

Navigating the Digital Terrain: Exploring Post-Covid-19 Technology Adoption Dynamics in Nigeria

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Abstract

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By investigating the complex effects of technology adoption in Nigeria and offering insight into the dynamic interactions between societal, economic, and technological factors as the global community navigates the post-pandemic era, this study seeks to address significant effects regarding Nigeria's post-COVID-19 technology landscape. The study employed the comprehensive framework, which merged the Technology Acceptance Model (TAM), Innovation Diffusion Theory, and Structuration Theory as a result of the coherence technology adoption model. The cross-sectional survey design gathered primary data through a 5-point Likert scale questionnaire. A simple random sampling technique was adopted to select and analyse 1040 respondents from nine different sectors of the Nigerian economy. Statistical Package for Social Science (SPSS) v25 was utilised for data screening and descriptive statistics, while, SmartPLS v4.0.9.5 was employed to calculate the inferential statistics. Based on the findings from different sectors within the population under investigation, it is clear that all exogenous variables affect the adoption of the technology. The study recommended that local community involvement in technology adoption, legalisation of cutting-edge sectorial compliance, and the use of computer-based evaluation systems for assessment and instructions across educational sectors should be prioritised by the public and corporate bodies.

Keywords: Technological Landscape, Post-COVID-19, Technology Adoption, Sectorial Assessment

1. Introduction

Following the COVID-19 pandemic, which caused unprecedented global disruptions, countries worldwide encountered a paradigm shift in several areas of daily life, with the adoption of technology emerging as a critical coping strategy and recovery stimulant (Converso, Bruno, Capone, Colombo, Falco, Galanti, Girardi, Guidetti, Viotti & Loera, 2021). Like many other countries, Nigeria had to deal with the severe difficulties brought on by the Corona Virus Disease in 2019 (COVID-19) pandemic. Lockdowns, social distancing policies, and changes to customary lifestyles spurred a rapid and pervasive use of technology (Oruma, Misra & Fernandez-Sanz, 2021). Technology became the pillar of resilience during these trying times, offering telehealth services, digital learning platforms,

Navigating the Digital Terrain: Exploring Post-Covid-19 Technology Adoption Dynamics in Nigeria and remote work alternatives (Vardhan, Gayen & Mafizul, 2020; Adeyanju, Ajilore, Onatunji & Mogaji, 2022).

It is critical to comprehend the long-term effects of this rapid use of technology as the pandemic progressively fades (Barchielli, Marullo, Bonciani & Vainieri, 2021). With its varied socioeconomic environment and special contextual elements, Nigeria offers an interesting case study for analysing how technology adoption happens in the wake of a major world crisis (Ifijeh & Yusuf, 2020). The pandemic altered several aspects of the nation's economic and political structure, including the movement of citizens and the role of e-commerce, e-learning, e-health, and remote meetings (Maikomo, Targema & Obun-Andy, 2021).

This study investigated the complex consequences of technology adoption in Nigeria, giving insight into the dynamic interplay of societal, economic, and technological elements as the world navigates the post-pandemic era (Ogunji, Onwe, Ngwa, David, Olaolu & Cresantus, 2022). The specific objectives include examining the effects of society's growing reliance on technology on the economy, establishing how to remove barriers to equitable access to digital resources, analysing how technology is changing healthcare delivery, identifying what needs to be done to address cybersecurity concerns, and providing enlightening assistance to businesses, decision-makers, and the general public as they navigate the quickly evolving technological landscape (Ebekoziem & Aigbavboa, 2021; Nwanyiuzor, Ngozi & Emelogu, 2023). The research encompassed a literature review comprises of theoretical framework, and empirical review, next section is the methodology consists of testing of hypotheses, followed by data results and analysis as well as discussion of findings, lastly conclusion and recommendations.

2. Literature Review

2.1 Theoretical Framework

The Technology Adoption Model (TAM) by Davis, (1989; 1993), the Technology-Organization-Environment (TOE) framework by Tornatzky and Fleischer (1990) were used as the theoretical foundation. Since its introduction, TAM has been used as a heuristic in many researches on technology adoption that focuses on users' behavioural intentions to utilise the technology, which span a large number of sectors (Eraslan Yalcin & Kutlu, 2019). Similarly, Tornatzky and Fleischer (1990) developed the TOE framework. The book highlights three contextual factors inside a business that impact its adoption and implementation process of technical innovations: the organisational, technological, and

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environmental contexts (Ahmed, 2020). TOE focuses on the technologies that are appropriate for every economic sector, the organisations that are best equipped to adopt the technologies, and the environments in which those technologies are best adopted.

This study developed a comprehensive framework that encompasses the individual-level motives, social dynamics, and structural influences on technology adoption at post-COVID-19 in Nigeria by merging TAM and TOE as the main theoretical models. TAM offers insights into user attitudes in technology adoption (Bokolo, 2021; Agarwal, Swami & Malhotra, 2022; Alkhwaldi & Al-Ajaleen, 2022). The Technology Acceptance Model (TAM) integrates the theory of perceived ease of use to describe how people adopt and use technologies, such as information systems (Venkatesh, 2000). It affects both the person's intention to use the technology or system and their opinion of its utility (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989). Its usage cuts across many fields, including education, healthcare, and commerce (Ishaq, Bashir, Zakariya & Sarwar, 2021). Hence the formulation of the following hypothesis:

H1: Perceived ease of use positively influences technology adoption.

The degree to which an individual or group of people believes a new concept, good, or service is superior to the current one is known as perceived usefulness ((Davis, 1989; Davis, Bagozzi, & Warshaw, 1989). It is among the variables that may affect how innovations are adopted or spread. A comparison of the advantages, expenses, dangers, and compatibility of the new and old alternatives can be used to gauge perceived usefulness with technology adoption. Therefore, the following hypothesis was formulated:

H2: perceived usefulness positively influences technology adoption.

The degree to which an individual or a group believes a new concept, good, or service to be superior to the current one is known as perceived relative advantage (Rogers, 2003). It is among the variables that may affect how innovations are adopted or spread by users' attitudes (Menzli, Smirani, Boulahia & Hadjouni, 2022). This is germane to this study as various sectors would tend to adopt technologies in post COVID-19 era in Nigeria: Hence the formulation of the hypothesis:

H3: Relative advantage positively influences technology adoption.

The term "perceived social structure" describes how people view their place and connections within a social network or hierarchy (Solakoglu & Yuksek, 2020). Numerous elements, including social class, social identity, social support, social presence, health, and general well-being might have an impact on it (Costello, Restifo & Hawdon, 2021; Kreijns, Xu & Weidlich, 2022). It is often referred to as social influence and subjective norm (Venkatesh, Morris, Davis & Davis, 2003; Venkatesh, Thong, & Xu, 2016), which affects peer influence in technology adoption. For emphasis, the hypothesis was formed:

H4: Social structure positively influences technology adoption.

The degree to which a novel concept, good, or service meshes with the wants, values, and routines of a prospective customer is known as perceived compatibility (Wang & Lin, 2021). It is among the variables that may affect how innovations are embraced or spread (Menon & Sujatha, 2021). Various sectors need to adopt technologies compatible with their goals. Hence the hypothesis:

H5: Perceived compatibility positively influences technology adoption.

The concept of perceived critical mass refers to the point at which people feel that a new behaviour, idea, or technological advancement has become sufficiently accepted or adopted within a social group for them to feel compelled to embrace it as well (Roca, Suárez & Meléndez-Rodríguez, 2023). Hence the hypothesis:

H6: Perceived critical mass positively influences technology adoption.

A three-dimensional analysis of the elements influencing technology adoption within an organisational environment is done using the Perceived Technology, Environment, and Organisation (TEO) framework (Sastararuji, Hoonsopon, Pitchayadol & Chiwamit, 2021). The first component is perceived technology, which focuses on how people in an organisation view the features of the technology itself (Ng, Lit & Cheung, 2022; Chittipaka, Kumar, Sivarajah, Bowden & Baral, 2023). The second dimension, perceived environment, delves into how the decision to adopt a specific technology is influenced by external factors, and the third component, perceived organisation, evaluates the influence of internal organisational characteristics on technology adoption (Hasani, O'Reilly, Dehghantanha, Rezanian, & Levallet, 2023).

H7: The interplay between technological factors, organizational characteristics, and the external environment positively influences technology adoption.

The phrase "perceived intention to adopt technology" describes how probable it is for a person or a group to use an innovative idea, technologically based good or service (Venkatesh, Morris, Davis & Davis, 2003; Kai-ming au & Enderwick, 2000; Dubey & Sahu, 2021), which mediated between exogenous and endogenous variables in this study. Hence the hypothesis was formulated:

H8: Technology adoption is positively mediated by the intention to use the technology.

2.2 Empirical Review

Numerous studies have shown that Nigerian socioeconomic sectors are gradually embracing innovation in a variety of fields (Mcclain, Vogels, Perrin, Sechopoulos & Rainie, 2021; Babalola, 2019). The use of technology in Nigeria during post-COVID-19 pandemic can be attributed to the current shifts in global events, wherein the new normal has become the new world order (Ibáñez-Sánchez, Orús, & Flavián, 2022). According to the research on career shock during the COVID-19 pandemic, Human Resource Development (HRD) was the most severely affected (Hite & McDonald, 2020). But verifying another study's conclusions (Amankwah-amoah, Khan, Wood & Knight, 2021), which regarded the post-COVID-19 era as the driving force behind the global acceleration of cutting-edge workplaces, this change was noticeable in terms of lifestyle, job performance, and corporate organisations (Bai, Quayson & Sarkis, 2021). According to the study of Qiao, Zhu, Guo, Sun and Qin (2021), which highlighted a strong practical absorption of learning utilising technology, e-learning in the post-COVID-19 period was established. "Strategic Monitoring, Assessment, and Reevaluate Technology adoption," is a clever usage of the term SMART, even though most people are cognisant of it from goal-setting (Agarwal, Swami & Malhotra, 2022). In Nigeria, the post-COVID-19 era has brought about the rise of digitalisation in all its manifestations from earlier studies. Oruma, Misra and Fernandez-Sanz, (2021) recommended digitalisation in all public sectors by international legal framework. This study aligned with the recommendation of cutting-edged offices in public sectors. According to Ebekozen and Aigbavboa (2021), construction sites need to be digitalised for effective output. Akintunde, Akintunde, Musa, Sayibu, Tassang, Reed and Chen (2021) reviewed various studies that supported the adoption of telemedicine in the health sector in Africa. In the study of Ogunji, Onwe, Ngwa, Olaolu, Cresantus and David (2022), it was revealed that most public tertiary institutions did not adopt e-learning during COVID-19 except private tertiary institutions. They recommended that for effective learning after the pandemic, e-learning should be prioritised in all public tertiary institutions.

Nwanyiuzor, Ngozi and Emelogu (2023) also advocated for the installation of ICT components in all public tertiary institutions. This study is in agreement with various studies that advocated for the adoption of technology for optimal performance in all sectors of the Nigerian economy.

The apparent gaps in the empirical research from various Nigerian authors on the post-COVID-19 adoption of technology necessitated the addition of a mediating variable and an increase in the number of independent variables, because many studies in Nigeria lack a mediating variable. Also, inadequacies found in previous research conducted during and after post COVID-19 era, which did not assess the impact of innovation adoption (Bai, Quayson & Sarkis, 2021) motivated this study (Maikomo, Targema & Obun-Andy, 2021). Sustained Manipulation, Adaptation, and Review Technology usability in the Nigerian economy were conceptualised in the study and the following hypotheses were formulated.

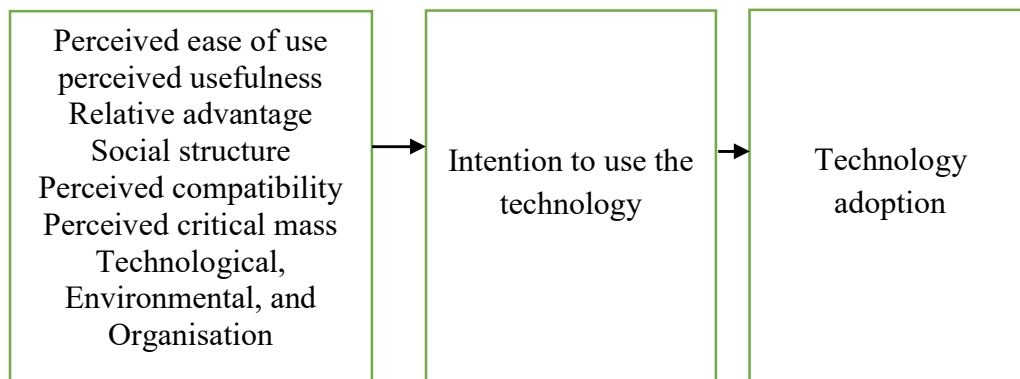


Figure 1: Conceptual Framework of the study

Sources: TAM and other models modified by the researcher, 2024

3. Methodology

The study used a cross-sectional and quantitative research design, data were gathered from structured questionnaires distributed to 1060 randomly selected Nigerians in several sectors online (Google Form) and offline. Following the return of 1056 questionnaires, 1040 were analysed, producing a quantitative analysis with a 98% accuracy rate. Of the returned surveys, 16 were excluded due to wrong filling. The accuracy of the answers is unaffected by the rejection of sixteen surveys. A 5-point Likert scale questionnaire was adopted to ensure respondents understood the filling completely on a scale of 1 to 5. 1 indicated “strongly disagree”, 2 “disagree”, 3 “neutral”, 4 “agree”, and 5 “strongly agree”. The questionnaires were designed to clearly define the study's objectives.

Descriptive statistics and data screening were analysed with SPSS, and inferential statistics were done with SmartPLS v4.0.9.5 (Hasan & Suciarto, 2020). Both statistical tools are user-friendly and reliable for the determination of the relationship between the exogenous and endogenous variables (Hair Jr., Hult, Ringle, Sarstedt, Danks & Ray, 2023).

3.1 Survey Validity and Reliability

According to Hair Jr., Hult, Ringle, Sarstedt, Danks and Ray (2023), construct reliability can be assessed using Cronbach's alpha and the composite reliability of each construct. Any number greater than 0.7 is advised for Cronbach's alpha and composite reliability (Asbari, 2021). When calculating the Cronbach's alpha coefficient, the weighted significance and equal weight of each variable are assumed. In contrast, the concept of composite reliability is based on the idea that different components should have varied weights, with each item being weighted according to its level of dependability as an individual. Evaluating an instrument's validity involves figuring out how well it captures the concept it is meant to capture. Conversely, testing for reliability looks at the measuring device's consistency and stability (Sekaran & Bougie, 2016). Internal consistency, construct validity, and individual item reliability are taken into account while assessing the outer model in partial least squares (PLS). Since the results in Table 1 were achieved with Average Variance Extracted (EVA) >0.500 and Composite reliability >0.700, the lower value of Cronbach's alpha threshold does not invalidate the results (Hair, Risher, Sarstedt & Ringle, 2019). The convergent validity results of Table 1 were obtained through the algorithm sequence of the SmartPLS v4.0.9.5 procedure.

Table 1: Construct Reliability and Validity

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
CCM	0.705	0.713	0.836	0.629
INT	0.766	0.789	0.850	0.589
PCB	0.610	0.647	0.790	0.561
PEU	0.338	0.344	0.750	0.601
PRA	0.666	0.763	0.806	0.588
PUS	0.620	0.679	0.792	0.567
SST	0.415	0.313	0.709	0.513
TAP	0.808	0.831	0.867	0.570

TOE	0.641	0.624	0.806	0.582
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Source: Researcher's Processed Data (2024)

4. Results and Discussions

The findings of a descriptive analysis of the respondents' demographic data, performed with IBM SPSS v25, are displayed in Table 2 as follows:

Table 2: Demographical characteristics of the respondents

Variable	Item	Frequency	Percentage %
Gender	Male	774	74
	Female	266	26
Age	18 – 30	110	11
	31 – 40	336	32
	41 – 50	390	38
	51 – 60	179	17
	60 – Above	25	2
Cadre	Manager	118	11
	Supervisor	640	62
	Operative	174	17
	Others (unspecified)	108	10
Sector	Academic	176	17
	Agricultural	97	9
	Artisan	82	8
	Civil Service	224	23
	Construction	55	5
	Financial	115	11
	Health	108	10
	Hospitality	127	12
	Industrial	56	5
Edu Qual	PhD	36	3
	M.Sc	187	18
	B.Sc	423	41
	ND	288	28
	O/L	106	10

Source: Researcher's Processed Data (2024)

Table 2 shows that the male population (774, or 74% of the total) outnumbered the female population (266, or 26%). Out of the entire population, those aged 41 to 50 accounted for the largest share, with 38%. Supervisors topped all other labour categories with a 62% share in the employment sector. 23% of the population worked in the civil service, and 41% of those with a B.Sc. held sway over other degrees.

Data Analysis of Figures 2 and 3

The algorithm and bootstrapping sequences in the SmartPLS v4.0.9.5 version were applied in two different evaluations of inferential statistics leading to multiple regression analysis (Hair Jr., Hult, Ringle, Sarstedt, Danks & Ray, 2023). The structural equation model is considered after the measurement equation model, which is considered first in the process, as shown in Figures 2 and 3. The outer loadings of each item as shown in Figure 2 resulted in the deletion of three (PEU2, SST1, and TOE4) weak loading items <0.500 accordingly (Wong, 2016).

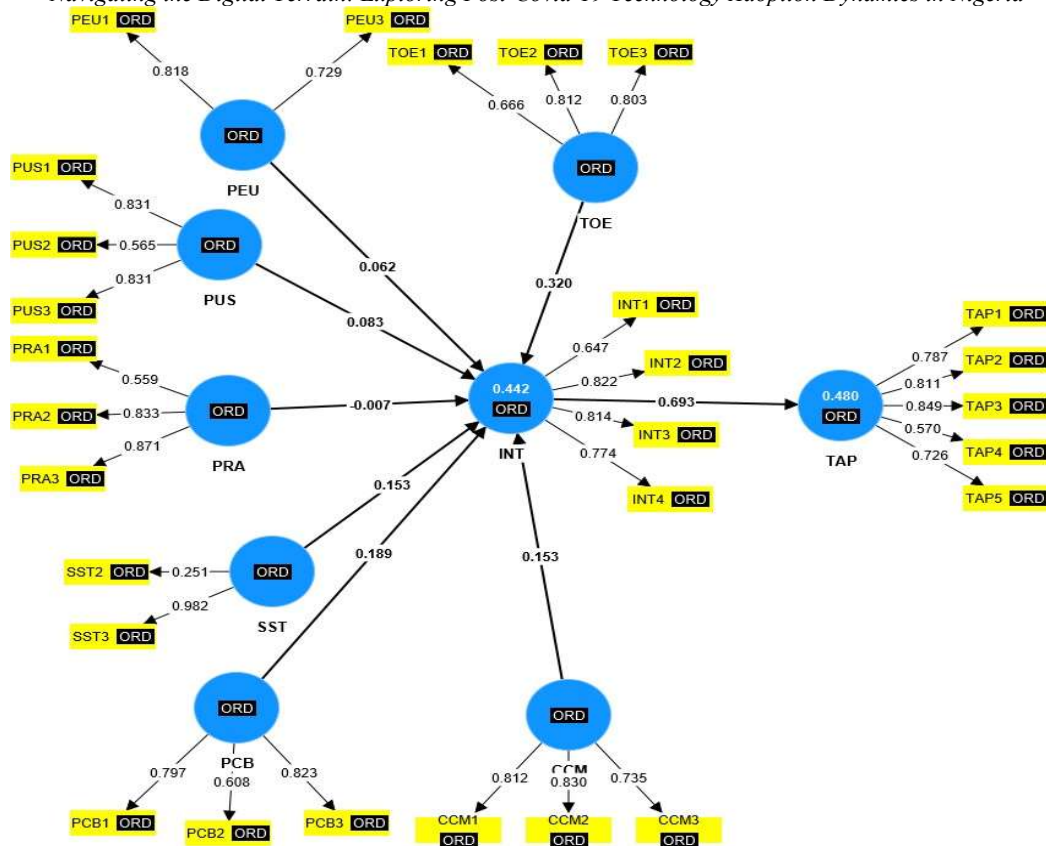


Figure 2: Algorithm Sequence of SmartPLS in Measurement Equation Modelling

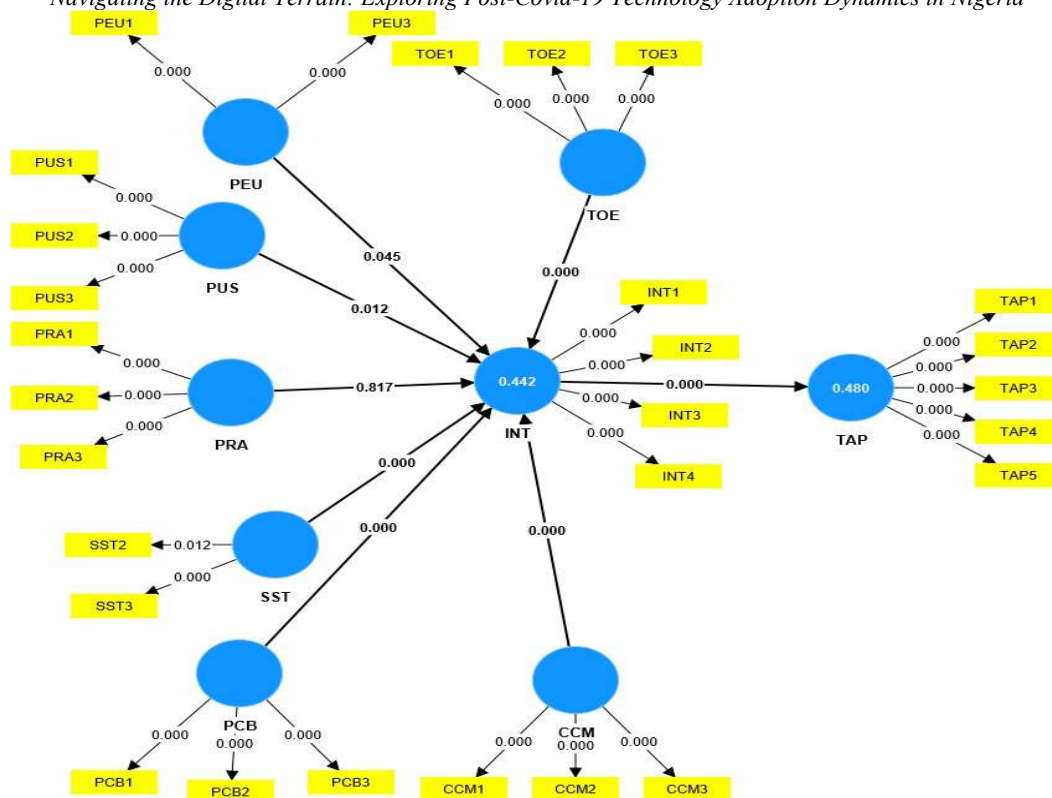


Figure 3: **Bootstrapping Sequence of SmartPLS in Structural Equation Modelling**

Hypothesis Testing

As indicated in Tables 4 and 6, the path coefficient was calculated to analyse the link between the technology adoption as endogenous variable and the perceived usefulness, perceived ease of use, perceived relative advantage, social structure, perceived compatibility, perceived critical mass, technology, organisation and environment as exogenous variables as well as the intention to use technology as mediator in the study. Table 5 displays the hypotheses' decision-making process in the bootstrapping procedure of SmartPLS v4.0.9.5 (Hair Jr., Hult, Ringle, Sarstedt, Danks & Ray, 2023).

Table 4: Path Coefficients of Variables

Variables	Original sample (O)	Sample mean (M)	Standard deviation(STDEV)	T statistics (O/STDEV)	P values
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CCM -> INT	0.153	0.153	0.037	4.107***	0.000
INT -> TAP	0.693	0.693	0.023	29.513***	0.000
PCB -> INT	0.189	0.189	0.036	5.258***	0.000
PEU -> INT	0.062	0.061	0.031	2.006**	0.045
PRA -> INT	-0.007	-0.006	0.031	0.232	0.817
PUS -> INT	0.083	0.082	0.033	2.512**	0.012
SST -> INT	0.153	0.153	0.035	4.321***	0.000
TOE -> INT	0.320	0.320	0.031	10.352***	0.000

*p<0.05, **p<0.01, ***p<0.000

Table 5: Decision Taking on Hypotheses

Hypotheses	Relationship	t value	p-value	Decision	2.5%	97.5%
H1	PEU -> INT	2.006**	0.045	Accepted	-0.002	0.120
H2	PUS -> INT	2.512**	0.012	Accepted	0.017	0.146
H3	PRA -> INT	0.232	0.817	Rejected	-0.067	0.057
H4	SST -> INT	4.321***	0.000	Accepted	0.080	0.218
H5	PCB -> INT	5.258***	0.000	Accepted	0.117	0.260
H6	CCM-> INT	4.107***	0.000	Accepted	0.083	0.228
H7	TOE -> INT	10.352***	0.000	Accepted	0.255	0.378
H8	INT -> TAP	29.513***	0.000	Accepted	0.645	0.736

*p<0.05, **p<0.01, ***p<0.000

Discussion of Findings

The study's aims and hypothesised parameters, which align with the primary outcomes of the post-COVID-19 era, served as the foundation for the study's findings and results (Amankwah-amuah, Khan, Wood & Knight, 2021; Yang, 2020). The structural equation model's bootstrapped results in Table 4 showed that all the t values are statistically significant except PRA -> INT, which has a value <1.96 thresholds as established by (Hair Jr., Hult, Ringle, Sarstedt, Danks & Ray, 2023). The possible reason for the exclusion of PRA -> INT could be the intricacy of some technologies' application by different personnel in the sectors under investigation (Bouaguel & Alsulimani, 2022). For example, the artisans might have found it difficult to use every type of technology available to them. According to the study, which examined the adoption of new technologies in Nigeria's economy following the COVID-19 pandemic, most industries have fully

Navigating the Digital Terrain: Exploring Post-Covid-19 Technology Adoption Dynamics in Nigeria embraced innovation and state-of-the-art offices (Fagbuyi, Adegbola, Chukwuma, & Alabi, 2023).

Table 6: Specific Indirect Effects (Mediation Interaction between Variables)

Variables	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics ((O/STDEV))	P values
PEU -> INT -> TAP	0.043	0.043	0.021	1.994**	0.046
TOE -> INT -> TAP	0.222	0.222	0.023	9.472***	0.000
CCM -> INT -> TAP	0.106	0.107	0.027	3.986***	0.000
PCB -> INT -> TAP	0.131	0.131	0.025	5.137***	0.000
PRA -> INT -> TAP	-0.005	-0.004	0.022	0.232	0.817
SST -> INT -> TAP	0.106	0.106	0.025	4.232***	0.000
PUS -> INT -> TAP	0.058	0.057	0.023	2.514**	0.012

*p<0.05, **p<0.01, ***p<0.000

Except for the lack of a relationship in PRA -> INT -> TAP, Table 6 shows that the mediating role of intention to adopt technology has a strong link between the endogenous variable and exogenous variables (Venkatesh, Morris, Davis & Davis, 2003). According to Gupta, Dasgupta and Gupta (2018), the intention to adopt technology has a complete mediating effect between the study's exogenous and endogenous variables. This study also confirmed the significant role of intention to use technology.

Table 7: Predictive Values and Model Fit (Goodness-of-Fit)

Variables	R-square	R ² Adjusted	Q ² predict	RMSE	MAE
INT	0.442	0.438	0.429	0.758	0.577
TAP	0.480	0.479	0.421	0.764	0.570

SRMR: Saturated Model 0.083, Estimated Model 0.092

Table 7 displays R² and Q² predictive values that are much higher than the thresholds. The 0.75, 0.50, and 0.25 thresholds are regarded as higher, moderate, and weak, respectively (Henseler, Hubona & Ray, 2016). A Q² esteem greater than zero, according to Hair Jr., Hult, Ringle, Sarstedt, Danks, and Ray (2023), indicates that sufficient recreation has occurred and the model is reliable. The TAP's R² and Q² values of 0.480 and 0.421, respectively, indicate that it is thought to be predictive of other factors. On the other hand, the Goodness of Fit

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5. Conclusion and Recommendations

The objective of this study is to address significant questions regarding how different economic sectors in Nigeria are faring in the post-COVID-19 technology landscape. Technology adoption appears to have gained traction in the fields under study, as evidenced by the intervening influence that intention to adopt technology had on the relationship between exogenous and endogenous variables. The perceived relative advantage with negligible positive correlation illustrates the superfluous use among employees in the examined sectors. Based on the findings from different sectors within the population under investigation, it is clear that all exogenous variables affect the adoption of the technology. Even the perceived relative advantage cannot be ignored because workers would be forced to use the available technology regardless of any difficulties encountered, which may be the result of cyberphobia among the tested groups, which comprised craftsmen (Fagbuyi, Adegbola, Chukwuma, & Alabi, 2023).

Potential constraints on the study revealing the unreliability or unavailability of data in some sectors, the period during which data was gathered, impeding longer-term trends or changes in technology adoption, potentially introducing sampling bias and reducing the generalisability of the findings, the variability of technological infrastructure across Nigerian regions, the possibility of response bias in the study should participants provide responses that are not a true reflection of the study, and the rapid advancement of technology as a result of changes in government policies regarding technology adoption are some of the study's limitations.

The under-listed recommendations are pertinent to this research.

- i. Encourage rural communities to participate in the adoption of new technologies to start a feedback loop leading to policy decisions on the economy.
- ii. The concerned government's organs, especially those saddled with ICT adoption should cooperate to remove obstacles to the use of cutting-edge technology through the enactment of laws.
- iii. The Ministry of Education should ensure that the Computer-Based Evaluation (CBE) system should be used at all academic levels for student assessment and instruction.

- iv. Encouragement of public-private partnerships in the healthcare sector to drive technology adoption and modern medical facilities to deter foreign health tourism should be upheld by the Ministry of Health and related health institutions.
- v. To reduce the risks associated with technology adoption and preparedness among individuals, groups, and governmental entities, also comprehensive cybersecurity education should be established.

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