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Research Article

Measuring Tax Professionals' Digital Technology Adoption Behaviour: A Confirmatory Factor Analysis

Kabir Abba Abdulkadir[1*], Joseph Femi Adebisi[2], Sunday Mlanga[3], Bala Salisu[4]

[1]Dept. of Taxation, ANAN University, Kwall, Plateau State, Nigeria
[2,3]College of Public Sector Accounting, ANAN University, Kwall, Plateau State, Nigeria
[4]School of Management Studies, The Federal Polytechnic Damaturu, Yobe State, Nigeria

**Corresponding Author: kabirabba@yahoo.com*

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Abstract— The study confirmed the structure of a scale designed to measure the digital technology adoption behaviour of tax professionals in Nigeria using Confirmatory Factor Analysis (CFA). Survey data were collected from 168 tax professionals working with Federal Inland Revenue Service (FIRS). CFA was performed to assess the reliability, validity, and structure of the construct. The results confirmed a unidimensional structure of digital technology adoption behaviour, comprising seven dimensions: digital technology usage, perceived utility, innovation seeking, perceived benefits, workflow digitalisation, skill development willingness, and adaptability. The measurement model demonstrated strong reliability ($\alpha = 0.930$; $\omega = 0.932$), construct validity (AVE = 0.663), and excellent factor loadings. A notable ceiling effect reflected consistently high digital adoption levels among the participants, indicating their readiness to embrace digital transformation. This study contributes to the literature on public sector digital transformation by empirically validating a multidimensional construct of digital adoption behaviour. However, the homogeneity of the sample (limited to FIRS professionals) may affect generalisability. Future studies could explore cross-organisational comparisons or adopt longitudinal approaches to assess changes in digital adoption behaviour over time.

Keywords— Digital Technology Adoption, Tax Professionals, Public Sector, Digital Transformation, Federal Inland Revenue Service (FIRS), Nigeria.

1. Introduction

Advanced digital technologies have the potential to modernize tax administration, providing real-time tax services and improving tax transparency [1]. Their adoption has led to qualitative changes in tax processes, allowing tax authorities to interact with taxpayers differently and improve control and analytical work, and revealing elements of the shadow economy [2]. Nevertheless, problems remain, especially in developing nations, about using new tax technologies. Studies have used the Unified Theory of Acceptance and Use of Technology (UTAUT) framework to investigate the adoption of digitalization in tax processes [3]. Some of the studies found that performance and effort expectancies, social impact, and working conditions may impact tax digitalization adoption [4]. However, research shows that only performance expectancy holds true in the Nigerian context. This may partly be explained by the research findings that behavioural expectations are stronger predictors of technology adoption than behavioural intentions [5]. This points to the need to understand the behaviour of employees in context of new technology adoption. Accurately measuring a phenomenon is a crucial step in understanding it. Hence, the need for accurate and contextually relevant measures of technology adoption behaviours.

In Nigeria, the FIRS has achieved key milestones in the digitalisation drive, with the introduction of the TaxPro-Max platform in 2021 being a most notable one. The TaxPro-Max enables taxpayers to register, file returns, and make payments electronically, marking a significant shift towards digital-first compliance processes [6]. Despite these advancements, Nigeria's progress in digital transformation has been relatively modest. Also, the success of tax system digitalisation in Nigeria is fundamentally contingent on the readiness, adaptability, and behavioural responses of tax professionals tasked with implementing these tools [7]. Notably, Nigeria was ranked Nigeria second to the last country in its 2024 Digital Competitiveness Ranking, reflecting systemic challenges such as inadequate infrastructure, limited digital skills, and low levels of innovation [8]. Furthermore, tax officials and stakeholders often exhibit reluctance to adopt new technologies due to fear of job displacement and unfamiliarity with digital systems [9]. Given the pivotal role tax professionals play in

facilitating the adoption of digital tools, it is critical to understand their digital adoption behaviour so as to optimise acceptance.

While existing studies have explored general technology adoption frameworks, limited research has specifically addressed the behaviour of tax professionals regarding digital technology adoption. Even the seminal work of Venkatesh *et al.* [10] on the UTAUT has been criticised for assessing only the broad dimensions of the UTAUT constructs, which may fail to capture the specific contextual elements essential for a deep understanding of behaviours and attitudes in particular settings [11]. In Nigeria, where tax compliance is a pressing issue, the absence of a validated scale tailored to this demographic represents a critical research gap. A title-abstract search of the Scopus database (December 14, 2024) using the search string [*TITLE-ABS ("tax*") AND TITLE-ABS (professional* OR practitioner*) AND TITLE-ABS (scale OR measure OR questionnaire) AND TITLE-ABS ("technology adoption behavi*")*] yielded not a single document. Addressing this gap is critical, as the lack of context-specific assessment tools limits the ability to design targeted interventions that address the tax sector's unique needs.

The current study addresses this gap by establishing the factor structure of a scale designed to measure the digital technology adoption behaviour of tax professionals in Nigeria using Confirmatory Factor Analysis (CFA). Also, it seeks to validate the scale's reliability and construct validity, ensuring its robustness for both academic research and practical application. Theoretically [10], this study extends the literature on technology adoption by contextualising existing frameworks and contributing to the development of domain-specific measurement tools. Practically, the validated scale provides policymakers and tax authorities with a reliable instrument to assess and understand adoption behaviour. Insights derived from the application of this scale can guide the design of targeted initiatives, including training programmes and incentive schemes, to encourage the adoption of digital tools in the tax sector. This study, therefore, bridges the gap between theoretical models and practical implementation, supporting Nigeria's broader digitalisation agenda and fostering improvements in tax compliance and revenue generation.

2. Theoretical Framework

Venkatesh *et al.*'s [10] UTAUT offers a robust explanatory framework for investigating the adoption of digitalisation in tax processes [4]. It is widely regarded as one of the most comprehensive models for examining technology adoption, integrating elements from eight major theoretical models, including the Technology Acceptance Model [12], the Social Cognitive Theory [13], and the Theory of Planned Behaviour [14]. Specifically, UTAUT emphasises behavioural outcomes, such as usage behaviour, as a central construct, which aligns with the study's objective to assess tax professionals' digital technology adoption. This study leverages UTAUT's focus on observable, measurable outcomes to develop a reliable and valid scale suited for assessing tax professionals' digital technology adoption behaviour.

UTAUT operationalises usage behaviour as the actual application of technology in real-world contexts [10]. As a unidimensional construct, usage behaviour captures the frequency, intensity, and breadth of technology usage, providing a framework to develop measurement items tailored to the tax profession, such as the use of e-filing systems and digital auditing tools. Meta-analyses of UTAUT-based studies show its constructs, including usage behaviour, account for up to 70% of the variance in technology usage [15], validating its predictive power. Also, studies report high internal consistency ($\alpha > 0.80$) for usage behaviour scales, highlighting the reliability of the framework for this study [15].

Tax professionals are key for the digital transformation of tax administration, with technology adoption playing a crucial role in improving efficiency, compliance, and overall service delivery. Given this, accurately measuring the adoption behaviours of tax professionals is essential for the effective design of policy initiatives and targeted training programmes that can facilitate smoother transitions to digital tools and platforms. This study leverages a construct from the well-established and empirically validated UTAUT to offer both a theoretical grounded and empirically developed scale for assessing digital technology usage in the tax profession. The scale's characteristics not only align with established behavioural theories but its practical application can also provide stakeholders with actionable suggestions for optimising digital adoption strategies in tax administration in Nigeria.

3. Concept Operationalisation

Tax professionals' response to digitalisation refers to the ways in which these professionals engage with and utilise digital technologies, particularly electronic tax systems, once they have decided to adopt such systems. This behaviour aligns with the use behaviour construct in the UTAUT [10], which provides a robust framework for understanding how individuals interact with technology after its adoption. Within the context of tax professionals, this construct can be operationalised by assessing various observable behaviours that reflect both the frequency and nature of their digital technology use, as well as its impact on their professional tasks.

The frequency of use is one of the first indicators of engagement with digital systems. It refers to how often tax professionals employ digital tools, such as e-filing systems or electronic tax management platforms, in their day-to-day tasks. Regular use of these systems indicates a high level of integration of digital tools into their work routines. For example, it has been noted that the frequency of e-filing among tax professionals has increased significantly in regions where digital tax systems have been fully implemented, underscoring the growing reliance on these systems [16]. Frequent use not only reflects adoption but also suggests that

tax professionals are becoming accustomed to the tools, indicating that they see value in integrating these systems into their professional workflows.

The extent of functional utilisation further examines the depth of tax professionals' engagement with digital tax systems. This dimension concerns the variety and range of features within these systems that professionals utilise, which indicates their proficiency and familiarity with the tools at their disposal. Tax professionals who engage with multiple features—such as automated tax computation, tax return submission, and client account management—are likely to exhibit more profound and versatile use behaviours [17]. Such comprehensive use suggests a higher level of technological integration into tax administration processes, contributing to greater operational efficiency.

Another key observable indicator is consistency and reliability, referring to how consistently tax professionals depend on digital tools for core tasks like preparing and submitting tax returns, and whether these systems perform reliably during use. Such consistent reliance indicates that digital systems have become integral to their daily routines. Hikmah *et al.* [18] emphasise that reliability and ease of use are vital to ensuring continued use of digital systems, especially in environments where frequent downtimes or technical issues might deter regular use. Reliable system performance fosters reliance on digital tools for critical tasks, reinforcing their adoption.

Adaptation to updates is another important factor influencing the response to digitalisation. Tax professionals must adapt to regular updates and enhancements in digital tax systems to stay current with technological advancements and regulatory changes. This adaptability is indicative of their commitment to leveraging digital tools for improved service delivery. It was explained that tax professionals in Sub-Saharan Africa have increasingly demonstrated adaptability to system updates, especially when these changes enhance system functionality or address regulatory requirements [19]. For instance, tax professionals may need to adjust their practices to comply with new e-filing features or modifications in tax reporting structures, reflecting their ongoing commitment to using digital technologies effectively.

Finally, the impact on professional efficiency measures how digitalisation influences tax professionals' operational efficiency, including changes in task completion times and error rates. The introduction of digital tools is often associated with reductions in the time spent on administrative tasks and improvements in accuracy. Opiso *et al.* [20] observe that the adoption of electronic tax systems in several African countries has led to significant reductions in error rates and enhanced tax compliance, as professionals are better equipped to manage complex tax regulations using automated tools. As such, the positive impact on professional efficiency is one of the key motivators for tax professionals to adopt and continually engage with digital tax systems.

Together, these observable—frequency of use, extent of functional utilisation, consistency and reliability, adaptation to updates, and impact on professional efficiency—provide a comprehensive framework for understanding tax professionals' response to digitalisation. This operational definition not only highlights the frequency and nature of system use but also underscores the broader implications of digital technology on professional practices, particularly in the context of tax administration in Sub-Saharan Africa. As tax professionals continue to integrate digital tools into their work routines, these observable behaviours will play a key role in shaping the future of tax compliance and administration in the region.

4. Methodology

4.1 Participants

The study involved 168 staff members of the FIRS, selected from various FIRS tax offices across Nigeria. The sample was chosen to ensure diversity in professional roles, geographical representation, and exposure to digital tax systems, thereby capturing a broad perspective on tax professionals' engagement with digital tax system. A stratified random sampling technique was used to ensure that the participants represented various hierarchical levels and functional areas within the FIRS, which strengthened the generalisability of the findings [21]. This approach was critical given the diverse operational contexts across FIRS offices and the varying levels of digital technology adoption.

4.2 Data Collection

Data were collected using an online questionnaire administered through Google Forms. The questionnaire was structured to include a force-answer question that required participants to express their informed consent before proceeding, aligning with ethical research practices. This method of data collection was selected due to its efficiency in reaching geographically dispersed participants and its ability to ensure standardisation in question delivery. Also, the use of an online format facilitated timely data collection while maintaining confidentiality and reducing potential biases associated with face-to-face interactions. This approach is consistent with recent trends in online research that leverage digital tools for enhanced participant engagement and response accuracy [22].

4.3 Scale Development and Refinement

The structure of the tax professional's digital technology behaviour scale was anchored on Venkatesh *et al.*'s [10] UTAUT and Hooda *et al.*'s [23] rendition. Seven items were adapted to evaluate tax professionals' usage behaviour regarding digital technology adoption. Four of these items were adapted from Ajzen [14] and Venkatesh *et al.* [10], and three additional items were sourced from Hooda *et al.* [23]. This combination ensured that the measure adequately reflects both foundational and recent perspectives on usage behaviour. A 7-item scale for the study construct.

To enhance the validity and relevance of the adapted measure, a rigorous refinement process was undertaken. A panel comprising six experts from Nigerian universities, specialising in taxation, technology adoption, and quantitative

research, assessed the adapted items for content relevance, clarity, and alignment with the study's objectives. This process aligns with best practices in scale development, where expert feedback is used to ensure that measures are contextually appropriate and devoid of ambiguity. The experts provided critical input on the cultural and contextual suitability of the items for tax professionals in Nigeria, leading to refinements that strengthened the scale's face and construct validity. Analysis of their observations was based on Lawshe's [24] content validity ratio.

Following the successful expert review, a pilot test was conducted to evaluate the scale's reliability and predictive validity for the target population. The pilot study involved 30 tax professionals who were not part of the main sample but shared similar demographic and professional characteristics. Reliability analysis yielded Cronbach's α = 0.934, exceeding the recommended threshold of 0.70 [25]. This demonstrated the internal consistency of the construct's indicators, thus supporting the robustness of the instrument for capturing tax professionals' digital usage behaviours. The final scale is displayed in Table 1.

4.2 Data Analysis

Data were analysed using a number of statistical tools for the purpose of aligning the data to the study model. Descriptives such as the mean ($\bar{x}$), the standard deviation (*SD*), the median absolute deviation (MAD_{robust}), variance (var.), skewness (g_1) and kurtosis (g_2) and their standard errors (*SE*), and range, were calculated to provide a detailed understanding of the data distribution and central tendencies. Model fit indices were evaluated using multiple criteria, including the chi-squared test (χ^2/df), Tucker-Lewis index (TLI), standardized root mean square residual (SRMSR), McDonald fit index (MFI), root mean square error of approximation (RMSEA), comparative fit index (CFI), goodness of fit index (GFI), and normed fit index (NFI), to assess the adequacy of the measure [26]. Using minimum residual factoring method, factor loadings were estimated through CFA, allowing for the evaluation of the constructs' dimensionality based on parallel analysis. Reliability was assessed using Cronbach's α and McDonald's ω, while the study determined the model's convergent validity based on average variance extracted (AVE) computations. All analyses were conducted using JASP, a statistical software package designed for robust statistical testing [27].

5. Results

5.1 Descriptive Statistics

The descriptive in Table 2 provide key insights into the study variables. Participants' age ($\bar{x}$ = 43.13 ± 10.72) is well-distributed with minimal skewness (g_1 = 0.09, *SE* = 0.19) and platykurtic tendencies (g_2 = -1.05, *SE* = 0.37), indicating diversity without extreme concentrations. Education levels ($\bar{x}$ = 2.30 ± 0.98) exhibit slight positive skewness (g_1 = 0.29, *SE* = 0.19) and platykurtic distribution (g_2 = -0.89, *SE* = 0.37), reflecting moderate variability. In contrast, tax professionals exhibited consistently high levels of digital technology adoption across all seven indicators of the construct (DTAB1 – DTAB7), with mean scores ranging from 4.714 to 4.899 and low variability (*SD* = 0.49 to 0.68).

Table 1. Tax Professionals' Digital Technology Adoption Behaviour Scale

SN	Indicator Name	Code	Statement
1.	Digital Technology Usage	(DTAB1)	Regular use of digital tools and software for diverse tax-related tasks.
2.	Perceived Utility of Digital Technologies	(DTAB2)	Belief in the efficiency and accuracy benefits of digital technologies.
3.	Digital Innovation Seeking	(DTAB3)	Proactive pursuit of new digital tools to enhance work efficiency.
4.	Perceived Benefits of Digital Integration	(DTAB4)	Perception of digital technology's transformative potential for tax processes.
5.	Workflow Digitalisation	(DTAB5)	Integration of digital solutions into workflows for improved outcomes.
6.	Digital Skill Development Willingness	(DTAB6)	Readiness to invest effort in acquiring digital competencies.
7.	Digital Adaptability	(DTAB7)	Comfort and flexibility in adapting to emerging digital tools and technologies.

The responses showed strong clustering at the upper end of the scale, with minimal variability and MAD_{robust} = 0.00, indicating that most participants reported high levels of digital technology usage (DTAB1), perceived utility of digital technologies (DTAB2), digital innovation seeking ((DTAB3), perceived benefits of digital integration (DTAB4), workflow digitalisation (DTAB5), digital skill development willingness (DTAB6), and digital adaptability (DTAB7). Also, the negative g_1 (ranging from -2.91 to -5.83) and high g_2 (from 9.38 to 36.42) for each dimension suggest severe ceiling effects, indicating a general trend of positive attitudes towards digital technology adoption. This provides useful insights into the overall digital readiness of tax professionals at FIRS.

Table 2. Descriptive Statistics of Study Variables

					Skewness		Kurtosis		
Variables	$\bar{x}$	***SD***	$\mathbf{MAD}_{robust}$	**Var.**	g_1	***SE***	g_2	***SE***	**Range**
Age	43.131	10.717	13.343	114.845	0.090	0.187	-1.053	0.373	38.000
Education	2.304	0.977	1.483	0.955	0.292	0.187	-0.887	0.373	3.000

DTAB1	4.810	0.489	0.000	0.239	-2.907	0.187	9.382	0.373	3.000
DTAB2	4.774	0.626	0.000	0.392	-3.800	0.187	17.278	0.373	4.000
DTAB3	4.762	0.621	0.000	0.386	-3.276	0.187	12.437	0.373	4.000
DTAB4	4.750	0.672	0.000	0.452	-3.484	0.187	13.778	0.373	4.000
DTAB5	4.899	0.497	0.000	0.247	-5.833	0.187	36.419	0.373	4.000
DTAB6	4.744	0.683	0.000	0.467	-3.385	0.187	12.855	0.373	4.000
DTAB7	4.714	0.658	0.000	0.433	-3.195	0.187	12.778	0.373	4.000

5.2 Principal Component Analysis (PCA)

A PCA was conducted to identify the underlying structure of the digital technology adoption behaviour data collected from the sampled tax professionals at FIRS. The analysis revealed a high overall Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (MSA = 0.923), indicating the data's suitability for factor analysis [27]. Bartlett's test of sphericity was significant ($\chi^2(21) = 883.107$, $p < .001$), supporting the factorability of the correlation matrix. The scree plot (Figure 1) shows that a single component was extracted, with an eigenvalue of 5.018, explaining 71.7% of the total variance, suggesting a robust underlying structure [27]). This is consistent with the unidimensional structure of the construct as theorised by Venkatesh *et al.* [10].

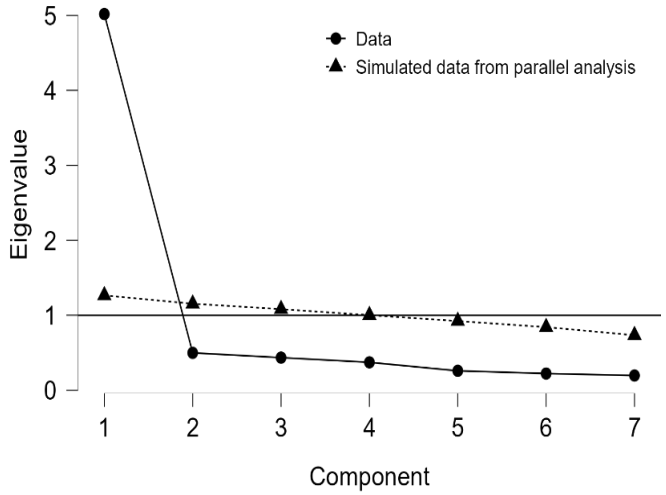

Figure 1. Scree Plot for the DTAB Scale

Component loadings (Table 3), computed based on promax method of oblique rotation, ranged from 0.810 (DTAB4) to 0.910 (DTAB5), all exceeding the 0.50 threshold for meaningful loadings [28], while uniqueness values ranged between 0.173 and 0.345, indicating shared variance across items. Model fit indices were acceptable, $\chi^2(14) = 49.245$, $p < .001$, supporting the validity of the unidimensional solution [27]. These results confirm that the seven items (DTAB1 to DTAB7) reliably represent a single latent construct (i.e., tax professionals' digital technology adoption behaviour. The model plot (Figure 2) visually represents the tested CFA model, displaying the latent construct and its observed indicators, and standardised factor loadings. It provides a clear depiction of the relationships among variables and supports the interpretation of the model's fit and structure.

Table 3. DTAB Scale Component Loadings

Construct	Indicators	Loadings	Uniqueness
Digital Technology Adoption Behaviour	DTAB5	0.910	0.173
	DTAB2	0.865	0.251
	DTAB3	0.846	0.284
	DTAB6	0.842	0.291
	DTAB7	0.827	0.316
	DTAB1	0.823	0.323
	DTAB4	0.810	0.345

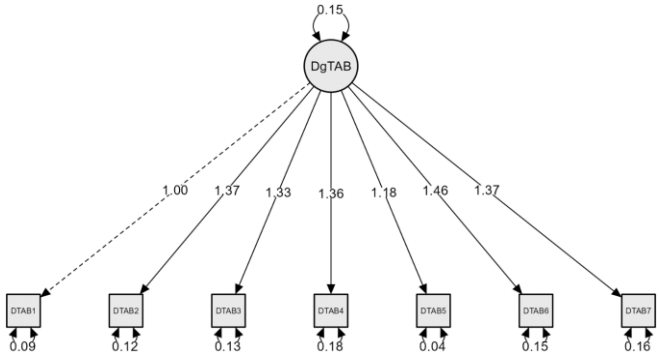

Figure 2. DTAB Structural Model Plot

5.3 Fit Indices and Measurement Model Adequacy

Finch and French [29] recommend using CFA rather than EFA where there is an established theory behind the latent construct investigated. Thus, in this study, model fit was assessed using multiple fit indices. Firstly, the χ^2 test result ($\chi^2(14) = 38.005$, $p < .001$) in Table 4 is statistically significant, suggesting that there is incongruence between the data and the model-implied covariance matrices. While a significant χ^2 may suggest model misfit, its sensitivity to sample size and model complexity must be considered [30]. In this case, the residual covariance matrix shows minimal discrepancies, with most residuals close to zero (e.g., < .001) and only a few small values like 0.032 and 0.023, as larger residuals would have contributed to a poorer χ^2 result. The implied covariance matrix closely aligned with the observed covariances, further supporting the appropriateness of the model [26]. Lastly, the R^2 values (0.595–0.822) indicate that the latent construct explains substantial variance in the observed variables, with even the lowest value (0.595 for DTAB4) remaining acceptable and the highest (0.822 for DTAB5) reflecting strong item reliability [30]. Together, the high R^2 values, minimal residuals, and acceptable χ^2 ratio suggest robust convergent validity, with the items effectively capturing the underlying latent construct.

Furthermore, the results in Table 5 show that CFI = 0.973 and TLI = 0.959 exceeded the acceptable threshold of 0.95, suggesting a well-fitting model [26]. The SRMR = 0.030 fell well below the 0.08 cut-off, further supporting a good model fit. Although the RMSEA = 0.101 is considered borderline vis-à-vis the recommended threshold of 0.08 [28], it remained within an acceptable range for models with fewer degrees of freedom. Other fit indices (GFI = 0.940; MFI = 0.931) indicated satisfactory fit and strong model performance [28]. The PNFI = 0.639 was moderate, balancing fit and model complexity. Also, the ECVI = 0.393 supports a stable model fit for replication in similar samples [29]. Collectively, these results suggest an overall satisfactory model fit.

Although the model fit indices show adequate model fit (χ^2/df = 2.715, CFI = 0.973, TLI = 959, RMSEA = 0.101, SRMR = 0.030, GFI = 0.940, MFI = 0.931), a single localised misfit was observed. The misfit plot (Figure 3) illustrates the residual discrepancies, specifically indicating potential underesti-mation of the covariance between indicator DTAB2 and indicator DTAB1 (digital technology usage), with a correlation coefficient of 0.11, which is slightly above the ideal threshold of < 0.10 [27]. However, as the misfit is barely marginal, it is unlikely to significantly impact the overall model fit or the interpretation of results.

Table 4. Covariance Matrices, Chi-Squared and R-Squared Statistics

Matrix	DTAB1	DTAB2	DTAB3	DTAB4	DTAB5	DTAB6	DTAB7
Implied Covariance Matrix	0.238						
	0.198	0.389					
	0.194	0.264	0.384				
	0.197	0.269	0.262	0.449			
	0.171	0.234	0.228	0.232	0.246		
	0.212	0.290	0.282	0.288	0.250	0.464	
	0.199	0.272	0.265	0.270	0.235	0.29	0.430
Residual Covariance Matrix	< .001						
	0.032	< .001					
	< .001	< .001	< .001				
	0.005	< .001	0.011	< .001			
	< .001	< .001	0.004	0.004	< .001		
	< .001	< .001	0.008	< .001	0.004	< .001	
	< .001	< .001	< .001	< .001	0.004	0.023	< .001
R-Squared R^2	0.612	0.696	0.671	0.595	0.822	0.667	0.633
Chi-Squared	$(\chi^2/df) = (38.005/14) = 2.715$						

Table 5. Model Fit Indices for the DTAB Scale

Index	Value	Threshold
Chi-Squared: $\chi^2(14) = 38.005$, $p < .001$	2.715	≤ 3.00
RMSEA	0.101	≤ 0.08
SRMR	0.030	< 0.08
CFI	0.973	≥ 0.95
TLI	0.959	≥ 0.95
GFI	0.940	≥ 0.90
MFI	0.931	≥ 0.90
PNFI	0.639	> 0.90
ECVI	0.393	—

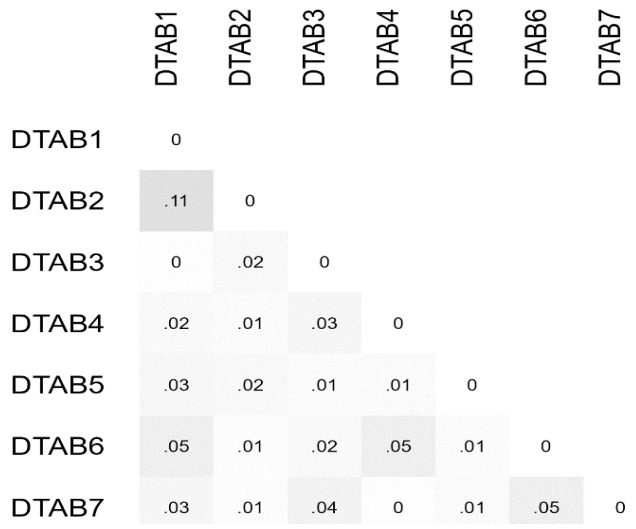

Figure 3. Misfit Plot of DTAB Scale Residuals

5.4 CFA Validation of the DTAB Scale

A CFA was conducted to assess the factor structure of the digital technology adoption behaviour construct. The results, displayed in Table 6, demonstrated that all seven indicators of the digital technology adoption behaviour construct loaded significantly onto the latent factor, confirming the validity of the measurement model. Specifically, digital technology usage (DTAB1) was fixed to 1.000 as a reference point, while the remaining indicators exhibited substantial loadings: perceived utility of digital technologies, DTAB2 (β = 1.365, *SE* = 0.114, *z* = 12.026, *p* < .001: 95% CI [1.143, 1.588]); digital innovation seeking, DTAB3 (β = 1.332, *SE* = 0.113, *z* = 11.752, *p* < .001: 95% CI [1.110, 1.554]); perceived benefits of digital integration, DTAB4 (β = 1.356, *SE* = 0.125, *z* = 10.877, *p* < .001: 95% CI [1.112, 1.600]); workflow digitalisation, DTAB5 (β = 1.179, *SE* = 0.088, *z* = 13.422, *p* < .001) with a narrower confidence interval of 1.007 to 1.351, indicating robust reliability; digital skill development willingness, DTAB6 (β = 1.459, *SE* = 0.125, *z* = 11.699, *p* < .001: 95% CI [1.215, 1.704]); and digital adaptability DTAB7 (β = 1.369, *SE* = 0.121, *z* = 11.320, *p* < .001) with confidence bounds between 1.132 and 1.607. The 95% confidence intervals for all loadings were narrow and did not include zero, further confirming their statistical significance. The variance of the latent construct was also significant (Variance = 0.145, *SE* = 0.024, *z* = 5.959, *p* < .001, 95% CI [0.098, 0.193]), indicating that the model adequately captured the variability in the data [30]. Altogether, the significant and high factor loadings, combined with narrow confidence intervals, confirm the reliability and coherence of the scale [30] in measuring tax professionals' digital technology adoption behaviour.

Table 6. Standardised Factor Loadings of the DTAB Scale

						95% CI	
Construct	**Indicator**	***β***	**SE**	***z***	***p***	**Lower**	**Upper**
Digital Technology Adoption Behaviour	DTAB1	1.000	0.000			1.000	1.000
	DTAB2	1.365	0.114	12.026	< .001	1.143	1.588
	DTAB3	1.332	0.113	11.752	< .001	1.110	1.554
	DTAB4	1.356	0.125	10.877	< .001	1.112	1.600
	DTAB5	1.179	0.088	13.422	< .001	1.007	1.351
	DTAB6	1.459	0.125	11.699	< .001	1.215	1.704
	DTAB7	1.369	0.121	11.320	< .001	1.132	1.607
Variances		0.145	0.024	5.959	< .001	0.098	0.193

5.5 Reliability and Validity of the DTAB Scale

The reliability and validity of the scale measuring digital technology adoption behaviour were assessed using multiple reliability metrics and the AVE, demonstrating excellent internal consistency and convergent validity. The data in Table 7 show that coefficient ω was 0.932 (*SE* = 0.008, 95% CI [0.916, 0.948]), confirming robust reliability without assuming tau-equivalence [31]. Cronbach's α was 0.930 (*SE* = 0.025, 95% CI [0.880, 0.979]), supporting internal consistency. Guttman's λ_2 was 0.931 (*SE* = 0.025, 95% CI [0.881, 0.981]), further affirming the scale's reliability. The split-half coefficient was high at 0.947 (*SE* = 0.008, 95% CI [0.931, 0.963]), indicating stability. The average inter-item correlation was 0.669, suggesting that the items are strongly correlated yet measure unique aspects of the construct [31].

Table 7. Reliability and Validity Statistics of the DTAB Scale

			95% CI	
Coefficient	***β***	***SE***	**Lower**	**Upper**
Coefficient ω	0.932	0.008	0.916	0.948
Coefficient α	0.930	0.025	0.880	0.979
Guttman's λ_2	0.931	0.025	0.881	0.981
Split-Half Test	0.947	0.008	0.931	0.963
AIC	0.669			
AVE	0.663			

The AVE was 0.663, exceeding the threshold of 0.50, confirming convergent validity [28], and indicating that 66.30% of the variance in the construct's items (i.e., digital technology usage, perceived utility of digital technologies, digital innovation seeking, perceived benefits of digital

integration, workflow digitalisation, digital skill development willingness, and digital adaptability) is explained by the underlying construct. These results indicate that the scale exhibits excellent reliability and convergent validity, supporting its appropriateness for measuring digital technology adoption behaviour of tax professionals in Nigeria.

6. Discussion

The results of this study provide significant insights into the digital technology adoption behaviour of tax professionals in Nigeria, particularly at Nigeria's apex tax authority (FIRS). The study's descriptives revealed that the participants exhibited consistently high levels of digital technology adoption, with minimal variability across all seven indicators, suggesting a high degree of digital readiness. This finding is consistent with existing literature that suggests a positive attitude towards digital technologies among professionals in various sectors [32]. The strong clustering of responses at the upper end of the scale, indicating ceiling effects, further supports the notion that tax professionals at FIRS are not only familiar with digital tools but also actively utilise them in their work processes. This trend reflects the broader global shift towards digitalisation in public services, highlighting the importance of fostering digital skills among public service professionals [33].

Factor analysis results confirmed that the digital technology adoption behaviour construct is unidimensional, in line with theoretical expectations [10]. The principal component analysis and subsequent confirmatory factor analysis demonstrated that the seven indicators of digital technology adoption behaviour are well-defined and contribute significantly to the latent construct. The high factor loadings and narrow confidence intervals for each indicator point to the robustness of the measurement model. This unidimensional structure is particularly relevant for both theoretical and practical applications, providing a clear framework for understanding and measuring digital technology adoption in professional settings.

Also, the reliability and validity of the scale were rigorously assessed using multiple measures, including coefficient ω, Cronbach's α, and the AVE. The results indicated excellent internal consistency and convergent validity, supporting the use of this scale to measure digital adoption behaviour of tax professionals in future research and practical applications. The high ω, α, and split-half values suggest that the scale is not only reliable but also stable over time, ensuring that it can be used across different contexts and populations of tax professionals. These findings align with previous research that advocates for the use of reliable and valid scales in digital technology adoption studies [34].

The implications of these findings are both theoretical and practical [35]. Theoretically, the study contributes to the growing body of knowledge on digital technology adoption in public administration. The study demonstrate that digital technology adoption behaviour is a unidimensional construct, it reinforces the theoretical understanding that various facets of digital adoption (e.g., usage, utility, innovation seeking, etc.) are closely related and can be measured as a single latent factor. Practically, these results suggest that tax professionals at FIRS are well-prepared for continued digital transformation. Policymakers and managers within FIRS and similar organisations can use these findings to inform training programmes, digital infrastructure investments, and policy decisions aimed at further enhancing digital adoption. Given the high levels of digital adoption already observed, future initiatives can focus on fine-tuning digital tools to meet specific needs and encourage continuous innovation. Also, the validated scale can serve as a useful tool for evaluating digital readiness in other public service institutions across Nigeria and beyond, aiding in the monitoring of digital transformation progress.

7. Conclusion

This study examined the digital technology adoption behaviour of tax professionals at the FIRS in Nigeria, confirming a unidimensional structure comprising seven dimensions: digital technology usage, perceived utility, innovation seeking, perceived benefits, workflow digitalisation, skill development willingness, and adaptability. The findings demonstrated excellent reliability, strong factor loadings, and high explained variance, validating the robustness of the measurement model. A notable ceiling effect reflected consistently high levels of digital adoption, suggesting FIRS professionals' readiness to embrace digital transformation and highlighting their positive attitudes towards innovation and skill development. These results contribute to the literature on public sector digital transformation and have practical implications for enhancing tax administration efficiency through digital integration. However, while the homogeneity of the sample may limit generalisability, future research could explore cross-organisational or longitudinal approaches to assess dynamic changes.

Data Availability
Data can be accessed from the corresponding author based on reasonable request.

Conflict of Interest
The authors declare no conflict of interest.

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Authors' Contributions
Author-1 conceived the topic and collected the data. Author-2 reviewed the literature and refine the research direction. Author-3 carried out the pretest and pilot test. Author-4 re-appraised the literature and analysed the main data. All authors participated in the revision and writing the final draft.

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AUTHORS' PROFILE

Mr. Kabir Abba Abdulkadir is a scholar and practitioner in the field of taxation and fiscal policy. He is currently a doctoral candidate at the Department of Taxation, ANAN University, Kwall, Plateau State, Nigeria. In addition to his academic pursuits, Mr Abdulkadir holds the position of Coordinating Director, Emerging Taxpayers Group, Federal Inland Revenue Service (FIRS), Nigeria, where he contributes to the development and implementation of tax administration strategies. His research interests focus on taxation and fiscal policy, and he has presented papers at national and international policy-level gatherings as well as published in several journals.

Professor Dr. Joseph Femi Adebisi is a distinguished academic and professional in the fields of accounting, auditing, and taxation. He is a Professor of Accounting at the College of Public Sector Accounting, ANAN University, Kwall, Plateau State, Nigeria, where he contributes significantly to the advancement of knowledge in his discipline. In addition to his academic role, Professor Adebisi is an experienced private practitioner in auditing and accounting, blending practical expertise with scholarly pursuits. His research interests encompass auditing, accountancy, and taxation, and he has an extensive publication record in journals, demonstrating his influence and thought leadership in these areas.

Professor Dr. Sunday Mlanga is a renowned academic and administrator at ANAN University, Kwall, Plateau State, Nigeria. He serves as a Professor of Accounting and the Director of Academic Planning, playing a pivotal role in shaping the institution's academic framework and strategic direction. Professor Mlanga's research interests span forensic auditing, accountancy, and taxation. He also has a keen interest in financial economics, business administration, and accounting, contributing to a multidisciplinary understanding of the financial and business sectors.

Dr Bala Salisu is an academic entrepreneur and researcher affiliated with the Federal Polytechnic Damaturu, Yobe State, Nigeria, where he serves as a Principal Lecturer. His primary research interests lie in the fields of Industrial, Work, and Organisational Psycho-logy, with special focus on leadership and psychometrics. Dr Salisu has published in several scholarly journals. His work reflects a dedication to exploring and addressing issues related to workplace dynamics, organisational behaviour, and psychological measurement.

