 Regression Analysis

Regression model was used to establish the influence of technology strategy on organizational performance in waste management companies.

**Table 2: Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.617 <sup>a</sup>	.401	.370	.62002

a. Predictors: (Constant), technology strategy

**Source: Survey data (2023)**

According to the results in Table 2, technology strategy accounted for 40.1% of the variation in organizational performance in waste management companies.

**Table 3: ANOVA**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.083	4	1.271	3.305	.013 <sup>b</sup>
	Residual	45.362	118	.384		
	Total	50.444	122			

a. Dependent Variable: Organizational performance

b. Predictors: (Constant), technology strategy

**Source: Survey data (2023)**

The overall model linking organizational performance in waste management companies in Nairobi City County, Kenya was significant (sig. = 0.013) indicating that technology strategy had a significant effect on organizational performance in waste management companies.

**Table 4: Model Coefficients**

	Unstandardized Coefficients		Standardized Coefficients		Sig.
	B	Std. Error	Beta	t	
(Constant)	2.865	0.428		6.691	0.000
Technology strategy	0.040	0.081	0.044	0.498	0.620

a. Dependent Variable: Organizational performance

**Source: Survey data (2023)**

$$Y = \beta_0 + \beta_1 X_1 + \varepsilon$$

$$\text{Organizational performance} = 2.865 + 0.040 (0.081)$$

Where; Organizational performance = Constant + technology strategy

Holding all other factors including functional strategies constant, organizational performance in waste management companies in Nairobi City County, Kenya is 2.865.

Results shown in Table 4 indicated that technology strategy affected organizational performance in waste management companies positively and insignificantly ( $\beta = 0.040$ , sig. = 0.620). Enhancing technology strategy leads to 0.040 increase in organizational performance in waste management companies. The findings contradict a study by Sukri and Yusoff (2021) and Penalba et al. (2015) who indicated that the technology strategy positively and significantly affected organizational performance in manufacturing companies and Panama MSMEs respectively.

## 6.0 CONCLUSION AND RECOMMENDATION

The regression analysis results helped in concluding that user friendliness, extent of automation and new e-applications influenced organizational performance in waste management companies positively and insignificantly. A technology strategy in a waste management company is vital for optimizing operations, improving efficiency, and staying competitive. It involves the strategic use of digital tools, data analytics, and automation to enhance waste processing, resource management, and customer service. A well-implemented technology strategy fosters innovation, cost-effectiveness, and environmental sustainability.

The study recommends that the companies need to make sure that automation aligns with the overall operational goals in the waste management companies which helps to optimize efficiency and innovation. Tailored automation enhances routine tasks, reduces costs, and ensures precise data management while strategic deployment aligns technology with specific needs, fostering a resilient and forward-looking foundation for success in the waste management industry.

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