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Research Article

Examining How Digitalization Affects Tax Compliance in Ghana Using Structural Equation Modelling (SEM)

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Abstract

This research study delved into the multifaceted realm of tax compliance within the digital economy context, with a specific focus on the impact of digitalization, the role of taxpayer education programs, and the importance of taxpayer awareness programs. A diverse sample of 278 participants, encompassing individuals engaged in various digital businesses and taxpayers in Ghana, provided valuable insights through structured questionnaires. This study examined the complex area of tax compliance in the context of the digital economy, paying particular attention to the effects of digitalization, the function of taxpayer education initiatives, and the significance of taxpayer awareness campaigns. Through the use of structured questionnaires, a varied sample of 278 participants; including taxpayers in Ghana and those involved in a range of digital businesses, providing insightful answers. The study produced important results by using a robust Structural Equation Modelling (SEM) technique. It was discovered that digitization has a favourable impact on tax compliance, highlighting its capacity to act as a stimulant for improved compliance practices. Additionally, initiatives to raise taxpayer knowledge and education have become essential in encouraging tax compliance in the digital economy. The significance of thorough tax education programs and awareness efforts is shown by these findings. As a result, this study encourages stakeholders to take the initiative and makes suggestions for managers, legislators, academics, and business leaders to use digitalization's revolutionary potential to promote tax compliance. Future scholars are encouraged by this work to go deeper into this dynamic field in order to better understand how the digital economy affects taxation and compliance.

Keywords

Taxation, Digitalization, Structural Equation Modelling (SEM), Tax Compliance, Digital Economy, Ghana Revenue Authority (GRA)

1. Introduction

The Ghana tax Authority (GRA) has launched a major digitalization drive as part of its transformation strategy to become a world-class tax administration. The goal is to create a totally digital tax system that allows taxpayers to file and pay their taxes from anywhere in the globe, at any time. The fast progress of digital technology has had a substantial im-

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pact on several parts of the economy, including taxation systems [1]. In today's digital economy, governments and tax authorities are progressively embracing digitalization methods to increase tax compliance and expedite operations. Ghana is one of the countries that has embraced digitization in tax administration, with the Ghana Revenue Authority (GRA) paving the way.

The digital economy has fundamentally impacted traditional practices and everyday routines [2]. "It is the most significant breakthrough of the twenty-first century [3]." Without a doubt, digitalization and improved connectivity foster the exponential growth of creative solutions and business models, creating new challenges for tax authorities [4]. Digitalisation has far-reaching implications for taxes, affecting both local and international tax policy and administration, introducing new tools and raising new difficulties. As a result, the tax policy implications of digitalization are at the heart of a current worldwide debate over whether international tax legislation are still 'fit for purpose' in an ever-changing environment [5]. However, [1] describe the digital economy as the part of economic production derived entirely or mostly from digital technology, with a business model centered on digital goods or services. The digital economy includes data analytics, robots and Artificial Intelligence (AI), machine learning, 3-D printing, and e-commerce [6].

Digitalizing tax systems involves using electronic platforms, online filing and payment systems, data analytics, and other technical tools to improve compliance and administration [7]. The move from old paper-based systems to digital platforms has various benefits, including improved efficiency, accuracy, transparency, and cost-effectiveness. Furthermore, it enables tax authorities to prevent tax evasion while increasing revenue collection. According to [8], digitization might be considered as an enhancement to the government's tax enforcement technologies. Better tax enforcement allows governments to raise the same amount of money with fewer taxes (more efficiently), or to earn more tax revenue with the same taxes. By incorporating more information into tax system design, digitalization can lessen the equity-efficiency trade-off. [9] Suggest that combating corruption and improving tax compliance through digital public services are critical aspects for promoting sustainable development. Using digital public services increases tax compliance because entrepreneurs feel more competent and responsible, and they choose to comply more fully. In contrast, the effect of digitalization on tax compliance in the digital economy is a complicated and diverse phenomenon [10]. It requires a full knowledge of several variables, including the role of taxpayer education and awareness initiatives, as well as ethical considerations [11]. The International Monetary Fund (IMF, add year and recognise it in the reference section) defines the digital economy as all activities that utilise digitised data. However, in a broad sense, any activities that use digitised data are part of the digital economy. Opponents of digital economy ring-fencing adopt the wide concept, and advocates prefer the tight definition [12]. The digital economy is growing at an exponential rate [13]. Taxpayer education campaigns are crucial for increasing tax compliance in the digital economy. These courses seek to enhance voluntary compliance by equipping taxpayers with the information and skills required to understand their tax responsibilities, navigate digital platforms, and comply with tax legislation. Effective taxpayer education may assist individuals and companies in meeting their tax duties while also helping to Ghana's overall economic growth [14]. Similarly, taxpayer education campaigns are crucial for increasing tax compliance in the digital economy [2]. These projects aim to educate taxpayers on their tax obligations, rights, and the benefits of compliance. Tax authorities may foster a culture of compliance among taxpayers by raising knowledge about the necessity of tax compliance, the repercussions of noncompliance, and the advantages of a well-functioning tax system.

Furthermore, ethical considerations are crucial in the digitalization of tax systems. As tax authorities acquire and analyse vast quantities of taxpayer data digitally, ethical issues concerning data privacy, cybersecurity, and fairness must be addressed. In the digital tax environment, it is vital to safeguard taxpayer information, provide secure digital transactions, and treat taxpayers fairly. As a result, the goal of this research is to investigate the influence of digitalization on tax compliance in the digital economy, with a specific focus on the Ghana Revenue Authority. It aims to look into the role of taxpayer education and awareness campaigns in promoting tax compliance, as well as the ethical concerns highlighted by tax systems' digital transition. By evaluating these aspects, the research hopes to give insights and recommendations for improving tax compliance and creating a strong digital tax environment in Ghana.

1.1. Problem Statement

The influence of digitization on tax compliance in Ghana is an important subject of research that needs to be addressed given the growing relevance of digital technology in tax administration. [3] Discussed how Sri Lanka's low-tax climate in the export-oriented ICT industry drew international investment while also raising worries about income loss from digitally imported goods. [15] Discovered that e-filing, e-billing, and administrative penalties improved taxpayer compliance. [9] Proposed that Romania should use digital public services to combat corruption and increase tax compliance in order to achieve long-term growth. Furthermore, the implementation of digital public services was projected to increase tax compliance and cut expenses for enterprises, therefore enhancing their faith in state institutions. Similarly, [16] discussed the good and negative effects of digitalization on VAT generation, tax administration, and network infrastructure. Also, [17] discovered that digitization was more successful in decreasing tax evasion in low-corruption nations than in high-corruption ones. Again, [18] discovered that

e-filing improves tax knowledge for people with impairments while having no substantial influence on tax compliance. Furthermore, [19] emphasised the significance of IT innovations for better tax administration and compliance. Similarly, [1] reported both good and negative effects on VAT production, tax administration, and network infrastructure. Similarly, [9] stated that the use of digital public services was likely to increase tax compliance and reduce costs for enterprises, hence increasing trust in state institutions.

Several studies have been done to better understand the elements that influence tax compliance among Ghana's small and medium-sized companies (SMEs). [20] Conducted pioneering micro-econometric research on the factors influencing tax morale in Ghana, revealing a non-linear link between age and tax morale in the nation. Similarly, [21] emphasised the need of considering the impact of religion and religiosity on tax compliance among SMEs in Ghana, which has been overlooked in prior research. Furthermore, [22] investigated the impacts of perception and growth opinions on tax compliance decisions in Ghana, providing insight into the psychological components of compliance. [23] Researched the tax compliance behaviour of SMEs in Ghana, emphasising the minimal impact of strategic response on tax compliance, demonstrating that diverse tactics implemented by SMEs do not significantly influence their tax compliance behaviour. This indicated that the perceived negative impact of existing tax regulations was a major factor of compliance among SMEs in Ghana, emphasising the significant tax gap in the informal sector. Furthermore, [24] said that the Ghana Revenue Authority implemented an online tax system in response to Ghana's developing digital economy, showing that the country's tax compliance environment is altering. Furthermore, research by [25, 26] examined socio-demographic characteristics and economic impacts on tax compliance among Ghanaian SMEs, offering useful insights into the varied nature of tax compliance. Furthermore, emphasised the importance of tax compliance costs on the behaviour of SMEs in Ghana, putting light on the understudied elements of compliance in emerging countries [27] Several studies have emphasised the issues of tax compliance among Ghana's small and medium-sized firms (SMEs) [28, 21, 29]. These research emphasised the need of understanding the elements that influence tax compliance, particularly the impact of digital tax systems [24, 30, 31]. Furthermore, the fragmentation of jurisdictions has been noted as a detrimental impact on Ghana's property taxes [32]. Furthermore, the COVID-19 epidemic has highlighted the importance of assessing the impact on Ghana's tax revenues and SMEs [33].

The extant literature has found many gaps in studies on tax compliance in Ghana. For example, the role of religion and religiosity on SMEs' tax compliance has been disregarded [21]. Similarly, the significance of trust in enhancing tax compliance has been empirically demonstrated, highlighting the necessity for more research into this link [34]. Furthermore, further research is needed on the socio-demographic characteristics that influence tax compliance, particularly in the context of specific tax kinds like tax stamps [25]. The impetus for this research derives from the need to fill these gaps and give vital information to Ghana's policymakers and tax officials. Understanding how digital tax systems, jurisdictional fragmentation, and the COVID-19 pandemic affect tax compliance is critical for developing effective tax policy and administration techniques. Furthermore, investigating the impact of religion, trust, and socio-demographic characteristics on tax compliance among SMEs might aid in the creation of tailored interventions to increase compliance. The issue statement for this research focuses around the need to completely evaluate the impact of digitalization on tax compliance in Ghana, taking into account the particular contextual circumstances and obstacles that SMEs experience. This study intends to contribute to the establishment of successful tax policies and administration procedures in Ghana by filling gaps in the current literature and giving empirical information on the impact of digital tax systems, religion, trust, and socio-demographic characteristics.

1.2. Research Objectives

In examining the impact of digitalization on tax compliance in the in Ghana, the study aims to:

1. Examine the effect of digitalization on tax compliance in the digital economy of Ghana.
2. Analyse the role of taxpayer education programs in promoting tax compliance in the digital economy in Ghana.
3. Analyse the role of taxpayer awareness programmmes in promoting tax compliance in the digital economy of Ghana.

1.3. Research Questions

1. What is the effect of digitalization on tax compliance in the digital economy in Ghana?
2. How do taxpayer education programs promote tax compliance in the digital economy in Ghana?
3. How do taxpayer awareness programs promote tax compliance in the digital economy in Ghana?

This study is divided into five sections, the first of which is this introduction. In order to uncover important concepts and theoretical underpinnings, the second portion explores the corpus of current knowledge by examining earlier studies, theories, and frameworks that are pertinent to the subject. The research methodology is reviewed in the third section, with a focus on the procedures for data collecting and analysis that clarify the selected design, sampling strategies, determining sample size, and highlighting the application of structural equation modelling (SEM). The research findings are presented and analyzed using tables, figures, and charts in the fourth section. The study's last section summarizes the main conclusions, talks about their ramifications, and provides

actionable advice for stakeholders like the Ghana Revenue Authority (GRA) on how to improve tax compliance in the digital economy. It also identifies research gaps and makes recommendations for future directions.

2. Literature Review

Focusing on the consequences of tax compliance in Ghana's digital economy, this review of the literature offers important insights into several research conducted by different experts in different contexts. It examines the theoretical, conceptual, and empirical analyses of earlier research on digitization and how it affects tax compliance. The study's hypothesis, which was formulated using the conceptual framework on the effect of digitalization on tax compliance in the digital economy, is also presented in this section.

2.1. Conceptual Review

2.1.1. Digitalization

Digital transformation is the process of integrating digital technology and tools into various elements of an organisation or system to enable automation, increased efficiency, accuracy, and accessibility of processes and services [35]. [36] Argues that digitalization is a multidimensional process that includes digitization and digital transformation, with each word signifying different elements of incorporating digital technology into an organization's business strategy. Digitization is the act of transforming information into a digital format, whereas digitalization is the application of information and communication technology to alter corporate processes and services, resulting in superior offers [9]. Digital transformation, on the other hand, refers to the development of wholly new business models using digital technology. Digitalization is described as the widespread use of digital instruments such as the internet and mobile phones in the economy.

The World Bank's Digital Adoption Index (DAI) is commonly used to quantify the level of digitization in 180 countries. It has three sub-indexes that focus on digital adoption by organisations, individuals, and governments. Based on the World Bank's own databases, DAI gives a more thorough view of digitalization adoption than perception polls [37]. [38] Used the DAI to evaluate the influence of digitalization on tax authorities' confidence and corruption, emphasising its importance in analysing the global expansion of digital technologies. Digitalization is a multidimensional term with far-reaching implications for a variety of industries, including banking. Measuring its scope necessitates the use of comprehensive indexes such as the DAI, which give a broader view on digitalization adoption. As digitization continues to transform the world's economies and financial systems, governments, researchers, and corporations must comprehend its ramifications and consequences on trust, corruption, and compliance.

2.1.2. Tax Compliance

The extent to which individuals and companies comply with tax laws and declare and pay taxes. Tax compliance is how well individuals and businesses declare and pay taxes according to tax laws [39]. In a well-functioning tax system, it ensures that the government can collect the revenues needed for public services and development. The digital economy affects tax compliance patterns, among other aspects. Tax regulations' complexity affects compliance [40]. In a digital economy with cross-border transactions and online company activities, tax legislation can become complicated, making it hard for taxpayers to understand their tax obligations. Complex tax regulations can cause unintentional tax reporting errors, lowering compliance rates. Trust in tax administration and perceived tax system fairness are also crucial [41]. When taxpayers believe their taxes will benefit society and that the tax system is fair, they are more likely to comply. In the digital economy, where tax authorities may have access to vast quantities of taxpayer data, data privacy and confidence in tax administration technologies are crucial. Tax enforcement and penalties are crucial [42]. In the digital economy, where transactions are harder to detect and manage, rigorous enforcement is essential to prevent tax evasion. Noncompliance penalties should be severely enforced to level the playing field and deter tax evasion. Cross-border transactions and companies' ability to shift revenues to low-tax nations make tax compliance difficult in the digital economy [13]. As digital enterprises and intangible assets move, organisations might use proactive tax planning to reduce their tax burden [13]. The digital economy affects tax compliance beyond enforcement and laws. Digital technology can aid tax compliance and evasion [43]. Automation and digital record-keeping can expedite tax filing for compliant taxpayers. They also enable tax avoidance through various methods and digital income concealing. Tax authorities struggle to track and audit taxpayers in the digital economy [44]. The sheer amount of digital transactions and data can overwhelm tax authorities, requiring powerful data analytics and AI to discover tax violations. Tax compliance is essential for a fair and effective tax system that funds public services. The digital economy presents tax compliance challenges and opportunities. Tax authorities must simplify tax regulations, create trust in tax administration, enforce fines, tackle BEPS, and use technology for compliance monitoring to adapt to the digital environment and ensure digital tax compliance.

2.1.3. Taxpayer Education: Check the Colon

The supply of information, tools, and training programmes to help taxpayers better understand their tax rights, duties, and obligations. It seeks to raise awareness and understanding about tax rules and regulations in order to encourage voluntary compliance. Taxpayer education is critical for increasing tax compliance in the digital economy [1]. With the rising complexity of tax legislation and the expanding use of digital technology for tax administration, it is even more important to

educate people about their tax rights, duties, and obligations [45]. Tax authorities can promote voluntary compliance by providing taxpayers with information, tools, and training programmes. In the digital economy, where online transactions and cross-border activities are frequent, taxpayer education is critical to tackling the difficulties of the digital sphere. Many taxpayers may engage in digital transactions without fully comprehending the tax consequences, resulting in inadvertent non-compliance [46]. Educating people on the tax consequences of digital activities can assist them in appropriately reporting their income and meeting their tax responsibilities. Furthermore, the digital economy creates new opportunities for tax planning and evasion, since firms may use loopholes and international tax discrepancies to reduce their tax payments [47]. Taxpayer education may enhance knowledge about the dangers of aggressive tax planning and the value of ethical tax procedures, preventing taxpayers from participating in tax evasion. The use of digital technologies to educate taxpayers is a significant tactic in the digital age. Online materials, seminars, and interactive platforms can help taxpayers acquire information and connect with tax authorities. Digital platforms enable tax authorities to reach a larger audience and personalise instructional materials to the unique demands and conditions of various taxpayer groups. Taxpayer education promotes openness and trust in the tax system. When taxpayers understand how their tax dollars are spent on public services and development, they are more inclined to cooperate willingly [48]. Digital platforms may be used to communicate the impact of tax money on public projects, instilling civic duty and pride in contributing to the well-being of society. Furthermore, in the digital economy, data privacy and security are top priorities. Educating people about the steps taken by tax authorities to protect their information can reduce concerns and boost trust in utilising digital platforms for tax compliance [49]. Transparent communication about data protection rules and cybersecurity safeguards can boost taxpayer confidence in the digital tax administration. Taxpayer education enhances tax enforcement operations. Tax authorities can encourage taxpayers to self-report and self-correct mistakes by increasing their self-awareness and tax literacy [50]. This proactive approach to compliance lessens the strain on tax enforcement resources and develops a collaborative connection between taxpayers and tax officials. Taxpayer education is an effective method for increasing tax compliance in the digital economy. Tax authorities may enable taxpayers to comply willingly and ethically by providing readily available and relevant information on tax laws, digital transactions, data privacy, and tax implications. Leveraging digital platforms for taxpayer education may improve communication and confidence between taxpayers and tax authorities, resulting in a more efficient and effective tax compliance environment in the digital age.

2.1.4. Taxpayer Awareness

Taxpayer awareness of their rights, duties, and rewards. It covers tax rules, filing methods, deadlines, and penalties for noncompliance. Taxpayer knowledge is vital to digital economy tax compliance. It measures taxpayer awareness of their tax duties, rights, incentives, and tax system. In a digital age when tax administration and transactions rely more on technology, taxpayer knowledge is crucial for accurate reporting and voluntary compliance [51]. In the digital economy, taxpayer knowledge encourages voluntary compliance. Taxpayers are more inclined to comply when they know their tax responsibilities and the advantages of compliance [52]. Lack of information about tax regulations and filing processes might lead to inadvertent non-compliance. In the digital economy, tax rules and regulations may change quickly to accommodate new digital transaction concerns and possibilities. Being aware of changes in tax regulations, timelines, and digital transaction requirements allows taxpayers to adjust their tax procedures [53]. Tax planning is also affected by taxpayer awareness. Businesses may use intricate tax planning tactics to optimise their tax status in the digital age. Knowing about incentives and tax planning options allows taxpayers to take use of lawful deductions and credits to lower their tax liability [51]. Since tax authorities want to boost economic development and investment, this tax planning is lawful and encouraged. However, taxpayer knowledge affects tax enforcement. Tax authorities may employ data analytics and digital tools to discover non-compliance trends in the digital economy [54]. Knowing they are under inspection may make taxpayers more careful about tax reporting to avoid audits and fines. This increased awareness may dissuade noncompliance. Tax authority information must be accessible and relevant for digital taxpayer awareness programmes to work. Tax information can be shared via government websites, mobile apps, and social media [3]. Customising the information for taxpayer groups and digital transactions helps boost compliance. Taxpayer knowledge increases tax system openness and confidence. When taxpayers understand how their tax contributions are used and how compliance funds public services, they are more likely to view taxes as a fair and essential social duty [55]. Taxpayer knowledge is vital to digital economy tax compliance. Informed taxpayers are more inclined to comply freely, plan taxes, and support transparent tax administration. As tax authorities use digital technologies for communication, offering accessible and relevant tax information may help taxpayers navigate the digital tax landscape and contribute to a more compliant and cooperative tax environment.

2.1.5. Digital Economy

Digital technologies including e-commerce, digital platforms, and online services are used for economic transactions [16]. The digital economy includes electronic payment systems, digital marketplaces, and other business-changing technologies. The internet economy has transformed tax compliance and administration. E-commerce, digital platforms, and online services are examples of digital economic

activity. Online shopping, advertising, cloud computing, and digital payments are all part of the digital economy [2]. Digital economy tax compliance presents problems and possibilities for tax authorities. In a digital economy, tax compliance monitoring and enforcement are tough. Traditional tax administration may fail to keep up with digital transactions and company models [56]. This allows tax avoidance and non-compliance since some digital transactions are hard to track and monitor. Tax base erosion and profit shifting can also result from the global digital economy. Tax disparities between nations can help multinational firms reduce their tax payments [57]. Base Erosion and Profit Shifting (BEPS) worries tax authorities globally. Tax authorities are using digital technology to address these issues. Data analytics and artificial intelligence are analysing massive volumes of digital data to help tax authorities' spot non-compliance trends and tax evasion [56]. Online audits and electronic filing simplify tax compliance for taxpayers [58].

Additionally, the digital economy has created new tax concerns that demand imaginative tax policy and regulation. Digital products and services, cross-border e-commerce, and the sharing economy complicate taxation and jurisdiction [14]. The digital economy has also raised worldwide tax reform concerns. The digitization of the economy has disturbed physical presence and profit allocation, leading to discussions on taxation rights across governments [17]. The internet economy has also improved taxpayer transparency and access to tax information. Many tax authorities offer online portals and digital tools to assist taxpayers understand and comply with their tax duties [59]. The internet economy has changed tax compliance and administration. While digital technologies make tax enforcement and evasion harder, they also make tax administration more efficient. Tax authorities must modify their policies and use creative techniques to guarantee fair and effective taxes in the digital economy.

2.1.6. Technological Adoption

Integration and use of digital technology and tools in an organisation or system. Technological adoption entails accepting, implementing, and using digital solutions to improve operations, decision-making, and performance [60]. Tech adoption is key to improving tax compliance in organisations and systems. Digital technology and tools are integrated and used to speed tax procedures, improve decision-making, and boost performance. Digital tax compliance solutions improve efficiency and effectiveness [61]. Process automation is crucial to tax compliance technology adoption. Tax authorities can automate tax computations, data collecting, and reporting via digital technologies. Automation lowers human error, maintains tax computation integrity, and speeds up tax filing. Taxpayers find it simpler to comply with tax rules, improving tax compliance [61]. Adoption of technology improves data administration and analysis. Tax authorities can efficiently gather, store, and analyse massive tax data with digital technologies. Advanced data analytics can reveal patterns, trends, and non-compliance. Tax authorities may better target enforcement and identify tax evasion using this knowledge, boosting tax compliance [37]. Technological adoption improves taxpayer participation and communication. Tax authorities may give taxpayers with real-time tax information, instructions, and resources via web portals and mobile apps [62]. Facilitating taxpayer-tax authority communication increases transparency and confidence, encouraging voluntary compliance. Digital solutions also enhance tax reporting and audits. Digital records and electronic tax filing make tax audits faster and more accurate [3]. This eases taxpayer and tax authority burdens, encouraging tax compliance cooperation. Addressing issues is necessary for tax compliance technology adoption. Technology availability and digital knowledge may prevent certain taxpayers from embracing digital solutions. Broad-based compliance requires inclusion and assistance for such taxpayers [9]. In the digital age, cybersecurity and data privacy are crucial. Tax authorities must prioritise taxpayer data security and invest in strong cybersecurity. Technological adoption in tax compliance transforms tax systems. Tax authorities may expedite procedures, improve data management, engage taxpayers, and increase tax compliance by using digital technology and applications. To maximise the benefits of technology adoption, the digital tax ecosystem must overcome issues and assure inclusiveness and data security [13].

2.2. Theoretical Framework

2.2.1. Technology Acceptance Model (TAM)

The Technology Acceptance Model suggests that perceived utility and simplicity of use impact technology acceptance and use [63]. TAM can be used to evaluate taxpayers' acceptance and use of digital tax compliance methods. It helps determine if taxpayers' perceptions of digital technologies' advantages and ease affect their compliance behaviour. The TAM hypothesis is commonly used to explain technology uptake and use. Perceived utility and ease of use impact technology use, according to TAM [64]. Perceived utility is how much people think the technology will improve their performance or make their jobs simpler. In contrast, perceived ease of use is how easy the technology is to understand and utilise. TAM may be used to analyse taxpayers' acceptance and use of tax authorities' digitization efforts in the digital economy [2]. Technology-based tax compliance strategies include online tax filing platforms, mobile tax payment applications, and electronic record-keeping systems [65]. Researchers and policymakers may use TAM to determine how taxpayers view the benefits and convenience of these digital technologies and if they affect compliance. Taxpayers are more inclined to utilise digital tax filing systems if they believe they simplify tax reporting and reduce administrative burdens. Taxpayers are more likely to utilise these tools for tax compliance if they are straightforward to use. TAM studies on tax compliance indicated that perceived utility and simplicity of use positively increase taxpayers' inclination to embrace digital tax tech-

nology [37]. Researchers have found that pleasant digital tool experiences boost tax authority trust [42]. This can encourage taxpayer compliance. Understanding tax compliance in the digital economy using TAM can assist tax authorities and policymakers create more user-friendly and effective digital solutions. Tax authorities may boost digital adoption and tax compliance by addressing taxpayers' concerns about utility and convenience of use. TAM sheds light on taxpayers' digital tax compliance technology adoption and use. Understanding taxpayers' views on digital tools' utility and simplicity of use helps improve tax administration tactics and digitalization steps to boost tax compliance in the digital economy.

2.2.2. Institutional Theory

Institutional Theory examines how formal and informal norms, practices, and regulations affect individual and organisational behaviour [66]. This theory can explain how legislative frameworks, regulations, and social norms affect digital economy tax compliance in the research. It examines how digitization affects taxpayer compliance and how it interacts with current institutional systems. Institutional Theory helps explain how formal and informal rules, norms, and practices affect individual and organisational behaviour [67]. Institutional Theory may be used to study how legal frameworks, regulations, and social norms affect taxpayer compliance in a digital economy. The institutional context strongly influences taxpayers' tax compliance behaviour. New institutional structures affect taxpayer compliance in the digital economy. Digital tax filing platforms, online payment systems, and electronic record-keeping regulations affect taxpayer-tax authority interactions [68].

Institutional theory states that normative forces and social expectations in the institutional setting motivate compliance behaviour as well as rational calculations. In the digital economy, tax compliance institutions have changed to accommodate technology. Digitalization can increase tax enforcement, transparency, and compliance data analytics for tax authorities. Digital tax compliance may also put people under normative pressure to disclose and pay in new ways. If most digital economy taxpayers file taxes online, social expectations may be that others do also. Institutional Theory also explains how digitization affects institutions. Digital economy may need changes to tax compliance systems and rules. Tax authorities may need to adapt tax laws, regulations, and enforcement techniques to reflect digital transactions and cross-border e-commerce difficulties and possibilities. Institutional Theory research on tax compliance in the digital economy found that harmonising formal (legal frameworks) and informal (social norms) laws promotes tax compliance [39]. In the digital age, institutional structures that build taxpayer-tax authority trust improve compliance [41]. Institutional Theory illuminates how institutions affect digital economy tax compliance. By understanding formal and informal regulations, conventions, and practices, tax authorities and policymakers may create successful methods to encourage voluntary compliance and a tax compliance culture in the digital age.

2.3. Empirical Review

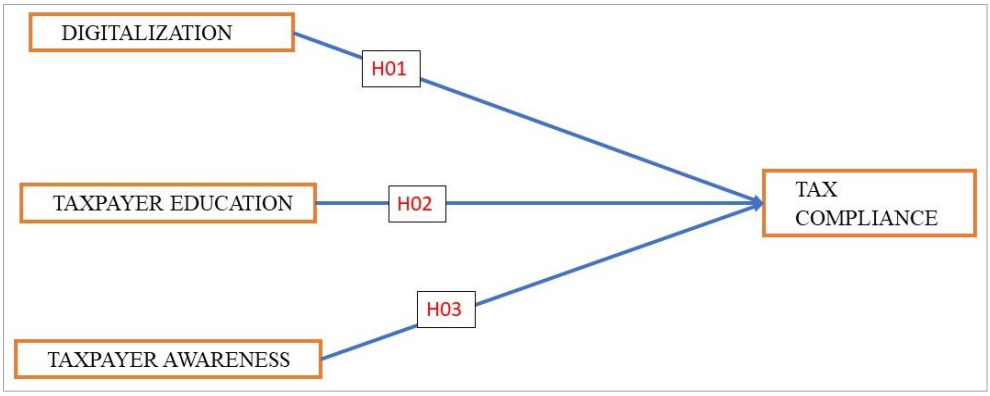
Ref. [14] uses panel estimators to analyse how public service digitization affected tax evasion in EU-27 member states between the years 2015 and 2019. Results show a U-shaped nonlinear link between digitization and tax evasion. Tax evasion first lowers when public service digitization speeds up to a threshold. After then, digitization accelerates tax avoidance again. This shows the intricacy of digitalization's influence on tax evasion and the necessity for well managed digitalization plans in public services to counteract it. In their 2021 study, [19] analyse how perceived risk moderates the link between tax IT and tax evasion trends. PLS was used to analyse 100 taxpayer surveys. The studies show that IT reduces tax avoidance. The moderating test showed that taxpayer risk perception increases IT use to reduce tax evasion. This indicates taxpayers employ IT to avoid tax scrutiny and fines. The report emphasises the need for tax authorities to use sustainable information technology to reduce tax evasion and improve taxpayer services and law enforcement. These findings can aid tax authorities in IT improvements to improve tax administration and compliance. [11] Analyses how tax administration digitization reduces compliance costs for Indonesian MSMEs. Digitalization is viewed as a way to enhance tax administration as SMEs develop. Using observation and SME survey data, the study uses a qualitative descriptive and explanatory method. The results show that knowledge, mediation, and tax satisfaction/fairness affect MSME taxpayer compliance in digital tax administration. Due to inefficient tax services, high tax rates, and harsh punishments, MSMEs still struggle to fulfil tax compliance expenses. These data show that Indonesian MSMEs require better tax administration. [69] Study India's GST rollout and the obstacles of digitising formalisation. Higher-capability corporations may use 'informal' transactions to capture rents, whereas smaller unregistered informal sector organisations may breach norms and use informal payments. To safeguard vulnerable populations against 'premature formalisation,' a cautious and inclusive approach is needed. [7] Examines digitalizing tax administration communication using paperless channels and AI technologies such as digital assistants, chatbots, and voicebots. The study examines how worldwide digital age megatrends, notably process automation, affect tax administration communication channels. The study compares digital communication tactics in OECD nations and Slovakia and examines tax administration communication with artificial intelligence using quantitative and qualitative methods. The findings stress the significance of investing in current technology, notably AI, to improve tax administration communication. The essay suggests teaching tax administration workers digital skills to help them adapt new technology. MTD's impact was examined by [10] utilising primary quantitative and

qualitative data from taxpayers, accountants, and multidisciplinary practitioners. Clearer compliance advice is needed for the 3.5 million single trader enterprises that contribute £1.9 trillion to the UK economy. HMRC should give robust anti-avoidance support for single traders and a good communication plan to help them implement MTD. [17] Explores how digitalization adoption moderates corruption and tax evasion. Data from 133 nations is analysed using the World Bank's digitalization adoption index and the shadow economy as a tax evasion proxy. Digitalization adoption negatively correlates with tax evasion, suggesting it can minimise it. Digitalization works best in low-corruption countries, according to the report. These findings show policymakers that digitization can fight financial crimes. Technology investments boost government tax collection and resource allocation. [16] Discuss DSTs and their effects, sparking stakeholder discussion." The research examines DST legislation and administration in relation to taxation canons through a literature analysis. Taxation rules are inconsistently followed, presumably due to economic, political, and social conditions. The study suggests that African governments must reconcile tax policy with the digital economy's needs when implementing DSTs. [41] Examine Cameroon's digitization and tax compliance. A causal research methodology and purposive sampling were used to survey 200 online tax payers. The primary data was acquired using Likert scale. Using Partial Least Square-Structural Equation Modelling (PLS-SEM), effort expectations, accessibility, and dependability positively and significantly affect tax compliance, whereas e-tax system cost has no significant effect. Behavioural intents of taxpayers somewhat mediated effort expectations. The government should make the e-tax system more user-friendly and accessible for all Cameroonian taxpayers. Based on a critical evaluation of 55 recent papers, [70] discusses the pros and drawbacks of taxing Africa's digital economy with value added tax. Revenue mobilisation and efficiency benefits are opportunities, whereas legal uncertainties, capacity restrictions, and tax knowledge shortages are problems. VATing the digital economy may increase costs, restrict access, inequality, and hinder sustainable development. [42] Examines how taxation technology affects digital economy entrepreneurs' compliance decisions. The study reveals that entrepreneurs' belief in the tax authority's technology and implementation capability greatly affect tax compliance using qualitative phenomenological investigation. It also shows a new digital economy compliance method called confirmatory compliance. This technique involves entrepreneurs following tax laws because they trust the technology-driven tax system. The perspective of e-Filing technology usage among Indonesian handicapped taxpayers improves understanding and tax compliance, according to [18]. Taxes provide government money, and philosophical and constitutional grounds require equitable treatment of disabled and non-disabled people. Disability taxpayers can use e-Filing for SPT reporting. Special-needs taxpayers may not see the benefits of this technology. Using 85 samples from disability SMEs in Bandung, West Java, the quantitative study explores whether e-Filing affects disability taxpayers' awareness. E-Filing improves disability tax understanding but not compliance. A disability-friendly website with modern technologies improves accessibility. [43] Examined how information technology affects tax administration in Kurdistan, focusing on productivity, implementation, and planning. Data was acquired via questionnaire and analysed using multiple regression and Pearson product moment correlation in descriptive research. Online tax filing, registration, and remittance improve regional tax management, according to the findings. To improve tax administration productivity and effectiveness, information technology is crucial. E-filing, e-billing, and administrative fines affect taxpayer compliance in Badung Regency, according to [15]. Maximising tax potential requires better tax compliance. Out of 126,477 taxpayers, 100 from North and South Badung KPPs were surveyed. E-filing and e-billing were examined by usability and convenience of use, whereas administrative penalty factors were based on tax punishments, violations, and applicability. We analysed data using multiple linear regression. The results show that e-filing, e-billing, and administrative fines improve taxpayer compliance, underscoring the relevance of technology-based tax reporting. [61] Examines Ethiopian tax administration's electronic sales registration machine use. Income taxes rise by at least 12% and VAT by 48%, according to the report. Taxpayers adjust sales and costs, resulting in lower net revenue increases than sales growth. A trial using letters showed that the robots improve compliance rather than commercial activity. The revenue administration underuses data, although machine adoption increases taxpayer record accuracy, lowering disparities. Digitized data management solutions can boost regional tax compliance.

2.4. Conceptual Framework and Hypothesis Development

2.4.1. Conceptual Framework

Technology Acceptance Model (TAM) and Institutional Theory underpin this study. TAM will examine taxpayers' adoption and use of digitalization methods in tax compliance, while Institutional Theory will examine how legislative frameworks and social norms affect digital economy tax compliance. The research on digitalization and tax compliance in Ghana's digital economy uses four primary constructs: Digitalization, Tax Compliance, Taxpayer Education, and Taxpayer Awareness. The study considers Taxpayer Education, Awareness, and Ethics as mediators of tax compliance. The framework will assist explain how these variables affect tax compliance in Ghana's digital economy.



Source: Authors construction

Figure 1. *Conceptual Framework on the impact of digitalization on tax compliance in the digital economy.*

2.4.2. Hypothesis Development

The first hypothesis is based on the Technology Acceptance Model and posits that digitalization positively influences tax compliance in the digital economy in Ghana. Previous research has shown that the adoption of digital tax filing platforms and online payment systems can improve tax compliance by providing convenience and ease of use for taxpayers [38]. Based on the conceptual framework, the following hypotheses are proposed:

H_1: Digitalization positively influences tax compliance in the digital economy in Ghana.

The second hypothesis is grounded in and suggests that taxpayer education programs positively impact tax compliance in the digital economy in Ghana. Research has indicated that providing taxpayers with information and resources about their tax obligations and rights can increase their understanding and willingness to comply voluntarily [50].

H_2: Taxpayer Education Programs positively impact tax compliance in the digital economy in Ghana.

The third hypothesis is also based on Institutional Theory and proposes that taxpayer awareness programs positively influence tax compliance in the digital economy in Ghana. When taxpayers are more aware of their tax obligations, deadlines, and potential consequences of non-compliance, they are more likely to comply with tax laws" [71].

H_3: Taxpayer Awareness Programs positively influence tax compliance in the digital economy in Ghana.

3. Data and Methodology

In this section the study design, study area, the sample procedures, the procedure for data collection and the analytical technique used to analyze the data are discussed. The research methodology focused on the procedures for data collection and analysis that clarify the selected design, sampling strategies, determining sample size, and highlighting the application of structural equation modelling (SEM).

3.1. Research Design

Any study's research design sets the framework for answering questions and testing hypotheses [72]. Different study designs suit different goals and data gathering methodologies [73]. Researchers use experimental design to change an independent variable to determine its effect on a dependent variable while controlling other factors. It's crucial for causality [74]. Quasi-experimental design manipulates an independent variable without random participant assignment, frequently for ethical or practical reasons [75]. A popular survey design uses structured questionnaires or interviews to collect data from a large respondent pool and analyse attitudes, opinions, behaviours, and population characteristics [76]. Observational design involves systematic observations of people or groups in natural situations without manipulating factors [77]. Case study design provides in-depth insights on one topic or event. Cross-sectional design collects data from many groups, whereas longitudinal design collects data from the same sample across time. Variable associations are examined without causality in correlational design. Experimental design generates hypotheses in new domains, whereas descriptive design describes phenomena [78].

This study uses survey design due of its advantages. Surveys collect data from a wide, representative sample, improving generalizability [77]. Structured data collection reduces biases, improving data dependability [77]. Surveys accurately evaluate complex concepts and attitudes and allow for statistical analysis [79]. Cost-effective surveys, especially with large populations, encourage sensitive information sharing by protecting respondent anonymity [80]. In conclusion, survey design is an effective way to gather large amounts of data from many respondents.

3.2. Research Approach

This study uses quantitative methods. To find patterns, trends, and interactions between variables, quantitative re-

search collects and analyses numerical data [78]. A structured questionnaire with Likert scale statements collects quantitative data that may be statistically analysed to derive conclusions and generalise about the population of interest [73]. Several arguments support quantitative research. First, the paper examines how digitalization affects tax compliance in Ghana's digital economy. Quantitative data gathering approaches like surveys may easily monitor digitalization and tax compliance characteristics [75]. Second, a quantitative method may examine how taxpayer education, knowledge, and ethics promote tax compliance in Ghana's digital economy. Numerical variables and respondents' views and attitudes can be used to quantify these notions [81]. Thirdly, a quantitative method allows the study to develop statistical correlations and test hypotheses across variables, improving knowledge of tax compliance in Ghana's digital economy [82]. As mentioned in the data analysis section, a quantitative approach provides statistical methods like Structural Equation Modelling (SEM) using SMART PLS. This study's aims may be met via SEM, which is ideal for testing theoretical models and evaluating complicated interactions between many variables [83]. The quantitative research approach is best for this study because it allows policymakers and tax authorities to systematically examine the effects of digitalization on tax compliance and the roles of taxpayer education, awareness, and ethics in the digital economy in Ghana.

3.3. Study Population

The research population is everyone or everything being studied. Individuals, enterprises, and organisations in Ghana's digital economy are the study population for the influence of digitalization on tax compliance. This covers taxpayers who use digital technologies including e-commerce, internet services, digital platforms, and electronic payment methods. The research population comprises tax authorities, policymakers, tax advisors, and digital technology and taxation professionals involved in digital economy tax compliance. The population is approximated at one thousand.

3.4. Sample Size and Sampling Technique

For representativeness and generalizability, the sample size and sampling procedure used in the research on digitalization and tax compliance in the digital economy, concentrating on the Ghana Revenue Authority (GRA), are crucial. Convenience sampling was used due to practical restrictions and target population accessibility. Convenience sampling selects people who are easily accessible to researchers [84]. This would choose Ghanaian taxpayers and businesses with tax responsibilities based on convenience and access. However, convenience sampling may add biases and restrict generalizability to the wider population. Therefore, evaluate the results in the context of the sampled population. An optimal sample size depends on study objectives, required accuracy, statistical power, and analytic methods [85]. Researchers seek for a suitable sample size to provide trustworthy and relevant results, but there is no set guideline. Power analysis, effect size estimation, and confidence level can determine quantitative study sample size. Researchers may also consider resources, time, and practicality when choosing a sample size. While convenience sampling was used for practical reasons, efforts were taken to guarantee a sufficient sample size for relevant analysis and results. Statisticians should evaluate the study objectives and analytic methods while determining sample size [86]. According to [87], the research sample size is 278 based on estimated populations at 5% confidence.

3.5. Data Collection Instrument and Data Source

This study collected data using a structured questionnaire. The poll asked respondents on digitalization, tax compliance in Ghana's digital economy, taxpayer education, awareness, and ethics. Each concept was represented by a questionnaire section. Each segment had construct-related statements or questions. A seven-point Likert scale, with 1 representing Strongly Disagree and 7 representing Strongly Agree, was used to rate each statement. A biographical profile portion of the questionnaire collects demographic information about respondents, including age, gender, education, employment, and digital economy and taxation experience. To achieve clear, relevant, and reliable replies, the data gathering instrument was carefully created. A small group of participants pre-tested it to discover any flaws or ambiguities and make necessary revisions before delivering it to the research population. A standardised questionnaire made data collecting and analysis efficient, allowing researchers to meet research objectives and make relevant findings. This research study used a structured questionnaire to obtain data from respondents. Ghanaian digital economy workers and enterprises with tax compliance responsibilities were surveyed. The respondents answered the google form questionnaire about digitalization, tax compliance in Ghana's digital economy, taxpayer education, awareness, and ethics. The constructs' connections and associations were analysed using respondent data. This study used questionnaire replies. The respondents' privacy was protected, and the data was used for study. The data was thoroughly evaluated and interpreted to meet study objectives and comprehend tax compliance in Ghana's digital economy.

3.6. Data Reliability and Validity

Data reliability and validity are crucial aspects of any research study to ensure the accuracy and credibility of the findings. In this study, measures were taken to ensure the data's reliability and validity. The questionnaire was carefully constructed to test the components with simple, unambiguous questions. A pilot test with a small sample of respondents identified questionnaire flaws and made required adjustments

before distributing the questionnaire to the research population. The questionnaire scales' reliability was assessed using Cronbach's alpha and other internal consistency tests. Data was collected consistently among respondents using standardised methods. Errors were removed by carefully entering and cleaning data. A detailed assessment of relevant literature and established scales was used to build the questionnaire to accurately measure the dimensions of interest. Field specialists examined the questionnaire for face validity and to verify it measures what it claims to. To determine criterion validity, questionnaire results were compared to external criteria or other validated measures. Experts assessed the questionnaire to verify it meets all study goals. The questionnaire scales' construct validity was assessed using exploratory and confirmatory factor analysis. The study uses these metrics to assure data reliability and validity, laying the groundwork for research analysis and interpretation.

3.7. Ethical Consideration

To protect participants' rights and assure research integrity, this study followed stringent ethical guidelines. All participants were informed of the study's goal, methods, and risks and benefits before participation. Each subject gave informed permission and can leave the research at any time without penalty. All responder data was kept private. The final paper offered only aggregated study data, not personal information. The findings were reported under pseudonyms to safeguard participants. Data was securely kept and only study researchers had access. Data was secured against unauthorised access, disclosure, and manipulation. No injury or pain was intended for research participants. Researchers minimised involvement risks and negative effects. To avoid bias in data collection, processing, and interpretation, the researchers were objective. To comply with ethical standards, the researcher obtained institutional review board or ethics committee permission. The study strives to respect the highest ethical standards and assure the research's integrity and dependability.

3.8. Data Analysis

A sophisticated statistical method for analysing complicated interactions between latent and observable variables in a research model is Structural Equation Modelling (SEM). This study used SMART PLS (Partial Least Squares) SEM software to analyse data and test the research model [88]. SEM analysis begins with data preparation. This entails evaluating data normalcy, outliers, and missing data. Outliers and missing data were handled with robust statistics and imputation. Normalisation data manipulations. The measuring model examines latent variables (constructs) and their indicators. Each concept is assessed for reliability and validity. The following steps do this: a. Reliability Assessment: Cronbach's alpha and composite reliability assessed construct internal consistency. Good dependability is over 0.7. b. Validity Assessment: Factor loadings above 0.7 suggest positive convergence. Average Variance Extracted (AVE) values above 0.5 suggest reasonable validity. Comparing the AVE to the square of concept correlations assessed discriminant validity. The structural model investigates hypothesised routes and latent variable associations. It evaluates model fit and relationship significance [85].

The steps are:

1. The links between latent variables were evaluated using path coefficients. T-values and p-values were calculated using bootstrapping to test path significance.
2. R-Squared (R2) Calculation: R2 values determined how much variation the external constructions explained in the endogenous constructs.
3. Predictive Relevance (Q2): Cross-validated redundancy (Q2) assessed model predictive relevance [89].

According to the model, mediation analysis examined the indirect effects of the independent variable on the dependent variable through mediators. To estimate path coefficient standard errors and confidence intervals and assess indirect impact significance, bootstrap samples were generated. R-Squared (R2), R2 Adjusted, and GOF were used to assess the SEM model's goodness-of-fit. Additionally, cross-validated predictive relevance (Q2) was assessed. SEM analysis findings were evaluated using study goals and assumptions. The data were clearly presented with tables and graphs showing connections and model fit. Employing SMART PLS for SEM analysis, this study seeks to validate the suggested research model and understand variable interactions in digital economy tax compliance. [90] State that SEM analysis will help researchers understand the mechanisms and progress this subject.

4. Results and Discussion

The methods for obtaining, evaluating, and deriving the results, as well as their interpretations, are described in this part. It shows the biographical profile of respondents, model depicting results of the factor loadings, correlation matrix, the selected variables' correlation statistics, collinearity assessment, inner structural model and finally the regression analysis of the study's objectives.

4.1. Bio Data of Respondents

Table 1 shows the respondents' demographics, educational qualifications, employment status, income levels, types of digital business involvement, years of experience, frequency of digital transactions, familiarity with digital tax reporting, e-filing usage for tax reporting, attendance at taxpayer education programmes, and self-assessment of digital tax compliance. These studies shed light on digital economy tax compliance aspects. Age breakdown shows that 40.6% of respondents are 26–35 and 42.1% are 36–45.

This distribution shows that the research focuses on prime-working-age people. Additionally, 64.4% of respondents are male, indicating a greater male involvement percentage in the survey. Nearly half (47.1%) of respondents had bachelor's degrees, while 41.4% have masters. This suggests a well-educated group, presumably due to digital business and tax reporting obligations. Again, 88.5% are employed, 5.8% are self-employed, and 5.8% are jobless. This employment distribution emphasises the need of recognising the viewpoints of working people in digital business and tax compliance. A significant percentage (47.1%) of respondents earn over GHS 10,000 monthly. This shows a broad income range in the sample, which may affect their ability to deal digitally and pay taxes. The most common digital business is digital content development (41.0%), followed by e-commerce (36.0%). This indicates that respondents engage in content-driven and e-commerce digital activities. Many (41.7%) have 1-3 years of digital business experience, showing a large number of recent entrants. Digital transactions are frequent, with 70.9% of respondents doing so every day. Their exposure to digital tax reporting rules and procedures may be affected by this frequency. Many people are either extremely familiar (40.6%) or moderately familiar (6.1%) with digital tax reporting. A significant fraction is indifferent (23.7%) and not very familiar (18.0%), reflecting varied levels of awareness with digital economy taxation. The high use of e-filing for tax reporting (76.6%) suggests that many respondents use digital platforms to file their taxes. The majority of respondents (76.6%) had attended taxpayer education programmes, which may indicate their dedication to learning and complying with digital tax legislation. When asked to assess their digital economy tax compliance, 17.6% and 41.7% of respondents say they are completely or mainly compliant. However, 29.1% are neutral, suggesting tax compliance may be improved. Only 5.8% claim to be occasionally compliant, while a comparable amount claims to be noncompliant.

Table 1. *Biographical Profile of the Respondents.*

		N	%
Age	18-25 years	16	5.8
	26-35 years	113	40.6
	36-45 years	117	42.1
	46-55 years	32	11.5
Total		278	100
Gender	Male	179	64.4
	Female	99	35.6
Total		278	100
Educational Qualification	Diploma/Certificate	32	11.5
	Bachelor's Degree	131	47.1
	Master's Degree	115	41.4
Total		278	100
Occupation	Employed	246	88.5
	Self-employed	16	5.8
	Unemployed	16	5.8
Monthly Income (in local currency)	Below GHS 1,000	16	5.8
	GHS 1,001 - GHS 3,000	33	11.9
	GHS 3,001 - GHS 5,000	50	18.0
	GHS 5,001 - GHS 10,000	48	17.3
	Above GHS 10,000	131	47.1
Total		278	100
	E-commerce	100	36.0

		N	%
Type of Digital Business (if applicable)	Freelancing/Gig Economy	16	5.8
	Digital Services	32	11.5
	Online Retail	16	5.8
	Digital Content Creation	114	41.0
Total		278	100
	Less than 1 year	32	11.5
	1-3 years	116	41.7
Years of Experience in Digital Business (if applicable)	4-6 years	49	17.6
	7-10 years	33	11.9
	More than 10 years	48	17.3
Total		278	100
	Daily	197	70.9
Frequency of Digital Transactions	Weekly	48	17.3
	Monthly	17	6.1
	Occasionally	16	5.8
Total		278	100
	Very Familiar	113	40.6
	Somewhat Familiar	17	6.1
Familiarity with Digital Tax Reporting a	Neutral	66	23.7
	Not Very Familiar	50	18.0
	Not Familiar at All	32	11.5
Total		278	100
Have you used e-filing for tax reporting?	Yes	213	76.6
	No	65	23.4
Total		278	100
Have you attended any taxpayer education programs in the past?	Yes	213	76.6
	No	65	23.4
Total		278	100
	Fully Compliant	49	17.6
How would you rate your level of tax compliance in the digital economy?	Mostly Compliant	116	41.7
	Neutral	81	29.1
	Occasionally Compliant	16	5.8
	Not Compliant at All	16	5.8
Total		278	100

Source: Author's Field work

4.2. Correlations of Study Variables

The correlations between research variables and their means and standard deviations are shown in Table 2. Tax compliance, digitization, taxpayer education, awareness, and ethics are analysed. These factors are scored on a Likert scale, with higher scores indicating greater concept levels. Variable mean values: Tax compliance has a mean of 4.1033, digitalization 4.0807, taxpayer education 4.1367, taxpayer awareness 4.1527, and ethical concerns 4.1706. These values indicate that survey participants reported somewhat high levels of tax compliance, digitization, taxpayer education, awareness, and ethical considerations. The standard deviations, which assess response variability within each variable, are modest, indicating that responses cluster around the averages. Respondents appear to agree on these notions. The correlation matrix shows substantial associations between research variables. Tax compliance is positively correlated with digitalization ($r = 0.621$, $p < 0.01$), suggesting that as digitalization grows, so does tax compliance. This suggests digitization may improve tax compliance in the research scenario. Tax compliance is favourably connected with taxpayer education ($r = 0.491$, $p < 0.01$) and awareness ($r = 0.261$, $p < 0.01$). These connections show that taxpayer education and awareness appear to increase tax compliance. Tax compliance has a positive correlation with ethical considerations ($r = 0.242$, $p < 0.01$). This means that respondents who view ethical issues as more important in tax compliance report higher tax compliance.

Table 2. *Correlations of study variables.*

	Mean	Std. Deviation	Correlations	Tax compliance	Digitalization	Role of taxpayer education	Role of tax payer awareness	Role of ethical considerations
Tax compliance	4.1033	.62675	Pearson Correlation	1				
Digitalization	4.0807	.62183	Pearson Correlation	.621**	1			
Role of taxpayer education	4.1367	.59771	Pearson Correlation	.491**	.287**	1		
Role of tax payer awareness	4.1527	.64554	Pearson Correlation	.261**	.234**	.669**	1	
Role of ethical considerations	4.1706	.58327	Pearson Correlation	.242**	.158**	.478**	.587**	1

**. Correlation is significant at the 0.01 level (2-tailed).
Source: Author's Field work

4.3. Evaluation of Outer Measurement Model

The outer measurement model is designed to compute the reliability, internal consistency, and validity of observed and unobserved variables. Single observed and construct reliability tests are used to examine consistency, whilst convergent and discriminant validity tests are used to assess validity. A single observed variable dependability characterizes the variance of an individual seen in comparison to an unobserved variable by assessing the observed variables' standardized outer loadings [88].

4.3.1. Construct Validity and Radiality

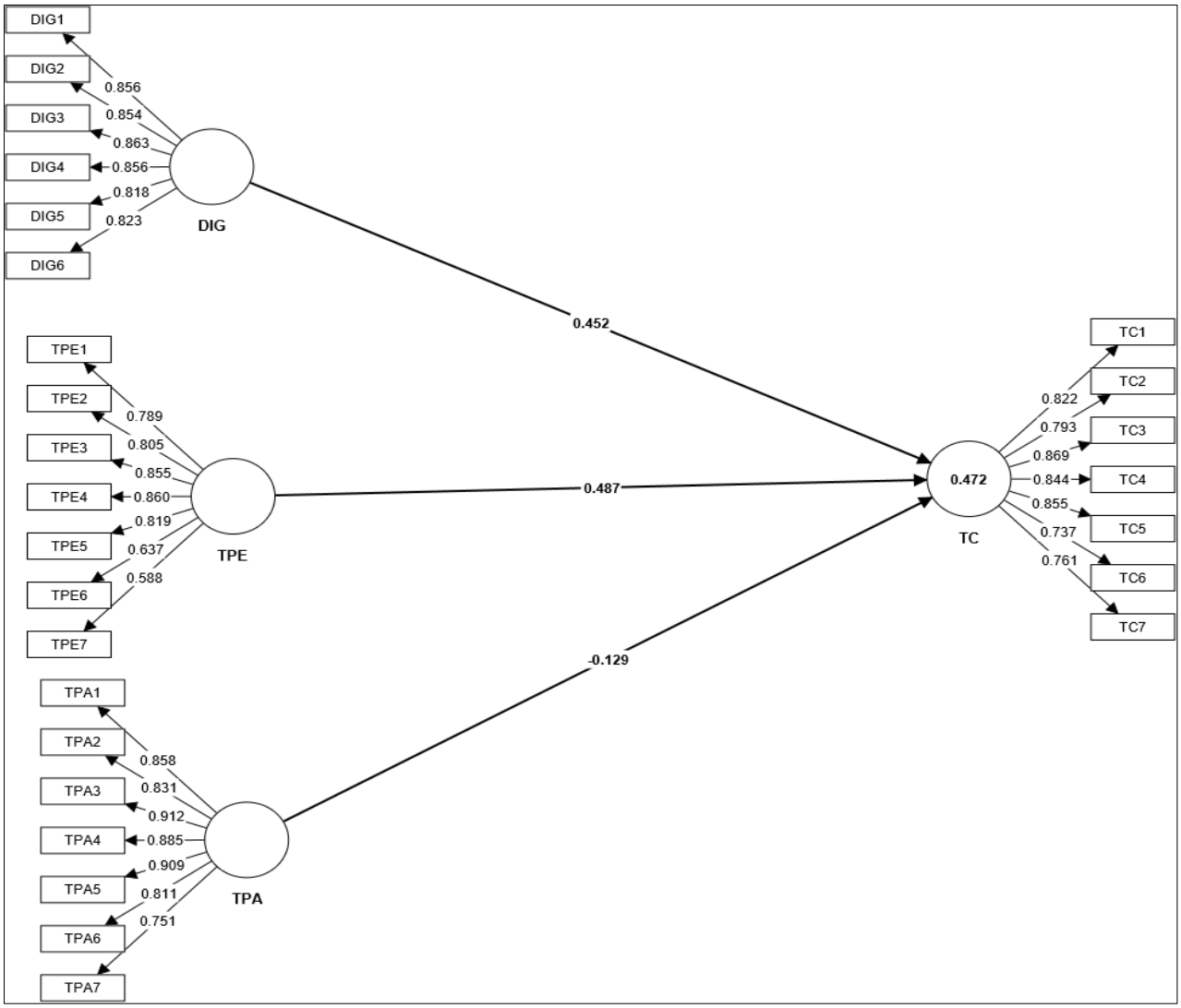
Table 3 summarises construct validity and reliability metrics for Digitalization, Tax Compliance, Taxpayer Awareness, and Taxpayer Education. Assessment of the study instrument and construct robustness depends on these measures. Research requires construct validity and reliability to ensure data consistency and representation of the constructs. Factor Loadings (FL), Composite Reliability (CR), and Average Variance Extracted are used to assess construct validity and reliability in table 3. The Table 3 shows factor loadings for six items (DIG1–DIG6) starting with Digitalization. A factor loading measures how well an item fits the construct. All factor loadings are high, from 0.731 to 0.895. These numbers above the 0.7 criterion, showing that each item is significantly associated to Digitalization. Composite Reliability (CR) assesses build item internal consistency. Digitalization has a remarkable CR of 0.988, considerably above the acceptable at 0.7, suggesting great internal consistency. The Average Variance Extracted (AVE) for Digitalization is 0.703, over 0.5, suggesting strong convergent validity. These findings prove the Digitalization construct's reliability and validity. Tax Compliance (TC) examines seven things (TC1–TC7). Variable factor loadings are typically acceptable. Composite Reli-

ability for Tax Compliance is 0.960, suggesting strong internal consistency, while AVE is 0.642, indicating adequate convergent validity. Taxpayer Awareness (TPA) is rated on seven items. The factor loadings for TPA vary from 0.766 to 0.912, which exceed the permissible level. Composite Reliability for Taxpayer Awareness is 0.941, suggesting great internal consistency, while AVE is 0.726, indicating acceptable convergent validity. Taxpayer Education (TPE) has seven components (TPE1–TPE7). All TPE factor loadings above the suggested level, from 0.707 to 0.840. Composite Reliability for Taxpayer Education is 0.889, suggesting high internal consistency, while AVE is 0.599, indicating adequate convergent validity.

Table 3. *Construct Validity and Radiality.*

CONSTRUCTS	ITEMS	FL	CA	CR	AVE
	DIG1	0.886	0.920	0.988	0.703
	DIG2	0.895			
Digitalization	DIG3	0.871			
	DIG4	0.872			
	DIG5	0.761			
	DIG6	0.731			
	TC1	0.772	0.914	0.960	0.642
	TC2	0.713			
Tax Compliance	TC3	0.821			
	TC4	0.787			
	TC5	0.882			
	TC6	0.793			
	TC7	0.831			
	TPA1	0.841	0.937	0.941	0.726
	TPA2	0.815			
Taxpayer Awareness	TPA3	0.908			
	TPA4	0.887			
	TPA5	0.912			
	TPA6	0.828			
	TPA7	0.766			
	TPE1	0.736	0.888	0.889	0.599
Taxpayer Education	TPE2	0.755			
	TPE3	0.811			
	TPE4	0.840			
	TPE5	0.815			
	TPE6	0.743			
	TPE7	0.707			

Source: Author's Field work



Source: Author's Field work

Figure 2. *Model Depicting Results of the Factor Loadings.*

4.3.2. Discriminant Validity

Latent concept discriminant validity was next [82]. In the route model, a construct's manifest variable is distinguishable from others if its latent variable cross-loading value is greater [82]. Discriminant validity was examined using Fornell and Larcker criteria and cross-loadings, [91]. A construct cannot have the same variance as another construct larger than its AVE value, according to the proposed standard. In Table 4, the squared correlations were compared to other latent component correlations for the Fornell and Larcker criterion test of the model.

4.3.3. Heterotrait-Monotrait Ratio

The researcher utilised the Heterotrait-Monotrait Ratio (HTMT) method to evaluate construct discriminant validity [82, 92].

The data analysis showed that all constructions had acceptable HTMT values ≤ 0.85 (Table 4).

Table 4. *Heterotrait-Monotrait Ratio (HTMT).*

	DIG	TC	TPA
TC	0.597		
TPA	0.241	0.269	
TPE	0.268	0.589	0.557

Source: Author's Field work

4.3.4. Funnell Larcker Criterion

The Funnell-Larcker criteria, sometimes known as the Fornell-Larcker criterion, evaluates construct discriminant validity in factor analysis or structural equation modelling (SEM). The Funnell-Larcker criteria determines whether the

indicators (observed variables) of separate constructs (latent variables) in a statistical model measure unique concepts or overlap or redundancy. The Funnell-Larcker criteria shows most conceptions have reasonable discriminant validity.

Table 5. Funnell Larcker Criterion.

	DIG	TC	TPA	TPE
DIG	0.845			
TC	0.552	0.811		
TPA	0.223	0.252	0.853	
TPE	0.248	0.534	0.507	0.835

Source: Author's Field work

4.3.5. Cross Loading

Cross-loading of all observed variables was larger than construct inter-correlations of all other observed variables in the model (Table 6). These results justified cross-loadings assessment requirements and verified the measurement model's discriminant validity. Thus, the suggested conceptual model was predicted to meet dependability, convergent validity, discriminant validity, and research model verification standards. Cross-loading values support discriminant validity since items load more strongly on their intended constructions than other constructs.

Table 6. Cross Loading.

	DIG	TC	TPA	TPE
DIG1	0.855	0.430	0.253	0.198
DIG2	0.853	0.395	0.261	0.201
DIG3	0.863	0.407	0.177	0.178
DIG4	0.855	0.546	0.192	0.270
DIG5	0.819	0.453	0.151	0.186
DIG6	0.825	0.525	0.120	0.206
TC1	0.539	0.838	0.195	0.350
TC2	0.508	0.810	0.158	0.378
TC3	0.484	0.878	0.190	0.381
TC4	0.468	0.858	0.168	0.343
TC6	0.313	0.726	0.228	0.515
TC7	0.368	0.746	0.276	0.606
TPA1	0.199	0.228	0.856	0.490
TPA2	0.235	0.221	0.829	0.434
TPA3	0.184	0.204	0.913	0.453
TPA4	0.157	0.186	0.886	0.422
TPA5	0.226	0.242	0.911	0.474
TPA6	0.136	0.165	0.810	0.356
TPA7	0.171	0.234	0.753	0.369
TPE1	0.230	0.485	0.305	0.817
TPE2	0.218	0.467	0.378	0.833
TPE3	0.206	0.438	0.445	0.867
TPE4	0.184	0.442	0.509	0.850
TPE5	0.193	0.384	0.503	0.806

Source: Author's Field work

4.3.6. Collinearity Assessment

Table 7 shows that all predictors have VIF values below 3.0, with the greatest being 1.905 for adequate replacement availability and the lowest being 1.05 (VIF < 3.0). These VIF values indicate that the measurement model has no substantial multicollinearity. This ensures model statistical estimations are accurate and reliable. VIF scores below 5 suggest that each item contributes unique information to the model and that there are no excessive linkages or redundancies. Thus, the measurement model is robust and the items may accurately assess their constructs in the research investigation.

Table 7. Collinearity Assessment.

	VIF
DIG1	4.157
DIG2	3.634
DIG3	3.386
DIG4	2.635
DIG5	2.327
DIG6	2.338
TC1	2.892
TC2	2.726
TC3	3.305
TC4	2.988
TC6	1.899
TC7	1.905
TPA1	3.177

	VIF
TPA2	2.964
TPA3	3.029
TPA4	4.331
TPA5	2.388
TPA6	2.585
TPA7	1.998
TPE1	2.264
TPE2	2.469
TPE3	2.718
TPE4	2.967
TPE5	2.487

Source: Author's Field work

4.4. Evaluation of the Inner Structural Model

Study found measuring model valid and reliable. Measure the Inner Structural Model results next. This involved observing model predictive relevancy and construct linkages. Key criteria for assessing inner structural models include R2, b value, T-statistic value, effect size ($f2$), predictive relevance (Q2), and Goodness-of-Fit (GOF) index [93, 94].

Measuring the Value of R2

The coefficient of determination estimates the structural model's prediction accuracy by measuring the endogenous construct's effect magnitude and variation [89]. According to [82], an R2 value of 0.568 is large, 0.50 is moderate, and 0.26 is weak.

Table 8. *Assessment of Coefficient of Determination (R2).*

	R-square	R-square adjusted
TC	0.478	0.473

Source: Author's Field work

4.5. Hypothesis Testing and Estimation of Path Coefficients

PLS path coefficients and regression analysis standardised b coefficient matched. The hypothesis's importance was determined by b. If the independent construct varied by one unit, b predicted the dependent construct's change. Each hypothesised model route's b values were determined; the higher the b value, the greater the significant effect on the endogenous latent construct. The b value must be confirmed for significance using the T-statistics test. The hypothesis's relevance was assessed via bootstrapping. To determine route coefficient and T-statistics significance, bootstrapping with five thousand subsamples without sign changes was utilised. Table 9 shows important route coefficients for study hypotheses. These path coefficients show the intensity and direction of the correlations between DIG, TPA, and TPE and TC (Tax Compliance). Table 9 also shows T-statistics and P-values to assess these associations' statistical significance.

Starting with the first hypothesis (DIG -> TC), the coefficient is 0.452, demonstrating a positive link between DIG and TC. This indicates that digitization increases tax compliance. The T-statistic of 8.544 above the crucial threshold, indicating statistical significance. The P-value of 0.000, below the significance level of 0.05, indicates that this link is extremely significant. Thus, the first hypothesis that digitization increases tax compliance is accepted.

On the second hypothesis (TPA -> TC), the correlation is -0.129, demonstrating a negative link between Taxpayer Awareness and Tax Compliance. This suggests that taxpayer knowledge lowers tax compliance. A T-statistic of 2.381 surpasses the threshold value, indicating statistical significance. The P-value of 0.017 is below 0.05, demonstrating this relationship's statistical significance. Therefore, the second hypothesis that taxpayer knowledge negatively affects tax compliance is likewise accepted.

The coefficient for the third hypothesis (TPE -> TC) is 0.487, indicating a positive link between Taxpayer Education and Tax Compliance. This suggests that taxpayer education increases tax compliance. The T-statistic of 7.729 above the crucial threshold, indicating statistical significance. The relationship's significant statistical significance is confirmed by the P-value of 0.000, which is below 0.05. Thus, the final hypothesis that taxpayer education increases tax compliance—is accepted. Table 9 strongly supports the study's hypotheses. The independent variables (DIG, TPA, and TPE) and the dependent variable (TC) have robust and statistically relevant correlations due to substantial path coefficients, high T-statistics, and low P-values. These findings emphasises the importance of digitalization, taxpayer education, and, somewhat unexpectedly, the negative effects of excessive taxpayer awareness on tax compliance behaviour.

Table 9. *Assessment of significant path.*

Hypothesis	Coefficient	T statistics	P values	Commence
DIG -> TC	0.452	8.544	0.000	Accepted
TPA -> TC	-0.129	2.381	0.017	Accepted
TPE -> TC	0.487	7.729	0.000	Accepted

Source: Author's Field work

4.5.1. The Effect Size (f^2)

Table 10's impact sizes (f^2) provide useful insights into predictor-outcome correlations. Effect size is a statistical term that assesses the strength of a link or difference between variables [82]. "TC." To begin, the effect size for the association between "DIG" and "TC" is 0.370, which is rather strong. This suggests a moderate to substantial effect, implying that the predictor variable "DIG" contributes significantly to explaining the variation in "TC." The impact size for the link between "TPA" and "TC" is much less, at just 0.010. This reduced impact size indicates that the predictor variable "TPA" contributes only marginally to the variability in "TC." Finally, the effect size for the association between "TPE" and "TC" is comparable to that of "DIG," with a significant value of 0.298. This suggests that, similarly to "DIG," the predictor variable "TPE" has a moderate to substantial effect on the outcome variable "TC," accounting for a major percentage of its variation.

Table 10. *Effect Size Assessment (f2).*

	f-square
DIG -> TC	0.370
TPA -> TC	0.010
TPE -> TC	0.298

Source: Author's Field work

4.5.2. Goodness-of-Fit Index

The Goodness-of-Fit Index (GFI) is a statistical tool that evaluates how well an estimated model matches observable data [95]. The GOF values range from 0 to 1, with values of 0.10 (small), 0.25 (mid), and 0.36 (large) indicating worldwide validation of the route model. A good model fit indicates that the model is simple and reasonable [96]. It compares the predicted model's fit to that of a saturated model, which fits the data exactly. The Goodness-of-Fit Index values show that the estimated model fits the data pretty well, with a fit comparable to the saturated model. The low SRMR and chi-square values, together with moderate values for d_ULS, d_G, and NFI, indicate that the estimated model fits the observed data well.

Table 11. *Assessment of Goodness-of-Fit Index.*

	Saturated model	Estimated model
SRMR	0.090	0.156
d_ULS	4.282	12.776
d_G	1.529	1.672
Chi-square	2214.165	2353.679
NFI	0.724	0.707

Source: Author's Field work

4.5.3. Cross-validated Predictive Relevance (Q2)

The cross-validated predictive relevance (Q^2predict) statistic evaluates a model's predictive power. Q^2predict is used to assess a model's predictive ability for Tax Compliance (TC). A Q-predict score of 0.461 suggests the model has modest predictive significance for TC. In summary, the model can explain 46.1% of the variance in TC, implying that the model's variables and linkages account for a significant percentage of the observed variation in tax compliance behaviour. In addition, the root mean squared error (RMSE) and mean absolute error (MAE) are metrics that evaluate the model's prediction accuracy. A lower RMSE and MAE indicate improved forecasting accuracy. In this scenario, the RMSE is 0.740 and the MAE is 0.559, reflecting the level of inaccuracy in the model's predictions. These data indicate that, on average, the model's predictions differ by around 0.740 and 0.559 units from the actual Tax Compliance levels. While not exceptionally low, these figures show relatively accurate predicted performance, especially given the complexity of the elements driving tax compliance in the digital economy.

Table 12. *Cross-validated Predictive Relevance (Q2).*

	Q^2predict	RMSE	MAE
TC	0.461	0.740	0.559

Source: Author's Field work

4.6. Discussion of Findings

The study findings and the empirical literature provide valuable insights into the effect of digitalization on tax compliance, the role of taxpayer education programs, and the role of taxpayer awareness programs.

4.6.1. Effect of Digitalization on Tax Compliance

The empirical research presents a mixed picture of digitalization's impact on tax compliance. On the one side, digitalization can boost tax compliance by increasing efficiency, transparency, and accountability in tax administration. Studies in Kurdistan [43] and Ethiopia [61] show that the implementation of electronic systems can result in greater tax income

and compliance. However, the relationship between digitalization and tax compliance is difficult. For example, research in the European Union [14] reveals a nonlinear relationship, with an initial boost in digitalization reducing tax evasion but excessive digitalization potentially increasing evasion. This shows that tax authorities should carefully balance their digitalization strategies to attain the best compliance results. Furthermore, research shows that digitalization alone is not a panacea for tax compliance. The success of digitalization efforts is heavily influenced by factors such as taxpayer trust in technology, the usability of digital systems, and the clarity of tax guidelines [10, 41].

4.6.2. Role of Taxpayer Education Programs

The empirical literature emphasises the importance of taxpayer education programmes in improving tax compliance. Studies in Romania [9] and Cameroon [41] show that teaching people about their tax obligations and offering clear instructions can increase compliance. Furthermore, research in Kenya [62] and a developing country environment [97] show that tax awareness is critical for improving compliance. This emphasises the potential benefits of taxpayer education programmes designed to improve taxpayers' awareness of tax regulations and processes.

4.6.3. Role of Taxpayer Awareness Programs

Taxpayer awareness programmes have also been proved to be effective in increasing tax compliance. These programmes seek to educate taxpayers on their tax responsibilities and the benefits of compliance. The empirical literature implies that raising awareness can improve compliance. For example, research in Sri Lanka [3] and Indonesia [18] show that improving awareness about the necessity of tax compliance and the consequences of noncompliance can lead to more responsible taxpayer behaviour. The study's findings and empirical literature illustrate the complex relationship between digitalization, tax compliance, taxpayer education, and awareness. While digitalization can improve compliance, it is not a one-size-fits-all solution, and the success of digitalization activities is contingent on a variety of circumstances." Taxpayer education and awareness programmes are critical for ensuring that taxpayers have the knowledge and incentive to comply with tax legislation in the digital age. Policymakers and tax authorities should take these considerations into account when developing and executing policies to increase tax compliance in the digital economy.

5. Conclusions and Recommendations

The section includes a description of the findings, inferences about how well the research met its goals, and suggestions based on the findings. The summary provides a quick glance at the work while reliving the key moments. The conclusion captures inference based on the empirical study, and recommendations are suggested based on the results reached. Recommendations are pertinent to both future research and the governments of certain nations.

5.1. Summary of Findings

This study conducted a detailed examination to better understand the influence of digitalization on tax compliance in Ghana's digital economy. The study's major findings, guided by the research objectives, shed light on the complicated interplay between digitization, taxpayer education programmes, taxpayer awareness programmes, and tax compliance. The primary findings, according to the study's aims, are as follows: The influence of digitization on tax compliance in Ghana's digital economy was found to be large and beneficial. According to the report, as the amount of digitalization increases, so does tax compliance. This shows that taxpayers' tax compliance behaviour improves as digital technologies are adopted and integrated into economic activity. The research of taxpayer education programmes revealed that they play an important role in increasing tax compliance in Ghana's digital economy. Respondents who had taken part in taxpayer education programmes reported better levels of tax compliance. This suggests that good taxpayer education campaigns have an important role in improving taxpayers' comprehension of tax regulations and desire to follow them. The study also looked into the effectiveness of taxpayer awareness programmes in encouraging tax compliance in the digital economy. Surprisingly, the research demonstrated that a high level of taxpayer awareness can have a detrimental impact on tax compliance. This implies that, while boosting awareness about tax duties is vital, there is a threshold at which increased awareness may not result in higher compliance. Finding the correct balance in taxpayer awareness campaigns appears to be critical.

5.2. Conclusion

Finally, this study shed light on the relationship between digitization, taxpayer education programmes, taxpayer awareness programmes, and tax compliance in the context of Ghana's digital economy. Based on the primary findings and studies, many key conclusions can be drawn:

The study unequivocally establishes a beneficial link between digitization and tax compliance. As digital technologies continue to pervade Ghana's digital economy, they have a discernible and positive impact on taxpayer compliance. This emphasises the need of using digitalization to improve tax administration and revenue collection. The need of taxpayer education programmes in promoting tax compliance is strongly emphasised. Respondents who have benefited from such programmes had greater rates of tax compliance. This emphasises the necessity for ongoing and effective taxpayer education activities to improve taxpayers' understanding of tax duties and willingness to comply. While taxpayer aware-

ness programmes are important, there is an intriguing discovery that greater awareness may not always result in increased compliance. Finding the correct balance in taxpayer awareness activities is critical. Policymakers should strive for educated awareness efforts that educate without overwhelming taxpayers, so that they are well-informed and motivated to fulfil their responsibilities.

5.3. Recommendations and Policy Implications

This study offers recommendations based on its findings: Assess Ghana's tax administration framework's digitalization projects to discover how digitalization affects tax compliance in the digital economy. This study should show how digitization can boost tax compliance efficiency, transparency, and accountability. Ghana should then balance compliance and risk from overreliance on digital platforms with digitalization objectives. Digitization requires investments in digital infrastructure and tool accessibility, especially in rural areas. Strategies can be adjusted for compliance by monitoring and assessing these actions. Ghana should provide comprehensive taxpayer education to enable taxpayers understand their rights, obligations, and support resources for tax compliance. Educational institutions, professional groups, and civil society organisations can design and deliver taxation education materials and workshops. Tax compliance and its contribution to national growth should be addressed early in education and occupational training. Interactive technologies and online instructions should assist taxpayers grasp complex tax rules.

To educate citizens about tax compliance and its consequences, Ghana should increase taxpayer awareness. Traditional media, social media, and community events can help propagate important ideas. Target small businesses, self-employed workers, and informal sector taxpayers with customised programmes. Success stories and tax compliance wins may inspire taxpayers. Awareness efforts will benefit from local leaders, community influencers, and religious institutions. These suggestions can boost digital economy tax compliance and economic growth in Ghana.

5.4. Suggestions for Future Studies

Tax compliance in the digital economy could be studied in many ways. First, blockchain technology, cryptocurrencies, and online marketplaces can be examined to see how digitalization affects tax compliance. Investigations into the best design and delivery of digital-age taxpayer education and awareness programmes may provide better strategies. Comparative research across countries and areas with differing levels of digitization could shed light on how digitalization affects tax compliance and suggest best practices. Finally, longitudinal studies tracking tax compliance behaviour as digitalization advances may reveal long-term trends and issues in this dynamic industry.

Abbreviations

AI	Artificial Intelligence
AVE	Average Variance Extracted
BEPS	Base Erosion and Profit Shifting
CR	Composite Reliability
COVID-19	Corona Virus Pandemic of 2019
DAI	Digital Adoption Index
DIG	Digitalization
DST	Digital Sales Tax
EU	European Union
FL	Factor Loading
GFI	Goodness-Fit Index
GOF	Goodness-of-Fit
GRA	Ghana Revenue Authority
GST	Goods and Services Tax
HMRC	Her Majesty Revenue and Custom
HTMT	Heterotrait-Monotrait Ratio
ICT	Information and Communication Technology
IMF	International Monetary Fund
IT	Information Technology
MAE	Mean Absolute Error
MSME	Micro Small and Medium Enterprises
MTD	Maximum Tolerable Downtime
OECD	Organisation for Economic Cooperation and Development
PLS-SEM	Partial Least Square-Structural Equation Modelling
RMSE	Root Mean Square Error
SEM	Structural Equation Modelling
SMEs	Small and Medium Enterprises
TAM	Technology Acceptance Model
TC	Tax Compliance
TPA	Taxpayer Awareness
TPE	Taxpayer Education
VAT	Value Added Tax

Author Contributions

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Patrick Akeba Atiawin: Datacuration, Formal Analysis, Methodology, Project administration, Resources, Writing–review & editing

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Conflicts of Interest

The authors declare no conflicts of interest.

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