Int. j. adv. multidisc. res. stud. 2024; 4(5):627-633

Received: 15-08-2024
Accepted: 25-09-2024

International Journal of Advanced Multidisciplinary Research and Studies

ISSN: 2583-049X

A Crucible of IoT Applications and Services and the Gambia Revenue Generation

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DOI: https://doi.org/10.62225/2583049X.2024.4.5.3300
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Abstract

The study investigated the relationship between Internet of Things (IoT) applications and services and The Gambia revenue generation, tax evasion and tax compliance respectively. It identified the challenges impeding the adoption and implementation of IoT applications and services in the revenue generation processes by the Gambia Revenue Authority (GRA). Both primary and secondary data were used in the study. Questionnaire and interview were used to generate the primary data. The study population (2188) comprised senior and mid-tier management personnel from the Ministry of Finance and Economic Affairs (MoFEA), staff members of The Gambia Revenue Authority, and the corporate taxpayers. The sampling approach used in this study was multistage. Personnel from the MoFEA and GRA were purposively selected, while corporate taxpayers were randomly selected. Their populations were then divided into various strata to ensure fair representation. Respondents were randomly picked from each stratum. To ensure an appropriate sample size, 327 individuals were selected. Data obtained were analysed using multiple regression, correlation coefficient, and simple regression analysis. Qualitative analyses were done on the interview responses. The study revealed that connectivity, networking, and data collection improve revenue generation, while increased IoT adoption and higher data utilisation and infrastructure investment reduce tax evasion and boost tax compliance. However, implementation of the IoT has encountered challenges in the form of technological barriers, financial constraints, and skill gaps. In view of these, investment must be made in enhancing connectivity and networking infrastructure, training staff in data analytics and cyber-security to optimise IoT data usage and boost IoT adoption through inducements and awareness programs. The study concluded that IOT applications and services are in the right direction to revolutionise The Gambia revenue generation.

Keywords: Internet of Things (IoT), Automation in Tax Administration, Tax Compliance, Tax Evasion, and Revenue Generation

Introduction

The Internet of Things (IoT) refers to the network of interconnected devices that communicate and exchange data through the Internet. These devices range from everyday home items to industrial devices, improving automation and efficiency. The Internet of Things (IoT) has transformed many sectors by enabling unparalleled interconnectedness and automated processes, which are critical for increasing efficiency and effectiveness. Asghari, Rahmani, and Javadi (2019) [7] present a comprehensive review of IoT applications, underlining their enormous potential for transforming traditional systems across industries. IoT applications range from smart homes and healthcare to more complex infrastructures connected and autonomous electric vehicles (Vaidya & Mouftah, 2020) [25]. These innovations increase user experience and contribute considerably to economic development by providing new revenue streams and improving service delivery.

In the context of tax administration, digital transformation has become an essential component. The Gambia, like many third world countries, faces challenges in tax collection processes and revenue generation. Traditional methods are often ineffective and susceptible to evasion and avoidance, as stated by Alm (2019) [3], who discusses the motivations behind tax compliance. Ajala and Adegbie (2020) [1] argued that the incorporation of information technology into tax systems leads to more effective tax assessments and collections, thus enhancing revenue generation.

Moreover, the execution of IoT in tax administration can be connected to the concepts of fog computing and 5G networks, which present the required infrastructure for managing large volumes of data generated by IoT devices (Khumalo, Oyerinde, & Mfupe, 2019; Banda, Mzyece, & Mekuria, 2023) [19, 8]. Technologies usage can greatly enhance the efficiency of tax collection processes by guaranteeing timely and accurate data processing.

The Gambia's revenue generation measures can greatly benefit from adopting IoT applications. This integration is not simply about integrating new technologies but also about transforming existing systems to improve transparency, accountability, and efficiency in tax administration. Historical perspectives on tax administration in The Gambia, as noted by Jallow (2011) [18], GRA (2021) [13], and the Ministry of Finance and Economic Affairs (MoFEA) in their various budget speeches (MoFEA, 2018 [21]; MoFEA, 2019 [22]; MoFEA, 2020 [23]; MoFEA, 2021 [24]; & MoFEA, 2022), reveal an ongoing struggle with tax evasion and inefficient tax collection approaches.

Addressing these challenges demands a multifaceted approach that includes modern technologies like IoT, which can streamline processes and lessen the burden on taxpayers and tax authorities. The systematic deployment of IoT-enabled applications in 6G-aware fog networks, as examined by Hazra *et al*. (2020) [16], demonstrates the possibility of enhanced service delivery and improved revenue generation. Additionally, the adoption of digital solutions can mitigate issues related to tax evasion and avoidance, thereby enhancing the overall tax compliance landscape (Alstadsæter *et al*., 2022) [5].

The adoption of Internet of Things (IoT) applications and services has the prospect to revolutionise The Gambia's revenue generation systems. However, integrating IoT technologies by the Gambia Revenue Authority (GRA) remains limited and inadequately investigated. The study aims to determine the effect of IoT technologies on the Gambian tax system within the period of 2023 and 2024, and specifically to: Assess the tangible effects of these IoT applications and services on revenue generation in The Gambia; probe how the IoT applications and services have prevented tax evasion in the Gambia; examine the ways by which the IoT applications and services have ensured tax compliance in The Gambia; Lastly, identify the challenges impeding the adoption and implementation of IoT applications and services in the revenue generation processes.

The hypotheses formulated for this investigation are:

$H_0$1: IoT applications and services do not significantly affect revenue generation in The Gambia.

$H_0$2: IoT applications and services do not significantly affect tax evasion in The Gambia.

H03: IoT applications and services do not significantly affect tax compliance in The Gambia.

Literature Review on Internet of Things (IoT), Automation in Tax Administration, Tax Compliance, Tax Evasion, and Revenue Generation in The Gambia

The advent of the Internet of Things (IoT) has revolutionised various sectors globally, including tax administration. IoT applications have been systematically reviewed to underscore their multifarious uses, from improving connectivity in autonomous vehicles to optimising service deployment in fog networks (Asghari *et al*., 2019; Hazra *et al*., 2020; Vaidya & Mouftah, 2020) [7, 16, 25]. These improvements highlight IoT's potential to transform traditional tax administration processes by integrating smart devices and real-time data analytics. In parallel, the efficacy of tax administration systems, necessary for enforcing tax compliance and mitigating tax evasion, has increasingly depended on digital transformations. Studies highlight the role of digital technologies in improving tax assessment accuracy and efficiency (Ajala & Adegbie, 2020; Alabede, 2004) [1, 2]. This shift towards digitalisation aligns with global trends aiming to leverage technology to enhance revenue generation and governance (Borges & Scarpin, 2019; Guyton *et al*., 2021) [9, 15].

Tax compliance remains a central problem impacted by various factors, including taxpayers' perceptions, legal frameworks, and technological infrastructures. Research indicates that effective tax administration systems, enabled by IoT and automation, can promote higher tax compliance rates through simplified processes and increased transparency (Alm, 2019; Ariwodola, 2001; Edori *et al*., 2017) [3, 6, 11]. These findings underline the climactic role of technology in shaping taxpayer behaviour and organisational practices. Conversely, the challenges of tax evasion on revenue generation measures continue, posing significant economic implications. Studies highlight how IoT-driven solutions in tax administration can mitigate tax evasion risks by improving monitoring abilities and data-driven audits (Alm, 2021; Fendt *et al*., 2020) [4, 12]. This technological integration promises to support regulatory measures and reduce criminal financial activities, thereby protecting fiscal sustainability.

In The Gambia, where digital infrastructure is evolving, the intersection of IoT, automation in tax administration, and compliance strategies presents unique opportunities and challenges. Leveraging insights from global practices, tailored IoT applications can potentially streamline tax processes, strengthen enforcement mechanisms, and optimize revenue generation (Gurama, 2020; IMF Report, 2020) [14, 17]. Such advancements are crucial for supporting sustainable economic development and effective governance in the country. Overall, the synergies between IoT, automation, tax compliance, evasion, and revenue generation highlight the transformative potential of digital technologies in modernising tax administration frameworks. As The Gambia progresses towards improving its digital infrastructure, integrating IoT-enabled solutions tailored to local contexts can drive significant advancements in fiscal transparency, efficiency, and revenue generation.

This literature review underscores the imperative for policymakers and stakeholders in The Gambia to adopt technological innovations effectively. By adopting IoT-driven strategies in tax administration, the country can navigate challenges related to tax compliance and evasion, ultimately promoting a conducive environment for economic growth and development.

Theoretical Framework

The Technology Acceptance Model (TAM), proposed by Fred Davis in 1989, presents a foundational framework for understanding how users perceive and adopt information technology (IT). The theory is centered on perceived usefulness (PU) and perceived ease of use (PEOU) as

pivotal factors impacting adoption decisions (Davis, 1989) [10]. Building on Davis's groundwork, Venkatesh and Davis (2000) [26] developed TAM by incorporating social influence and cognitive processes, improving its applicability across various technological contexts (Venkatesh & Davis, 2000) [26]. Further development led to the Unified Theory of Acceptance and Use of Technology (UTAUT), presented by Venkatesh, Morris, Davis, and Davis, (2003) [27], which incorporated insights from TAM and other theories to encompass broader determinants like performance expectancy and social influence (Venkatesh *et al*., 2003) [27]. In the context of "A Crucible of IoT Applications and Services and The Gambia Revenue Generation," TAM presents a robust lens to probe how IoT technologies are perceived in improving revenue generation processes.

TAM's emphasis on perceived usefulness and ease of use aligns with understanding GRA's adoption of IoT applications, potentially enhancing tax collection and operational efficiency. However, TAM has faced objections for oversimplifying adoption processes and neglecting socio-cultural and organisational factors (Davis, 1989) [10]. Despite these critiques, TAM and its evolution into UTAUT remain climacteric in examining technology adoption within organisational settings, demonstrating an understanding of the complexities of new technologies like IoT in revenue generation practices, especially in The Gambia.

Methodology

This study seeks to understand the effect of IoT applications and services on revenue generation in The Gambia. The study adopted a mixed-method research design to help harnesses the strengths of both qualitative and quantitative research methodologies to probe deep into multifaceted phenomena. The research includes a population count of 2188 participants including 19 senior and mid-tier management individuals from the Ministry of Finance and Economic Affairs (MoFEA), 857 staff members of The Gambia Revenue Authority as of May 30, 2024, and the 1312 corporate taxpayers classified as significant contributors to GRA as of May 30, 2024. Using the Krejcie and Morgan (1970) [20] formula, a sample size of 327 participants was chosen.

This study used a multi-stage sampling technique. Personnel from the MoFEA, GRA officials, and corporate taxpayers from The Gambia were purposively selected. Their populations were then divided into various strata to ensure fair representation. Respondents were randomly picked from each stratum.

The independent variable is the IoT applications and services, measured by data connectivity and networking, data collection and management, data security and privacy, performance and reliability, adoption rate of IoT technologies, extent of IoT integration, IoT data utilisation, and investment in IoT infrastructure. The revenue generation in The Gambia serves as the dependent variable, proxied by tax collection rates, compliance rates, efficiency of tax administration, and tax evasion rates. The study used Multiple Regression, Correlation, and Simple Regression analysis to test the hypotheses which aligns with objectives one, two, and three while objective four was done qualitatively. Data gathered were from primary sources through questionnaires and key informant interviews and supplemented with secondary data from literature, governmental reports, academic journals, and digital platforms.

IOT Applications and Services and The Gambia Revenue Generation: Statistical Perspective

Table 1 shows that of the 327 questionnaires distributed for this study, 289 were returned, resulting in an 88.38% return rate. The remaining 38 questionnaires that were not returned accounted for 11.62% of the total.

Table 1: Ratio of Questionnaires Administered and Returned

Grouping of respondents	Questionnaire Administered	Questionnaire Returned	% of Questionnaire Returned
GRA staff	128	113	88.28
MoFEA	3	3	100
Corporate Taxpayers	196	173	88,27
Total	**327**	**289**	**88.38**

Source: Field Work, (2024)

Hypothesis 1

$H_0$1: IoT applications and services do not significantly affect revenue generation in The Gambia.

Table 2: Coefficients[a]

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-3.591E-16	.066		.000	1.000
	Connectivity and Networking	.768	.038	.829	20.216	.000
	Data Collection and Management	.232	.070	.103	3.294	.001
	Security and Privacy	-1.318E-15	.038	.000	.000	1.000
	Performance and Reliability	-3.995E-15	.043	.000	.000	1.000
a. Dependent Variable: Revenue Generation						

Source: Author's Computation, (2024)

Table 2 revealed that the constant term is not significant, as demonstrated by its unstandardized coefficient of -3.591E-16, standardized coefficient of .000, t-value of .000, and significance level of 1.000. This suggests it doesn't contribute to the model. Subsequently, connectivity and networking reveal a significant positive effect on revenue generation, with an unstandardized coefficient of .768, standardized coefficient of .829, t-value of 20.216, and significance level of .000. This implies that a one-unit increase in connectivity and networking is associated with a 0.768 unit increase in revenue generation, marking it as the most influential factor in the model. Moreover, data collection and management also greatly contribute to revenue generation, evidenced by an unstandardized coefficient of .232, standardized coefficient of .103, t-value of 3.294, and significance level of .001. This implies that a one-unit increase in data collection and management leads to a 0.232-unit increase in revenue generation, showing a moderate influence compared to connectivity and networking. Conversely, security and privacy, with an unstandardized coefficient of -1.318E-15, standardized coefficient of .000, t-value of .000, and significance level of 1.000, are not significant and do not affect revenue generation according to the model. Finally, performance and reliability also indicate no significant effect on revenue

generation, as reflected by an unstandardized coefficient of -3.995E-15, standardized coefficient of .000, t-value of .000, and significance level of 1.000.

In conclusion, connectivity and networking are the most important aspects that positively affect revenue generation, followed by data collecting and management. However, in this paradigm, security and privacy, as well as performance and reliability, do not influence revenue generation.

Hypothesis 2

$H_0$2: IoT applications and services do not significantly affect tax evasion in the Gambia.

Table 3: Correlations

		Adoption Rate of IoT Technologies	Extent of IoT integration	IoT Data Utilization	Investment in IoT Infrastructure	Tax Evasion in The Gambia
Adoption Rate of IoT Technologies	Pearson Correlation	1	.917**	-.449**	-.475**	-.436**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	289	289	289	289	288
Extent of IoT integration	Pearson Correlation	.917**	1	-.449**	-.405**	-.362**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	289	289	289	289	288
IoT Data Utilization	Pearson Correlation	-.449**	-.449**	1	.687**	.711**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	289	289	289	289	288
Investment in IoT Infrastructure	Pearson Correlation	-.475**	-.405**	.687**	1	.893**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	289	289	289	289	288
Tax Evasion in The Gambia	Pearson Correlation	-.436**	-.362**	.711**	.893**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	288	288	288	288	288
**. Correlation is significant at the 0.01 level (2-tailed).						

Source: Author's Computation, (2024)

The correlation Table 3 examines the connection between IoT-related variables (adoption rate of IoT technologies, extent of IoT integration, IoT data utilisation, and investment in IoT infrastructure) and tax evasion in The Gambia, using Pearson correlation coefficients. Adoption rate of IoT technologies: There is a strong positive correlation with the extent of IoT integration (.917**). Contrarily, there are moderate negative correlations with IoT data utilisation (-.449**), investment in IoT infrastructure (-.475**), and tax evasion (-.436**). The extent of IoT integration: Similarly, it indicates moderate negative correlations with IoT data utilisation (-.449**), investment in IoT infrastructure (-.405**), and tax evasion (-.362**). IoT data utilisation: Additionally, there are strong positive correlations with investment in IoT infrastructure (.687**) and tax evasion (.711**). Investment in IoT infrastructure: Also, it shows a strong positive correlation with tax evasion (.893**).

Consequently, increased adoption and integration of IoT technologies correlate with lower tax evasion. However, increased IoT data utilisation and investment in infrastructure correlate with higher tax evasion. In conclusion, therefore, while IoT adoption and integration reduce tax evasion, higher data utilisation and infrastructure investment may increase it, implying a necessity for cautious IoT implementation.

H03: IoT applications and services do not significantly affect tax compliance in The Gambia.

Table 4: Coefficients[a]

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.203	.024		8.537	.000
	IoT Applications and Services	.797	.028	.861	28.656	.000
a. Dependent Variable: Tax Compliance in The Gambia						

Source: Author's Computation, (2024)

The linear regression analysis in Table 4 presents the impact of IoT applications and services on tax compliance in The Gambia. The constant coefficient (B = .203, t = 8.537, p = .000) denotes the baseline level of tax compliance.

Moreover, the unstandardized coefficient for IoT applications and services (B = .797, Std. Error = .028) implies that each unit increase in IoT applications and services results in a .797 unit increase in tax compliance. The standardized coefficient (Beta = .861) reveals a strong positive relationship. The t-value (28.656) and significance (p = .000) demonstrate that the relationship is highly significant.

Consequently, these results imply that increasing IoT applications and services significantly increase tax compliance in The Gambia. Therefore, promoting IoT technology adoption improves revenue generation in The Gambia.

IOT Applications and Services and The Gambia Revenue Generation: Qualitative Perspective

Theme 1: Challenges Impeding the Adoption and Implementation of IoT Applications and Services in Revenue Generation Processes by the GRA

Sub theme 1: Challenges impeding the adoption and implementation of IoT applications and services in the revenue generation processes.

Informant 1: Responses from senior and middle management staff of the Ministry of Finance and Economic Affairs (MoFEA):

Technological Barriers: "*One of the main challenges is inadequate technological infrastructure to support IoT applications effectively* (Inf1, 2024)."

Financial Constraints: "*Limited budget allocations for upgrading and maintaining IoT systems pose a considerable hurdle* (Inf1, 2024)."

Informant 2: Responses from Heads of Technical Services (1), GRA:

Skills and Training Gaps: "*There is a notable lack of skilled personnel proficient in managing and using IoT technologies* (Inf2, 2024)."
Data Security Concerns: "*Guaranteeing the security of data collected through IoT devices is a significant problem, as it involves sensitive taxpayer information* (Inf2, 2024)."
Informant 3: Responses from Head, ICT Department (1), GRA:
Resistance to Change: "*Many employees are resistant to embracing new technologies due to a lack of understanding and fear of job loss* (Inf3, 2024)."
Integration Issues: "*Incorporating IoT systems with existing legacy systems is complex and often challenging* (Inf3, 2024)."
Informant 4: Responses from Commissioner, Domestic Tax Department (1), GRA:
Financial Constraints: "*Securing funding for the initial setup and ongoing maintenance of IoT infrastructure is demanding* (Inf4, 2024)."
Technological Barriers: "*Our current technological framework is not fully compatible with cutting-edge IoT solutions* (Inf4, 2024)."
Informant 5: Responses from Commissioner, Customs and Excise Duty (1), GRA:
Data Security Concerns: *"Safeguarding the integrity and confidentiality of data collected via IoT devices is a crucial problem* (Inf5, 2024)."
Skills and Training Gaps: "*We lack personnel with the necessary expertise to fully leverage IoT technologies* (Inf5, 2024)."
Informant 6: Responses from Head of Corporate Taxpayer Division (1), GRA:
Resistance to Change: "*There is considerable resistance from staff members accustomed to traditional methods* (Inf6, 2024)."
Financial Constraints: "*Allocating sufficient financial resources to support IoT initiatives remains a major impediment* (Inf6, 2024)."
Informant 7: Responses from Operation Manager (1), Africell:
Technological Barriers: "*The dearth of a robust and reliable internet infrastructure inhibits the effective deployment of IoT solutions* (Inf7, 2024)."
Data Security Concerns: "*We are wary of the potential data breaches and privacy issues associated with IoT* (Inf7, 2024)."
Informant 8: Responses from Manager (1), Jah Oil:
Financial Constraints: *"High costs associated with implementing IoT systems are a substantial impediment* (Inf8, 2024)."
Skills and Training Gaps: "*Our staff require more training to use IoT technologies* (Inf8, 2024)."
Informant 9: Responses from Manager (1), Qcell:
Resistance to Change: "*There is a general unwillingness to shift from established practices to new IoT-based methods* (Inf9, 2024)."
Integration Issues: "*Incorporating IoT with our current systems is proving to be more demanding than expected* (Inf9, 2024)."
Informant 10: Responses from Manager (1), Eco-Bank Gambia Ltd:
Technological Barriers: "*The technological infrastructure required for IoT is not fully developed in our region* (Inf10, 2024)."
Data Security Concerns: "*We are worried about the security vulnerabilities that IoT systems might present* (Inf10, 2024)."
Informant 11: Responses from General Manager, Sene-Gambia Beach Hotel:
Financial Constraints: "*The investment required for IoT adoption is substantial and difficult to justify with our current budget* (Inf11, 2024)."
Skills and Training Gaps: "*We need to invest in training programs to upskill our workforce for IoT technology* (Inf11, 2024)."
Informant 12: Responses from Manager, J. Financial Services Ltd:
Resistance to Change: "*There is a cultural opposition to new technology among employees comfortable with traditional methods* (Inf12, 2024)."
Integration Issues: "*Our existing systems are not easily compatible with new IoT technologies, creating integration obstacles* (Inf12, 2024)*."*
Informant 13: Responses from Chief Account Manager, Shyben A. Madi and Sons Ltd:
Technological Barriers: "*The infrastructure needed for reliable IoT implementation is still lacking us* (Inf13, 2024)."
Financial Constraints: "*The cost of deploying and maintaining IoT systems is a substantial impediment for us* (Inf13, 2024)."

Discussion of Findings

The findings of this study prove the achievement of the specific objectives and validate the hypotheses. The analysis reveals consistency with the scholarly works discussed in the literature review and aligns with the theoretical framework.

On hypothesis 1, the study investigated the impact of IoT applications and services on revenue generation in The Gambia. The results in Table 2 demonstrate that connectivity and networking significantly improve revenue generation, with a 0.768 unit increase for each unit increase in connectivity and networking. Data collection and management also have a positive effect. However, security, privacy, performance, and reliability do not significantly impact revenue generation. These findings align with the literature review of the study, highlighting the transformative potential of IoT in enhancing operational efficiencies and revenue generation (Asghari, Rahmani, and Javadi, 2019; Vaidya and Mouftah, 2020) [7, 25]. This alignment is consistent with the Technology Acceptance Model (TAM) proposed by Davis (1989) [10], which posits that perceived usefulness and ease of use significantly impact technology adoption. Connectivity and networking, along with data collection and management, are perceived as useful and easy to use, leading to higher adoption rates and subsequent revenue generation progress.

Concerning hypothesis 2, the correlation analysis in Table 3 reveals that increased IoT adoption and integration correlate with lower tax evasion, while higher data utilization and infrastructure investment correlate with higher tax evasion. This indicates a nuanced impact of IoT on tax compliance, reflecting the findings of Alm (2019) [3] and Khumalo, Oyerinde, and Mfupe (2019) [19] that highlight the complex role of technology in tax compliance. TAM, with its focus on perceived usefulness and ease of use, supports this finding by suggesting that technologies perceived as

beneficial and easy to integrate are more likely to be adopted effectively. However, if data utilization and infrastructure investments are perceived as complex or risky, they may inadvertently increase tax evasion, underscoring the need for cautious implementation.

About hypothesis 3, the linear regression analysis in Table 4 indicates that increasing IoT applications and services significantly enhances tax compliance, with a .797 unit increase for each unit increase in IoT applications and services. This positive influence is supported by Alstadsæter *et al*. (2022) [5] and Ajala and Adegbie (2020) [1], who found that technological advancement, including IoT, plays a crucial role in enhancing tax compliance through more accurate and real-time data. This finding aligns with TAM's principles, as IoT applications are perceived as useful tools that improve tax compliance by presenting accurate data and enhancing operational efficiency. The strong positive relationship between IoT adoption and tax compliance underlines TAM's relevance in understanding technology adoption in revenue generation processes.

From the qualitative data, many challenges inhibit the adoption and implementation of IoT applications and services in the revenue-generation process. Key informants from various organisations highlighted these challenges to include technological barriers, financial constraints, skills gaps, data security concerns, resistance to change, and integration issues. These challenges are mirrored in the literature (Banda, Mzyece, and Mekuria, 2023; Hazra *et al*., 2020; Alabede, 2004; Borges and Scarpin, 2019) [8, 16, 2, 9]. These challenges echo TAM's limitations, as noted by Davis (1989) [10], for oversimplifying the adoption process and neglecting socio-cultural and organisational factors. While TAM concentrates on perceived usefulness and ease of use, it may not fully capture the complexity of these barriers. The evolution of TAM into the Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh *et al*. (2003) [27], which includes factors like performance expectancy and social influence, better addresses these complexities.

In summary, the findings demonstrate that connectivity, networking, and data collection improve revenue generation, while increased IoT adoption reduces tax evasion. However, higher data utilisation and infrastructure investment may increase tax evasion. IoT applications significantly boost tax compliance. Effective IoT implementation encounters challenges including technological barriers, financial constraints, skills gaps, data security concerns, resistance to change, and integration problems. These results align with TAM and UTAUT, underlining the complex influence of IoT on efficiency and compliance and the need for a nuanced approach in The Gambia.

Recommendations

Based on the findings of this study, several recommendations can be made to improve the influence of IoT applications and services on revenue generation, tax evasion prevention, and tax compliance in The Gambia:

First, invest in enhancing connectivity and networking infrastructure, guaranteeing reliable and widespread internet access across the country through collaboration with telecommunications companies. Simultaneously, execute advanced data management systems and stringent data protection protocols, training staff in data analytics and cybersecurity to optimise IoT data usage. Furthermore, boost IoT adoption through inducements and awareness programs, promoting seamless integration with existing systems to increase revenue generation and tax compliance, while providing essential technical support.

Additionally, allocate sufficient budget for IoT infrastructure setup and maintenance, seek international aid and partnerships to address financial constraints, and establish comprehensive training programs to bridge skills gaps. Finally, address resistance to change by involving employees in IoT project planning, promoting a culture of technological innovation, and fostering collaboration between government agencies, private sector entities, and international organisations to support IoT initiatives and leverage resources effectively.

Conclusion

This study underscores the influential effect of IoT applications on revenue generation in The Gambia. Connectivity and networking emerged as factors improving revenue, while increased IoT adoption and integration were connected to lower tax evasion. However, technological barriers, financial constraints, skills gaps, data security concerns, and resistance to change impede IoT implementation.

To leverage IoT's potential, The Gambia must improve infrastructure, improve data management and security, facilitate IoT adoption, provide financial and training support, and facilitate collaboration between government and private sectors. Addressing these challenges will enable The Gambia to fully benefit from IoT technologies in revenue generation in the country.

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