

# Examining the Effectiveness of TERMIS in Enhancing Parking Fee Revenue Collection in Tanzania: A Case of Iringa Municipality

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**Abstract:** This study investigated the impact of the Tanzania Revenue Management Information System (TERMIS) on parking fee revenue collection in Iringa Municipality, focusing on system adoption, technical functionality, and user accessibility. The main objectives were to examine the effect of system adoption rate on revenue collection, evaluate the influence of technical functionality, and identify the role of user accessibility in improving compliance and revenue outcomes. A cross-sectional survey design was employed, collecting data from 100 users of the TERMIS parking module. Quantitative analyses, including descriptive statistics, Spearman's correlation, and multiple regression, were conducted to assess relationships between the independent variables and parking revenue collection. The findings revealed strong positive correlations among TERMIS adoption, technical functionality, user accessibility, and revenue collection. Regression analysis indicated that technical functionality and user accessibility were significant predictors of revenue collection, while system adoption showed a positive but statistically insignificant effect. These results underscore that reliable technical operations and accessible, user-friendly interfaces are critical to achieving enhanced municipal revenue, whereas adoption alone is insufficient without supportive infrastructure and user engagement strategies. The study concludes that the effectiveness of TERMIS depends on a combination of technical reliability, accessibility, and adoption strategies, highlighting the need for integrated approaches in digital revenue systems. Theoretical contributions include the validation of the Technology Acceptance Model and Information Systems Success Model in a municipal context, while methodological contributions emphasize the value of combining correlational and multivariate analyses. Practically, the study recommends strengthening system reliability, expanding payment options, enhancing user support, conducting awareness campaigns, and implementing supportive policies to optimize revenue collection. Limitations related to cross-sectional design and localized focus are noted, with suggestions for longitudinal and comparative studies to deepen understanding. The study provides actionable insights for municipal managers, policymakers, and researchers aiming to improve the efficiency, inclusivity, and financial sustainability of digital revenue collection systems in Tanzania and similar developing country contexts. This electronic document is a "live" template and already defines the components of your paper [title, text, heads, etc.] in its style sheet.

**Keywords—** Parking revenue performance, System Adoption, Technical Functionality, User Accessibility, TERMIS

## 1. 1 BACKGROUND AND LITERATURE SURVEY

The rapid urbanization and increasing vehicle ownership in Tanzania have intensified the demand for efficient parking management systems. However, many local governments struggle with ineffective parking fee collection mechanisms, leading to significant revenue losses. The Tanzania Electronic Revenue Management Information System (TERMIS) was introduced as a digital solution to streamline revenue collection, including parking fees. This study seeks to examine the effectiveness of TERMIS in enhancing parking fee revenue collection, focusing on its operational efficiency, challenges, and overall impact on revenue generation. By evaluating TERMIS, this research aims to provide insights into how digital systems can improve revenue collection and inform policy decisions for sustainable urban management.

The inefficient collection of parking fees is a growing concern in urban areas worldwide. Traditional manual systems in developing countries are prone to revenue leakage and low compliance [1]. To address these issues, cities are turning to advanced technologies. Electronic payment apps and automated card issuance systems can streamline parking management, improving efficiency and user convenience [2]. Smart parking systems utilizing sensors and mobile applications can provide real-time information on available spaces, reducing congestion and fuel consumption [3]. These technologies offer features such as dynamic slot allocation, security management, and statistical reporting [4]. Implementing digital solutions, along with improved enforcement and public awareness campaigns, can enhance parking tax revenue collection and overall urban transportation efficiency [1, 3].

The inefficient parking fee collection problem involves various stakeholders and technological solutions. Local

governments and parking operators struggle with revenue collection due to illegal parking and non-compliant attendants [5]. To address these issues, automated parking systems using number plate recognition technology have been proposed [6, 7]. These systems minimize human interaction, improve convenience, and enhance security in public parking lots. They also facilitate electronic fee collection without magnetic cards and provide parking guidance to users [8]. Mobile phone-based parking systems have shown success in countries like Singapore and Germany, improving traffic management and fee collection efficiency [9]. However, implementing such solutions requires consideration of local banking models and system environments [8]. These technological advancements contribute to the broader goal of automating and digitizing essential services in urban areas [5].

The inefficient collection of parking fees poses significant challenges for local governments, urban planners, and the public. In Samarinda City, weak supervision, limited technology, and low public awareness hinder effective parking tax collection [8]. To address these issues, smart parking applications can optimize space usage, enhance user convenience, and provide real-time monitoring [10]. Mobile phone-based parking systems have shown success in countries like Singapore and Germany, improving traffic management and fee collection efficiency [11]. Implementing digital technologies in parking systems can enhance taxpayer compliance, reduce revenue leakage, and streamline the parking process through features like advance reservations and electronic payments [10, 11]. These solutions aim to alleviate traffic congestion, improve space utilization, and significantly enhance the overall parking experience for users in urban areas [12].

Various studies synthesize research on parking systems and revenue collection in Tanzania and Indonesia. Studies highlight the need for improved parking management in Tanzanian cities, as inefficient systems contribute to economic losses through increased fuel consumption, time waste, and air pollution [13, 14]. The implementation of local government revenue collection information systems in Tanzania has shown mixed results, with system and information quality positively impacting success, while service quality and trust negatively affected outcomes [14]. Research on performance information use by local government stakeholders in Tanzania reveals that collection and utilization are influenced by stakeholders' power and interests [15]. Similarly, a study in Semarang, Indonesia, identified challenges in parking management, including illegal parking lots and non-compliant attendants, emphasizing the need for stricter enforcement and stakeholder collaboration to optimize revenue collection [5].

The inefficient collection of parking fees and other revenues in African urban areas is a significant challenge for local governments. Studies have identified several key issues, including inadequate revenue collection tools and technology, weak governance structures, and resistance to change among stakeholders [16, 17]. In Kenya, for example, 72% of system

users contribute to e-government system failures due to resistance [16]. Other challenges include high parking fees, system failures, and lack of parking spaces [17]. The implementation of information systems has shown potential to improve revenue collection efficiency and effectiveness [18]. However, fiscal decentralization and local revenue mobilization face political and administrative constraints, as well as issues with citizens' compliance [19]. Addressing these challenges requires comprehensive reforms, including improved technology adoption, capacity building, and legal frameworks for revenue collection [17].

Parking challenges in Tanzanian cities, particularly inefficient collection systems, result in significant revenue losses for local governments and impact public services [20]. The manual parking methods lead to time and fuel wastage, contributing to economic losses and urban congestion [13]. To address these issues, innovative smart parking systems are recommended, which can improve efficiency and reduce environmental impact [13]. However, the implementation of information systems for revenue collection faces challenges, including negative effects of service quality and trust on user satisfaction [14]. Similar issues are observed in other contexts, such as Samarinda City, where weak supervision, limited technology, and low public awareness hinder effective parking tax collection. Potential solutions include adopting modern parking technologies, improving urban planning, enhancing regulatory measures, and implementing policies that provide incentives for compliance and strict sanctions for violations [21].

The problem of inefficient parking fee revenue collection has developed as a result of rapid urbanization and the increasing number of vehicles worldwide [1-3, 5, 8]. In developed countries, the problem has been addressed through the adoption of advanced digital systems, but in many developing countries, including those in Africa and Tanzania, the problem persists due to reliance on manual or semi-automated systems [13, 16, 18, 19]. The stakeholders involved in parking fee collection include local governments, municipal authorities, parking operators, and the general public. The problem is significant because it results in revenue losses, impacts the provision of public services, and affects the transparency and convenience of the parking fee collection process [10, 11, 20]. In Tanzania, the introduction of TERMIS was intended to address these issues, but its effectiveness remains unclear, and the system faces implementation challenges. This study seeks to examine the effectiveness of TERMIS in enhancing parking fee revenue collection in Iringa Municipality, providing valuable insights for policymakers and stakeholders in Tanzania.

## 1.2 Statement of the Problem

Electronic parking systems are increasingly recognized as effective tools for optimizing revenue collection and improving urban management. These systems integrate digital technologies like electronic payments, automated enforcement, and centralized monitoring to enhance efficiency

and transparency [1, 8]. By implementing electronic parking and automated card issuance, cities can streamline access control, reduce human error, and provide a seamless user experience [10]. Such systems also enable effective monitoring of parking-related aspects, contributing to increased local revenue and minimizing leakages [16]. Advanced features like number plate recognition further enhance convenience and security in public parking areas, eliminating the need for physical tokens and facilitating automated fee collection [3]. These technological advancements in parking management systems offer significant potential for improving urban services, increasing revenue, and enhancing public trust in local governments.

The implementation of electronic revenue collection systems in Tanzanian local governments faces significant challenges. While such systems aim to improve efficiency and transparency, their success is influenced by various factors. System and information quality positively impact user satisfaction, but service quality and trust in the system have negative effects [22]. In urban areas, parking management struggles with balancing regeneration, restraint, and revenue objectives [20]. To address revenue collection issues, some municipalities have outsourced the process, which can be effective if properly managed [23]. However, the adoption of electronic fiscal devices for revenue collection encounters obstacles such as low public awareness and resistance from stakeholders [24]. These challenges highlight the need for comprehensive strategies to improve revenue collection systems, including enhancing trust, providing education, and investing in infrastructure development.

Inefficiency and ineffectiveness of parking fee revenue collection systems in Iringa Municipality, results in significant revenue losses, poor service delivery, and a lack of transparency. The reliance on manual systems creates opportunities for corruption and undermines public trust in local government authorities. While TERMIS was introduced as a solution, its implementation has been inconsistent, and its impact on revenue collection has not been thoroughly evaluated. This raises critical questions about the system's effectiveness, the challenges hindering its full adoption, and the potential for improvement. Without addressing these issues, Iringa Municipality will continue to lose revenue, struggle to provide essential services, and fail to meet the growing demand for efficient urban management. This study seeks to address these issues by examining the effectiveness of TERMIS in Iringa Municipality, identifying the challenges hindering its adoption, and proposing recommendations for improvement.

### 1.3 Research Objectives

#### 1.3.1 General Objective

This study aims to examine the effectiveness of TERMIS in enhancing parking fees revenue collection in Tanzania.

#### 1.3.2 Specific Objective

(i) To examine the effect of system adoption rate on parking fee revenue collection in Iringa Municipality.

(ii) To investigate the effect of technical functionality on parking fee revenue collection in Iringa Municipality.

(iii) To identify the effect of user accessibility on parking fee revenue collection in Iringa Municipality.

### 1.4 Hypothesis

H<sub>1</sub>: There is a significant positive relationship between TERMIS adoption rates and parking fee revenue collection in Iringa Municipality.

H<sub>2</sub>: Improved technical functionality of TERMIS significantly enhances parking fee revenue collection efficiency in Iringa Municipality.

H<sub>3</sub>: Enhanced user accessibility features significantly improve parking fee compliance and revenue collection in Iringa Municipality.

The study makes several theoretical contributions by extending the understanding of digital revenue collection systems in municipal contexts. First, it reinforces and empirically validates concepts from the Technology Acceptance Model (TAM) and Information Systems Success Model, demonstrating that user adoption alone is not sufficient to drive revenue performance; instead, technical functionality and system accessibility are critical determinants. Second, it contributes to New Public Management (NPM) theory by showing that digital tools, when reliable and user-friendly, can enhance efficiency and accountability in public revenue collection. The findings also highlight gaps in existing theories, particularly in developing country contexts where infrastructural limitations and socio-economic disparities influence system effectiveness. By integrating adoption, technical functionality, and accessibility into a single analytical framework, this study provides a more holistic understanding of the factors influencing digital municipal revenue systems, offering a theoretical foundation for future research in similar contexts.

### 2.0 Methodology

Research methodology provides a systematic framework for investigating the research problem, ensuring validity, reliability, and logical coherence in the study [25]. It encompasses the strategies, techniques, and procedures used to collect, analyze, and interpret data [26]. This chapter outlines the methodological approach adopted to examine the effectiveness of TERMIS in enhancing parking fee revenue collection in Iringa Municipality, Tanzania. Specifically, it details research design and approach, study area and justification, target population and sampling techniques, data types, sources, and collection methods, data analysis and presentation techniques. The methodology ensures that the study's objectives are addressed rigorously while maintaining scientific and practical relevance.

## 2.1 Study Area

Iringa Municipality, Tanzania, serves as an ideal study location due to its status as a mid-sized urban center experiencing growing parking management challenges while having implemented the Tanzania Rural and Urban Roads Agency (TARURA) e-Revenue Management Information System (TERMIS) for parking fee collection. This makes it a valuable case for examining both the system's potential and its real-world implementation hurdles, particularly in the wards of Kitanzini, Mshindo, Mlandege, Gangilonga, Kihesa, and Ruaha. The Municipality's ongoing struggles with TERMIS adoption and enforcement issues mirror Tanzania's broader digital revenue collection challenges, providing a microcosm for understanding the technical, institutional, and user-related barriers that affect similar systems nationwide. By focusing on Iringa, this study can generate insights that are both locally relevant for municipal authorities and potentially applicable to other Tanzanian urban centers facing comparable digital transition challenges in revenue management.

The implementation of TERMIS in Iringa is overseen by TARURA, which is responsible for managing urban and rural road infrastructure, including parking fee collection systems. In the specified wards—Kitanzini, Mshindo, Mlandege, Gangilonga, Kihesa, and Ruaha—TERMIS aims to streamline parking fee collection through digital means, reducing revenue leakages and improving efficiency. However, these wards face unique challenges that reflect both localized and systemic issues. For instance, Kitanzini and Mshindo, being central and densely populated, experience high parking demand, leading to enforcement difficulties and user resistance due to limited awareness or technical issues with payment platforms. Mlandege and Gangilonga, with their mix of commercial and residential areas, encounter challenges related to inconsistent enforcement and infrastructure limitations, such as inadequate parking spaces or poor system integration. Kihesa and Ruaha, which include both urban and peri-urban zones, face additional barriers like low digital literacy among users and connectivity issues, hindering TERMIS adoption. These ward-specific dynamics highlight the interplay of technical (e.g., system reliability), institutional (e.g., enforcement capacity), and user-related (e.g., awareness and trust) barriers, making Iringa an exemplary case for studying TARURA's digital revenue management initiatives and their scalability across Tanzania.

## 2.3 Research Approach

This study employed a quantitative research approach to investigate the relationships between variables but data was collected in TERMIS effectiveness and revenue collection from car parking in Iringa Municipality, Tanzania. The quantitative approach is chosen because it allows for the systematic examination of measurable variables across a large sample, enabling the identification of trends, patterns, and statistical relationships [27]. By collecting numerical data, this approach facilitates the testing of hypotheses and the generalization of findings to the broader population of car parking revenue collection in similar contexts.

## 2.4 Research Design and Strategy

This study employed a quantitative non-experimental design, combining descriptive and correlational approaches to systematically analyze the relationship between TERMIS implementation (independent variables) and parking revenue collection performance (dependent variables). The descriptive component quantifies measurable aspects such as TERMIS adoption rates, technical functionality, and revenue trends, while the correlational aspect tests statistical relationships (e.g., between system uptime and revenue leakage). This design aligns with the quantitative approach [27], focusing on objective, numerical data to evaluate TERMIS effectiveness in a real-world setting where experimental manipulation is impractical. By leveraging existing TERMIS implementation data, the study ensures methodological rigor while providing actionable insights for improving revenue collection systems in Tanzania. The study employed a survey strategy to collect numerical data from key stakeholders, supplemented by secondary data analysis of TERMIS records.

## 2.5 Sampling Procedure and Sample Size

### Sampling Procedure

This study employed a stratified random sampling technique for parking users and purposive sampling for key TERMIS stakeholders to ensure representative and targeted data collection. This study employed a stratified random sampling technique for parking users, categorizing the estimated 1050 daily users in Iringa Municipality by vehicle type (private vs. commercial) to ensure balanced representation, with random selection within each stratum to minimize bias, while purposive sampling targets key TERMIS stakeholders including municipal revenue officers (10-15), technical administrators (5-7), and enforcement staff (5-8) based on their direct involvement in TERMIS operations or revenue collection, ensuring both statistical comparability across user groups and expert insights from critical system implementers.

### Sample Size

According to [28], sampling is the process of selecting a subset of individuals or elements from a larger population to represent the characteristics of the entire population. It is a crucial aspect of research methodology, particularly when dealing with large populations where it is impractical or impossible to study every individual. The expected sample size will be obtained from the following formula, given by [29]. When dealing with a population as small as 1050 sample frame, a finite population correction (FPC) is often applied. This adjusts the sample size downward, as you don't need as large a sample when you're sampling a significant proportion of a smaller population.

The formula is:

$$n = \frac{N}{1 + N(e^2)}$$

Where:

$n$  = Sample Size

$N$  = Sample Frame = 1050

$e$  = Sampling Error which is 10% of the population

$$\text{Hence } n = \frac{1050}{1 + 1050(0.1^2)} = 91.3 = 92$$

Thus, 100 parking users will be surveyed for quantitative data.

## 2.6 Data Collection Methods

Data collection methods refers to the ways which used to collect data. The study employed questionnaire as a quantitative data collection instrument that helps to cover larger target groups than the interview, given the quality and chance of no response. The questionnaire was prepared using 5 Point Likert-Scale approaches also the questionnaire was guided by variables as indicated in the objectives. Data was collected by using closed ended questions because it's easier to analyze, administer and are economical in terms of money and time.

## 2.7 Data Analysis

According to [30] data analysis refers to the process that deals with methods and techniques of taking raw information, mining and extracting for insight that are relevant to the primary goals or objectives of the study, also drilling down into this information so as to transform matrices, facts and figures into initiatives for improvement. The data for this study was analyzed using quantitative technique to ensure a comprehensive understanding of the research problem. Quantitative data will be processed using the Statistical Package for Social Sciences (SPSS) version 20. Descriptive statistics including frequencies, percentages, means, and standard deviations was employed to summarize and present the characteristics of the dataset. Inferential statistics, specifically correlation and multivariate regression analysis, was used to examine the relationships and the statistical significance between the independent and dependent variables.

The data was analyzed using computer software, Statistical Package for Social Sciences (SPSS) version 20 techniques so as to extract and analyze findings of the study, since because SPSS has got descriptive statistics and inferential statistics, where descriptive analysis is presented by using statistical tools mainly frequencies, percentages, mean and standard deviation to summarize the responses and inferential analysis is conducted by using correlation and multivariate regression to show the relationship and the significance between dependent and independent variables.

## 2.8 Modal Specification

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

Where  $Y$  = Parking revenue performance

$X_1$  = System Adoption

$X_2$  = Technical Functionality

$X_3$  = User Accessibility

$\beta_0$  = Intercept

$\beta_1, \beta_2, \beta_3$  = Coefficients measuring the effect of each independent variable on dependent variable.

$\varepsilon$  = Error term

This statistical model quantified the strength and direction of these relationships through coefficient analysis ( $\beta_1$ - $\beta_3$ ).

## 3. Result and Discussion

This section presents the results and analysis of the study on examining the effectiveness of the Tanzania Electronic Revenue Management Information System (TERMIS) in enhancing parking fee revenue collection in Tanzania. The section is structured to provide a logical flow of the findings, beginning with the sample characteristics of the respondents to establish the demographic profile of the study population. This is followed by descriptive statistics that summarize key patterns and trends in the data related to TERMIS adoption and its impact on revenue collection. The section further employs multivariate analyses, including correlation and regression, to test relationships and measure the predictive power of TERMIS on parking fee revenue outcomes. The presentation of results is aligned with the study objectives and research questions, enabling a comprehensive discussion of TERMIS effectiveness. The section concludes with a summary that synthesizes the major findings.

### 3.2 Sample Characteristics

This section presents the demographic and background information of the respondents who participated in the study. Understanding the sample characteristics is essential as it provides context for interpreting the findings and ensures that the perspectives captured reflect the diversity of parking system users. The analysis covers respondents' gender, age categories, types of vehicles owned or used, and frequency of parking. These attributes help in assessing how different groups interact with the Tanzania Electronic Revenue Management Information System (TERMIS) and their experiences with parking fee payment.

#### 3.2.1 Gender

The gender distribution of respondents provides insights into the participation of both men and women in parking activities within Iringa Municipality. Examining gender characteristics is important, as it highlights the level of representation and helps to identify any gender-based differences in the use of the Tanzania Electronic Revenue Management Information System (TERMIS). Table 1 shows the respondent's gender.

Table 1; Gender of respondents

| Gender |        |           |
|--------|--------|-----------|
|        |        | Frequency |
| Valid  | Male   | 67        |
|        | Female | 33        |
|        | Total  | 100       |

Source: Field Data

The results in Table 1 indicate that the majority of respondents were male, accounting for 67% of the sample, while females represented 33%. This shows that men are more actively engaged in parking activities compared to women, possibly reflecting differences in vehicle ownership or usage patterns between genders. The distribution also suggests that TERMIS primarily interacts with male users, although female participation remains notable.

#### 4.2.2 Age

The age distribution of respondents provides an understanding of the demographic profile of TERMIS users and helps to establish which age groups are more engaged in parking fee payment activities. Age is an important characteristic, as it may influence familiarity with digital platforms and attitudes toward compliance with revenue collection systems. Table 2 shows the age of respondents.

Table 2: Age of Respondents

|       | Frequency | Percent |
|-------|-----------|---------|
| 26-35 | 33        | 33      |
| 36-45 | 51        | 51      |
| 46+   | 16        | 16      |
| Total | 100       | 100     |

Source: Field Data

The results in Table 2 show that the majority of respondents (51%) were between 36–45 years, followed by 33% in the 26–35 years category. Only 16% were aged 46 and above. These findings suggest that most TERMIS users are within the productive and economically active age groups, which reflects their high level of engagement in activities that require frequent parking. The relatively lower proportion of respondents aged 46 and above may indicate less involvement in daily parking or a reduced preference for digital revenue systems among older individuals.

#### 3.2.3 Vehicle Type

The type of vehicle owned by respondents is a key characteristic in understanding parking fee patterns, as different vehicle categories are likely to have varying parking needs and frequency of use. Private vehicles, for instance, are often associated with individual usage, while commercial and government vehicles are usually linked to institutional or business-related parking activities. Table 3 below shows the vehicle type of respondents.

Table 3; Shows vehicle type of respondents

|            | Frequency |
|------------|-----------|
| Private    | 59        |
| Commercial | 33        |
| Government | 8         |
| Total      | 100       |

Source: Field Data

The findings in Table 3 reveal that the majority of respondents (59%) owned private vehicles, while 33% reported using commercial vehicles. Government vehicles accounted for only 8% of the sample. This distribution indicates that private vehicle owners form the largest group utilizing parking services, suggesting that TERMIS plays a critical role in managing revenue collection primarily from individual users. The presence of commercial vehicles also highlights the system's importance for business-related activities, while the smaller proportion of government vehicles suggests limited representation of institutional parking in the dataset.

#### 3.2.4 Frequency of Parking

The frequency of parking among respondents provides insights into the intensity of parking demand and the potential revenue generated through TERMIS. Regular parking behavior reflects the level of dependency on parking services and helps determine the system's effectiveness in managing consistent transactions. Table 4.4 shows the frequency of parking of respondents.

Table 4: Frequency of parking of respondents

|       | Frequency |
|-------|-----------|
| Daily | 100       |

Source: Field Data

As shown in Table 4.4, all respondents (100%) reported using parking services on a daily basis. This finding suggests that the surveyed population comprised regular and consistent users of parking facilities, emphasizing the significance of TERMIS in ensuring efficient fee collection and service delivery. The daily usage pattern highlights the system's potential to generate steady revenue streams for local authorities while also pointing to the need for reliable

technological infrastructure to handle frequent transactions without disruptions.

### 3.3 Descriptive Statistics

To assess the effectiveness of TERMIS in enhancing parking fee revenue collection, respondents were asked to rate their perceptions on various indicators, including TERMIS adoption, technical functionality, user accessibility

efficiency, and overall effectiveness. Responses were measured using a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree. Table 5 presents the descriptive statistics for these indicators.

#### 3.3.1 TERMIS Adoption

Table 5: Descriptive Statistics on TERMIS Adoption

| Statement                                               | N   | Mean | Std. Deviation | Interpretation     |
|---------------------------------------------------------|-----|------|----------------|--------------------|
| I find TERMIS easy to use for parking payments          | 100 | 4.20 | 0.70           | High agreement     |
| TERMIS has made parking fee payment more convenient     | 100 | 4.35 | 0.62           | High agreement     |
| I prefer using TERMIS over the previous manual system   | 100 | 4.10 | 0.75           | High agreement     |
| The registration process for TERMIS was straightforward | 100 | 3.90 | 0.80           | Moderate agreement |
| I receive adequate support when facing TERMIS issues    | 100 | 3.65 | 0.85           | Moderate agreement |

Source: Field Data

The results in table 5 showed that most respondents found TERMIS easy to use ( $M = 4.20$ ,  $SD = 0.70$ ) and more convenient compared to manual systems ( $M = 4.35$ ,  $SD = 0.62$ ). A majority also preferred TERMIS over the manual approach ( $M = 4.10$ ,  $SD = 0.75$ ). However, satisfaction was lower with the registration process ( $M = 3.90$ ,  $SD = 0.80$ ) and support services ( $M = 3.65$ ,  $SD = 0.85$ ), indicating room for improvement in customer assistance.

#### 3.3.2 Technical Functionality

Table 6: Descriptive Statistics on Technical Functionality of TERMIS

| Statement                                            | N   | Mean | Std. Deviation | Interpretation     |
|------------------------------------------------------|-----|------|----------------|--------------------|
| TERMIS operates reliably without frequent breakdowns | 100 | 4.00 | 0.72           | High agreement     |
| Payment processing through TERMIS is fast            | 100 | 4.15 | 0.65           | High agreement     |
| The system provides secure transactions              | 100 | 4.30 | 0.55           | High agreement     |
| TERMIS works well with my preferred payment method   | 100 | 4.05 | 0.68           | High agreement     |
| I receive prompt payment confirmation                | 100 | 4.25 | 0.58           | High agreement     |
| The system is user-friendly for first-time users     | 100 | 3.80 | 0.82           | Moderate agreement |
| TERMIS is available when I need to make payments     | 100 | 4.10 | 0.62           | High agreement     |

Source: Field Data

The system's technical performance was generally rated positively, with secure transactions ( $M = 4.30$ ,  $SD = 0.55$ ) and prompt payment confirmation ( $M = 4.25$ ,  $SD = 0.58$ ) receiving

the highest ratings. Respondents also agreed that the system was fast and reliable ( $M = 4.15$  and  $4.00$ , respectively). However, first-time users reported slightly lower satisfaction ( $M = 3.80$ ,  $SD = 0.82$ ), suggesting that additional user-friendly guidelines or onboarding support may be necessary.

### 3.3.3 User Accessibility

Table 4.7: Descriptive Statistics on User Accessibility of TERMIS

| Statement                                                       | N   | Mean | Std. Deviation | Interpretation             |
|-----------------------------------------------------------------|-----|------|----------------|----------------------------|
| TERMIS access points (kiosks/agents) are conveniently located   | 100 | 3.95 | 0.77           | Moderate to high agreement |
| Customer support is available when I encounter issues           | 100 | 3.70 | 0.88           | Moderate agreement         |
| The system accommodates users with limited digital literacy     | 100 | 3.50 | 0.90           | Neutral to moderate        |
| I can easily switch between payment methods (cash/mobile money) | 100 | 4.05 | 0.65           | High agreement             |
| TERMIS has improved transparency in parking fee collection      | 100 | 4.20 | 0.60           | High agreement             |

Source: Field Data

Accessibility indicators revealed mixed experiences. While transparency improvements were strongly endorsed ( $M = 4.20$ ,  $SD = 0.60$ ) and payment method flexibility was appreciated ( $M = 4.05$ ,  $SD = 0.65$ ), customer support availability ( $M = 3.70$ ,  $SD = 0.88$ ) and accommodation for

Collection Impact

low-digital-literacy users ( $M = 3.50$ ,  $SD = 0.90$ ) were less favorably rated. This indicates potential barriers for certain user groups.

### 4.3.4 Revenue Collection Impact

| Statement                                             | N   | Mean | Std. Deviation | Interpretation      |
|-------------------------------------------------------|-----|------|----------------|---------------------|
| TERMIS has reduced revenue leakage in parking fees    | 100 | 4.30 | 0.55           | High agreement      |
| The system has improved transparency in collections   | 100 | 4.25 | 0.60           | High agreement      |
| TERMIS has increased government revenue from parking  | 100 | 4.10 | 0.65           | High agreement      |
| The system has reduced corruption in parking payments | 100 | 4.05 | 0.70           | High agreement      |
| TERMIS provides accurate records of all transactions  | 100 | 4.35 | 0.50           | Very high agreement |

Source: Field Data

The revenue-related impact of TERMIS was highly rated, with accurate record-keeping being the strongest area ( $M = 4.35$ ,  $SD = 0.50$ ), followed by reduced leakage ( $M = 4.30$ ,  $SD = 0.55$ ) and transparency in collections ( $M = 4.25$ ,  $SD = 0.60$ ). These findings emphasize TERMIS's role in strengthening accountability and financial performance, though some respondents still noted that corruption, while reduced, had not been entirely eliminated ( $M = 4.05$ ,  $SD = 0.70$ ).

### 3.4 Multivariate Analyses: Correlation

Multivariate analysis allows researchers to examine relationships among multiple variables simultaneously, providing deeper insights beyond simple descriptive statistics.

Table 8: Correlations

|                           | Revenue Collection Impact | TERMIS Adoption | Technical Functionality | User Accessibility |
|---------------------------|---------------------------|-----------------|-------------------------|--------------------|
| Spearman's rho            | 1.000                     | .842**          | .846**                  | .864**             |
| Revenue Collection Impact |                           |                 |                         |                    |
| Correlation Coefficient   | 1.000                     | .842**          | .846**                  | .864**             |
| Sig. (2-tailed)           | .                         | .000            | .000                    | .000               |
| N                         | 100                       | 100             | 100                     | 100                |

Among these techniques, correlation analysis is widely used to measure the strength and direction of associations between two or more continuous variables. Correlation does not imply causation, but it helps identify patterns and potential linkages that may warrant further investigation. In this study, correlation analysis is employed to explore the relationships between the independent variables—such as TERMIS adoption, technical functionality and user accessibility—and the dependent variable, revenue collection impact. The results of this analysis provide a foundation for understanding how these variables interact and guide subsequent regression or predictive analyses

### Correlation Analysis Findings

|                         |                         |        |        |        |        |
|-------------------------|-------------------------|--------|--------|--------|--------|
| TERMIS Adoption         | Correlation Coefficient | .842** | 1.000  | .864** | .821** |
|                         | Sig. (2-tailed)         | .000   | .      | .000   | .000   |
|                         | N                       | 100    | 100    | 100    | 100    |
| Technical Functionality | Correlation Coefficient | .846** | .864** | 1.000  | .844** |
|                         | Sig. (2-tailed)         | .000   | .000   | .      | .000   |
|                         | N                       | 100    | 100    | 100    | 100    |
| User Accessibility      | Correlation Coefficient | .864** | .821** | .844** | 1.000  |
|                         | Sig. (2-tailed)         | .000   | .000   | .000   | .      |
|                         | N                       | 100    | 100    | 100    | 100    |

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The correlation analysis (Table 8) was conducted using Spearman's rho to determine the relationships between TERMIS adoption, technical functionality, user accessibility, and revenue collection impact in Iringa Municipality. The results indicate statistically significant and strong positive correlations among all variables at the 0.01 level (2-tailed), suggesting meaningful associations between system-related factors and parking fee revenue collection. Specifically, the findings in relation to the study objectives are as follows:

#### 3.4.1 Effect of System Adoption Rate on Revenue Collection

TERMIS adoption exhibited a strong positive correlation with revenue collection impact ( $r = 0.842$ ,  $p < 0.01$ ). This indicates that higher adoption rates of TERMIS among users are associated with improved efficiency in parking fee revenue collection. This supports the objective of examining the effect of system adoption rate on revenue collection in Iringa Municipality, demonstrating that widespread use of the system contributes significantly to revenue performance.

#### 3.4.2 Effect of Technical Functionality on Revenue Collection

Technical functionality also showed a strong positive correlation with revenue collection impact ( $r = 0.846$ ,  $p < 0.01$ ). This suggests that well-functioning technical components of TERMIS, such as system reliability, payment processing, and real-time tracking, play a critical role in enhancing revenue collection, aligning with the objective of investigating the effect of technical functionality.

Table 9: Model Summary<sup>b</sup>

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics |          |     |     |               | Durbin-Watson |
|-------|---|----------|-------------------|----------------------------|-------------------|----------|-----|-----|---------------|---------------|
|       |   |          |                   |                            | R Square Change   | F Change | df1 | df2 | Sig. F Change |               |

#### 3.4.3 Effect of User Accessibility on Revenue Collection

User accessibility was positively correlated with revenue collection impact ( $r = 0.864$ ,  $p < 0.01$ ), indicating that systems that are easier for users to access and navigate significantly contribute to improved collection of parking fees. This finding fulfills the objective of identifying the effect of user accessibility, highlighting the importance of user-friendly interfaces in achieving higher revenue performance.

These results demonstrate that TERMIS adoption, technical functionality, and user accessibility are all positively and significantly associated with parking fee revenue collection, confirming that both the usability and performance of the system are key drivers of municipal revenue enhancement.

#### 3.5 Multivariate Analyses: Regression

Regression analysis is a statistical technique used to examine the extent to which one or more independent variables predict or influence a dependent variable. Unlike correlation, which only measures the strength and direction of relationships, regression allows for the assessment of the magnitude and significance of the impact of each predictor while controlling for others. In this study, regression analysis is employed to determine how TERMIS adoption, technical functionality, and user accessibility collectively and individually affect parking fee revenue collection in Iringa Municipality. The results provide insights into the key system factors that drive improved revenue performance.

##### 3.5.1 Regression Model

|  |                   |      |      |         |      |         |   |    |      |       |
|--|-------------------|------|------|---------|------|---------|---|----|------|-------|
|  | .904 <sup>a</sup> | .818 | .812 | 2.11149 | .818 | 143.921 | 3 | 96 | .000 | 3.178 |
|--|-------------------|------|------|---------|------|---------|---|----|------|-------|

a. Predictors: (Constant), User Accessibility, TERMIS Adoption, Technical Functionality

b. Dependent Variable: Revenue Collection Impact

The regression analysis was conducted to examine the collective effect of TERMIS adoption, technical functionality, and user accessibility on parking fee revenue collection in Iringa Municipality. The results of the model summary (Table 4.9) indicate a strong overall fit.

The model produced a multiple correlation coefficient ( $R = 0.904$ ), suggesting a very strong relationship between the independent variables and revenue collection impact. The coefficient of determination ( $R^2 = 0.818$ ) shows that approximately 81.8% of the variance in revenue collection impact is explained collectively by TERMIS adoption, technical functionality, and user accessibility. The adjusted  $R^2$  (0.812) confirms that the model remains robust after adjusting for the number of predictors.

The model's standard error of the estimate is 2.11149, indicating the average distance between the observed and predicted values. The F-statistic ( $F = 143.921$ ,  $p < 0.001$ ) shows that the overall regression model is statistically significant, meaning that the independent variables reliably predict revenue collection impact.

Furthermore, the Durbin-Watson statistic of 3.178 suggests that there is no serious positive autocorrelation in the residuals, indicating that the model assumptions regarding independence of errors are reasonably met.

### 3.5.2 ANOVA Result

**Table 10: ANOVA<sup>a</sup>**

| Model      | Sum of Squares | df | Mean Square | F       | Sig.              |
|------------|----------------|----|-------------|---------|-------------------|
| Regression | 1924.956       | 3  | 641.652     | 143.921 | .000 <sup>b</sup> |
| Residual   | 428.004        | 96 | 4.458       |         |                   |
| Total      | 2352.960       | 99 |             |         |                   |

a. Dependent Variable: Revenue Collection Impact

b. Predictors: (Constant), User Accessibility, TERMIS Adoption, Technical Functionality

The ANOVA test was conducted to determine whether the regression model significantly predicts the dependent variable, revenue collection impact, based on the independent variables (TERMIS adoption, technical functionality, and user accessibility).

As shown in Table 10, the regression model produced a sum of squares of 1924.956 with 3 degrees of freedom (df), resulting in a mean square of 641.652. The residual sum of squares was 428.004 with 96 degrees of freedom, leading to a total sum of squares of 2352.960. The model yielded a highly significant F-value of 143.921 with a p-value  $< 0.001$ , confirming that the regression model is statistically significant.

This result indicates that the set of predictors—TERMIS adoption, technical functionality, and user accessibility—collectively explain a significant proportion of the variation in revenue collection impact. In other words, the model provides strong evidence that these system-related factors have a meaningful effect on parking fee revenue collection in Iringa Municipality.

### 3.5.3 Regression Coefficients

**Table 11: Coefficients<sup>a</sup>**

| Model                   | Unstandardized Coefficients |            | Standardized Coefficients | t     | Sig. |
|-------------------------|-----------------------------|------------|---------------------------|-------|------|
|                         | B                           | Std. Error |                           |       |      |
| (Constant)              | 1.930                       | .783       |                           | 2.466 | .015 |
| TERMIS Adoption         | .178                        | .100       | .193                      | 1.775 | .079 |
| Technical Functionality | .332                        | .089       | .475                      | 3.749 | .000 |
| User Accessibility      | .268                        | .100       | .267                      | 2.671 | .009 |

a. Dependent Variable: Revenue Collection Impact

Source: Field Data

The regression coefficients provide insights into the individual contribution of each predictor variable (TERMIS adoption, technical functionality, and user accessibility) to the dependent variable, revenue collection impact. As shown in Table 11, the regression equation can be expressed as:

$$Y = 1.930 + 0.178X_1 + 0.332X_2 + 0.268X_3$$

Revenue Collection Impact=1.930+0.178(TERMIS Adoption)+0.332(Technical Functionality)+0.268(User Accessibility)

The findings indicate the following:

TERMIS Adoption had a positive but statistically insignificant effect on revenue collection ( $\beta = 0.193$ ,  $t = 1.775$ ,  $p = 0.079$ ). Although the direction of influence is positive, the effect is not strong enough to be considered significant at the 0.05 level.

Technical Functionality had the strongest and most significant positive effect on revenue collection ( $\beta = 0.475$ ,  $t = 3.749$ ,  $p < 0.001$ ). This implies that improvements in the technical reliability and efficiency of TERMIS substantially enhance parking fee revenue collection in Iringa Municipality.

User Accessibility also showed a significant positive effect on revenue collection ( $\beta = 0.267$ ,  $t = 2.671$ ,  $p = 0.009$ ). This suggests that greater ease of access and user-friendliness of the system contribute meaningfully to improved revenue performance.

The constant value ( $B = 1.930$ ,  $p = 0.015$ ) represents the baseline revenue collection impact when all predictor variables are held at zero.

The results demonstrate that technical functionality and user accessibility are significant predictors of revenue collection, while TERMIS adoption, though positively related, does not significantly influence revenue collection on its own.

#### 3.5.4 Regression Findings with Respect to Specific Objectives

The regression analysis was conducted to evaluate the influence of TERMIS adoption, technical functionality, and user accessibility on parking fee revenue collection in Iringa Municipality. The results provide evidence on how each specific objective was addressed:

Objective I: To examine the effect of system adoption rate on parking fee revenue collection in Iringa Municipality

The results show that TERMIS adoption had a positive but statistically insignificant effect on revenue collection ( $\beta = 0.193$ ,  $t = 1.775$ ,  $p = 0.079$ ). This suggests that while greater adoption of the system tends to enhance revenue collection, the effect was not strong enough to be statistically confirmed at the 5% significance level. Therefore, TERMIS adoption alone may not directly drive revenue performance unless supported by other system-related factors.

Objective II: To investigate the effect of technical functionality on parking fee revenue collection in Iringa Municipality

Technical functionality was found to be the most significant predictor of revenue collection ( $\beta = 0.475$ ,  $t = 3.749$ ,  $p < 0.001$ ). This indicates that improvements in the technical performance of TERMIS—such as reliability, processing speed, and system stability—play a critical role in boosting parking fee revenue. The finding strongly supports the second objective, highlighting that robust technical functionality is essential for effective revenue collection.

Objective III: To identify the effect of user accessibility on parking fee revenue collection in Iringa Municipality

User accessibility also demonstrated a significant positive influence on revenue collection ( $\beta = 0.267$ ,  $t = 2.671$ ,  $p = 0.009$ ). This finding confirms that when the system is user-friendly and easy to access, it encourages compliance and efficiency in fee payment, ultimately enhancing municipal revenue. Thus, the third objective is achieved, showing that accessibility is a key factor in ensuring the success of TERMIS.

Together, the regression results demonstrate that the effectiveness of TERMIS in enhancing parking fee revenue collection in Iringa Municipality depends not only on the level of system adoption but more critically on its technical functionality and user accessibility. While adoption alone showed a positive but insignificant effect, the findings revealed that well-functioning technical features and an accessible, user-friendly system are the strongest drivers of improved revenue outcomes. This suggests that for digital revenue collection systems like TERMIS to achieve their intended impact, municipalities must prioritize both system reliability and ease of use alongside encouraging widespread adoption. Ultimately, the results confirm that TERMIS has the potential to significantly strengthen municipal revenue collection when all these dimensions are addressed in a complementary manner.

#### 4. Discussion of the Findings

This section discusses the study findings in relation to the research objectives, hypotheses, and reviewed literature. It interprets the results presented in section 3, highlighting their implications for understanding the impact of TERMIS adoption, technical functionality, and user accessibility on parking fee revenue collection in Iringa Municipality.

##### 4.2 Discussion and Summary of the Findings

The purpose of this study was to examine the effect of TERMIS on parking fee revenue collection in Iringa Municipality, focusing on system adoption, technical functionality, and user accessibility. The findings from the analyses are discussed in line with the study objectives as follows:

Objective I: To examine the effect of system adoption rate on parking fee revenue collection in Iringa Municipality

The regression results revealed that TERMIS adoption had a positive but statistically insignificant effect on revenue collection, suggesting that while increased adoption may encourage better compliance and efficiency, adoption alone does not strongly influence revenue performance without support from other factors such as technical reliability and user accessibility. These findings partially align with Fabusuyi and Hampshire (2018), who reported that the adoption of digital meters in San Francisco increased parking revenue by 30% and improved compliance rates, clearly demonstrating a direct positive relationship between adoption and revenue performance.

Similarly, Zhang (2017) found that mobile payment adoption in Singapore's smart parking systems reduced revenue

leakage by 25%, emphasizing the importance of widespread adoption in curbing inefficiencies. However, unlike these studies, the results from Iringa show that adoption by itself does not significantly predict revenue collection, possibly reflecting contextual challenges such as lower levels of digital literacy, infrastructural limitations, or weaker enforcement mechanisms in Tanzania. The findings also resonate with Chikombe and Mwangi (2014), who observed in Nairobi that although many drivers registered for digital payment systems, consistent usage was limited due to technical glitches and inadequate user education. This mirrors the Tanzanian context, where registration may not translate into meaningful usage without addressing supporting factors.

Furthermore, Kavishe et al. (2023) found that while TERMIS registration levels were relatively high in Dar es Salaam, active usage remained low, with system awareness being the main driver of adoption. This supports the current study's finding that adoption alone does not guarantee improved revenue collection unless complemented by user awareness, enforcement, and technical reliability. Thus, while evidence from developed contexts emphasizes adoption as a direct driver of revenue growth, the Tanzanian case highlights that adoption must be reinforced by enabling conditions to achieve the same impact.

**Objective II:** To investigate the effect of technical functionality on parking fee revenue collection in Iringa Municipality

The regression analysis confirmed that technical functionality had the strongest and most significant positive influence on revenue collection ( $\beta = 0.475$ ,  $p < 0.001$ ), highlighting that improvements in system reliability, payment efficiency, and integration are critical to enhancing municipal revenue performance. This finding strongly aligns with Kumar, Singh, and Gupta (2018), who found that smart parking meters with 99.5% uptime in Oslo generated 28% higher revenue compared to those with lower reliability, emphasizing that system stability directly translates into revenue gains.

Similarly, Chen (2020) demonstrated that blockchain-based payment systems in Shanghai reduced processing time by 40% and eliminated revenue leakages, further reinforcing the importance of technical efficiency and secure operations in maximizing revenue collection. The results of the present study also resonate with the observations of Goundar et al. (2021), who documented widespread failures in African smart parking projects due to system downtime and poor integration with mobile money platforms—factors that mirror the challenges in many Tanzanian municipalities.

In the same vein, Mtebe and Sausi (2021) reported that TERMIS modules in Tanzanian cities faced payment delays and frequent outages, which hindered smooth revenue collection despite having strong fraud prevention mechanisms. The present study's findings support their conclusion that technical shortcomings can severely undermine system effectiveness, even when adoption and accessibility are relatively strong.

However, unlike the advanced solutions studied in contexts such as Oslo and Shanghai, the Tanzanian case reveals that infrastructural limitations and integration challenges remain significant barriers to technical performance. Mutually, these insights suggest that technical functionality is not just an operational requirement but the backbone of successful digital parking systems, and without it, adoption and accessibility alone cannot sustain revenue growth.

**Objective III:** To identify the effect of user accessibility on parking fee revenue collection in Iringa Municipality

Regression results confirmed that user accessibility had a positive and significant influence on revenue collection ( $\beta = 0.392$ ,  $p < 0.01$ ), highlighting that ease of registration, multiple payment options, and user support systems are central to improving compliance and sustaining municipal revenue. This outcome is consistent with the findings of Biyik et al. (2021), who studied multimodal payment systems in London and revealed that offering four or more payment options increased compliance to 92% compared to 68% for single-method locations. Although their study did not assess accessibility challenges among elderly or technologically disadvantaged users, the evidence accentuates that flexibility in payment channels is strongly linked to improved revenue performance.

Similarly, Channamallu et al. (2025), in their Cape Town study, demonstrated that physical payment points within 500 meters increased compliance by 37% among low-income drivers, while digital payment methods were primarily used by high-income groups (82% adoption). This finding resonates with the Tanzanian context, where socioeconomic and digital divides remain prominent, suggesting that balanced access to both physical and digital channels is vital for equitable revenue collection. Ng and Kim (2021) further emphasized the importance of accessibility through effective support systems, showing that 24/7 multilingual assistance improved compliance rates by 29% in Seoul, whereas limited support in Nairobi led to unresolved issues for 43% of users. This parallels the Iringa case, where limited customer support and language barriers often reduce system effectiveness.

Mzee (2020), studying TERMIS adoption in Kisutu ward, also found that simplified registration processes increased first-time completion rates from 54% to 83%, while the absence of Swahili-language support reduced system usage by 38%. The present study corroborates Mzee's findings by showing that such accessibility barriers directly reduce revenue potential, although Mzee did not quantify their financial impact. Jointly, these insights reinforce that user accessibility is not merely a technical feature but a critical determinant of compliance, inclusivity, and ultimately revenue collection. Without addressing accessibility concerns—whether through multimodal payment systems, proximity of access points, or language-sensitive support—municipalities risk excluding large segments of users, thereby undermining the financial sustainability of smart parking systems like TERMIS.

### 4.3 Summary of Hypotheses Testing

Table 5.1: Summary of Hypotheses Testing

| Hypothesis | Statement                                                                                                           | $\beta$<br>(Beta) | Sig.<br>Value | Decision      | Interpretation                                                         |
|------------|---------------------------------------------------------------------------------------------------------------------|-------------------|---------------|---------------|------------------------------------------------------------------------|
| H1         | TERMIS adoption has a significant positive effect on parking fee revenue collection in Iringa Municipality.         | 0.193             | 0.079         | Not Supported | Effect is positive but not statistically significant at $p < 0.05$ .   |
| H2         | Technical functionality has a significant positive effect on parking fee revenue collection in Iringa Municipality. | 0.475             | 0.000         | Supported     | Strong, positive, and highly significant effect on revenue collection. |
| H3         | User accessibility has a significant positive effect on parking fee revenue collection in Iringa Municipality.      | 0.267             | 0.009         | Supported     | Positive and statistically significant effect on revenue collection.   |

Source: Field Data

### 5. Conclusion

The study set out to examine the impact of TERMIS on parking fee revenue collection in Iringa Municipality, focusing on system adoption, technical functionality, and user accessibility. The findings reveal that technical functionality and user accessibility are the most significant drivers of revenue collection, while system adoption, although positively related, did not have a statistically significant effect on its own. Specifically, regarding the first objective, the study concludes that adoption alone is insufficient to enhance revenue unless complemented by robust technical performance and user-friendly features. For the second objective, it is evident that reliable and efficient technical operations, including stable system uptime and prompt payment processing, substantially improve revenue outcomes, emphasizing the critical role of system functionality. In relation to the third objective, the study confirms that greater user accessibility—including simplified registration processes, multiple payment options, and supportive user interfaces—enhances compliance and contributes positively to municipal revenue. The study concludes that the effectiveness of TERMIS in improving parking fee revenue collection relies on a combination of technical reliability, accessibility, and supportive adoption strategies, highlighting the need for an integrated approach to digital revenue system implementation.

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