Factors influencing the adoption of electronic identity in Nigeria

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Abstract: Despite its benefits, adopting electronic identification in Nigeria has been slow. This study aims to identify the factors influencing electronic identification adoption in Nigeria using the Technology Acceptance Model and self-determination theory as bases. The model was expanded to include digital literacy, access to information and communications technology, perceived credibility, and trust. A total of 692 responses were collected using a questionnaire distributed using convenience sampling. The data was analysed using partial least squares structural equation modelling. The findings indicate that the strongest factor affecting the adoption

of electronic identification is perceived credibility, followed by perceived usefulness and perceived ease of use. Furthermore, electronic identification adoption is also predicted significantly by digital literacy, trust, and perceived autonomy. However, access to information and communications technology was found to have no significant impact on electronic identification adoption, while perceived cultural influence had a negative effect. These findings provide insights into the factors influencing electronic identification adoption in Nigeria and suggest strategies to increase adoption rates.

Keywords: electronic identification, perceived credibility, digital literacy, trust, perceived autonomy, perceived cultural influence, access to ICT

1. Introduction

The emergence of digital technologies and the internet has given way to the conception of different electronic systems, such as e-government and electronic identification (e-ID) systems. Governments worldwide recognise the benefits of using these technologies to provide efficient and secure services to their citizens. E-government is a term that describes the use of digital technologies to deliver government services. This includes services such as online tax filing, online voting, and online application processes for government benefits (Sukarno & Nurmandi, 2023). E-government aims to streamline government services, making them more accessible and convenient for citizens (Rodríguez & Manuel, 2018).

Governments are increasingly adopting electronic national identity systems as an important technology to improve service delivery. These systems use electronic means to accurately identify individuals for various purposes, including access to government services, financial transactions, and voting (Eke et al., 2022). One of the key advantages of e-ID systems is the increased accuracy and security they provide for individual identification. By using advanced electronic technologies such as biometric scanning, e-ID systems can reliably verify the identity of individuals, thereby reducing the risk of identity fraud and theft. This enhanced security also means that e-ID systems are more resistant to tampering, making them more robust and reliable than traditional forms of identification (Pöhn et al., 2021).

Another vital advantage of e-ID systems is that they can streamline service delivery, making it faster and more efficient. By enabling government agencies to quickly and accurately identify individuals, e-ID techniques can help to eliminate unnecessary paperwork and bureaucracy, reducing waiting times and delays for individuals seeking services. This can result in improved customer satisfaction and more efficient use of government resources (Mir et al., 2022). Moreover, e-ID systems can also help to ensure greater accessibility and inclusivity for individuals, particularly those who may face barriers to traditional forms of identification. Individuals who are homeless or who do not have a fixed address may face significant challenges in obtaining conventional forms of identification. E-ID systems, which can always be accessed online, can help to overcome these barriers and ensure that these individuals can access essential government services and other benefits.

The Nigerian government has made concerted efforts to promote the adoption and use of E-ID, but the level of adoption and usage remains limited. Nigeria has a population of over 300 ethnic groups with diverse cultural landscpe speaking more than 500 languages. Such a cultural landscape presents unique challenges and opportunities for adopting electronic identification (e-ID) systems. On the one hand, the sheer scale and diversity of the population necessitate robust and inclusive e-ID systems that can cater to the varying needs, preferences, and cultural sensitivities of different ethnic and religious groups. Failure to account for this diversity could result in resistance, mistrust, or low adoption rates among certain segments of the population. On the other hand, the successful implementation of e-ID systems in such a diverse setting could serve as a powerful case study for promoting digital inclusion and bridging cultural divides. By designing e-ID systems that are sensitive to cultural nuances and accessible to all segments of the population, Nigeria could demonstrate the potential for technology to transcend cultural boundaries and facilitate more equitable access to services and opportunities. Moreover, Nigeria's multi-ethnic society represents a microcosm of the cultural diversity observed across many developing nations, particularly in Africa and Asia. Understanding the challenges and strategies for e-ID adoption in this context could provide valuable insights for other countries grappling with similar cultural complexities.

According to a study by Abdulkareem and Ramli (2021a), only 22.5% of Nigerian citizens used e-government services despite their availability. Research in this respect has attributed low usage to various factors, such as low levels of digital literacy, inadequate infrastructure, and limited access to technology. These factors have made it difficult for citizens to access e-government services, resulting in limited usage (Abdulkareem & Ramli, 2021b). More so, as of 2022, about 90 million Nigerians were enrolled for the e-ID card, representing less than half of the country's estimated population of over 200 million. This figure is lower when compared with other developing countries like South Africa and Malaysia in terms of e-ID enrolment (Borak, 2023; Shibayan, 2022). Despite the challenges, the Nigerian government has continued to promote the adoption and usage of e-government and e-ID systems. For instance, the government has launched various initiatives, such as the National Identity Management Commission (NIMC), to enhance the enrolment of citizens for e-ID cards. The NIMC has also introduced a mobile app that allows citizens to access their e-ID information using their smartphones, which is expected to increase the usage of e-ID systems (Eke et al., 2022).

Most studies that have examined the adoption of e-government in Nigeria tend to focus on the broader factors that affect e-government adoption (AbdulKareem et al., 2020; Kirfi & Ishola, 2018). While these factors are undoubtedly important, they may not be specific enough to explain Nigeria's low level of e-ID adoption. E-ID is a crucial component of e-government, and its success depends on the ability of citizens to enrol and use the system effectively. Therefore, it is important to understand the factors affecting e-ID adoption in Nigeria. This study seeks to address this gap in the literature by examining the factors contributing to e-ID adoption in Nigeria. By focusing specifically on e-ID adoption, this study aims to identify factors that are more specific and relevant to e-ID, which can help to inform policy decisions aimed at promoting the adoption and usage of e-ID systems in Nigeria.

2. Theoretical background and hypothesis formation

This paper adopts the Technology Acceptance Model (TAM) and Self Determination Theory (SDT) as theoretical frameworks for understanding the adoption of e-ID in Nigeria. TAM is a popular theoretical framework for understanding how individuals adopt new technologies. The model was first proposed by Davis (1989) and has since been applied to various technologies, including electronic identity (e-ID) systems. The TAM model implies that the usage of new technologies is prompted by perceived usefulness (PU) and perceived ease of use (PEOU).

SDT is a motivational framework that underscores the significance of three fundamental psychological needs, competence, autonomy, and relatedness, in shaping human motivation and well-being (Ferrand et al., 2014). According to this theory, individuals possess an inherent inclination toward growth and integration, and their motivation and well-being are optimised when these basic psychological needs are fulfilled within their social environment. SDT's applicability extends across diverse domains, such as education, healthcare, sports, work, and personal relationships, with interventions derived from the theory to promote intrinsic motivation, well-being, and optimal functioning.

In alignment with these theoretical foundations, this study incorporates factors such as perceived usefulness, perceived ease of use, digital literacy, access to ICT, perceived cultural influence, trust, perceived credibility, and perceived autonomy into its framework. These elements collectively influence the intention to adopt e-ID in Nigeria, as illustrated in Figure 1. Drawing on the principles of SDT, the study recognises the interplay of these factors in shaping individuals' motivations and willingness to embrace electronic identity practices within the Nigerian context.

2.1. Perceived usefulness

Adopting electronic identity (e-ID) systems is significantly influenced by the perceived usefulness, a critical factor in the decision-making process. Perceived usefulness, as defined by Tahar et al. (2020), denotes the extent to which individuals believe technology will enhance their performance or productivity. In the context of e-ID systems, perceived usefulness specifically pertains to the individual's belief that utilising these systems will enhance their online activities' efficiency, security, and convenience. Existing research underscores the substantial impact of perceived usefulness on adopting e-ID systems, with studies by Lampouw and Fajar (2019) and Strauß and Aichholzer (2010) highlighting this relationship. The empirical evidence suggests that the degree to which individuals perceive e-ID systems as beneficial influences their willingness to adopt and integrate these systems into their online practices.

One way e-ID systems can be perceived as useful is by offering greater security and privacy. In an era of increasing online threats such as identity theft and fraud, e-ID systems can provide a more secure means of verifying one's identity online. By reducing the risk of identity theft, e-ID systems can provide users with a greater sense of privacy and control over their personal information, which can be a significant motivator for adoption. Another way e-ID systems can be perceived as useful is by offering greater convenience and efficiency. By allowing users to access multiple online services and applications using a single set of credentials, e-ID systems can reduce the need for multiple

usernames and passwords, making online activities more efficient and convenient. This can be especially important for individuals who regularly access various online services and may have difficulty remembering multiple login credentials.

H1: Perceived usefulness will influence the intention to use e-ID in Nigeria

2.2. Perceived ease of use

Perceived ease of use is another key factor impacting the adoption and use of electronic identity (e-ID) systems. Perceived ease of use refers to the extent to which individuals believe that technology is easy to use and does not require significant effort or skill (Tahar et al., 2020). In e-ID systems, perceived ease of use can be a substantial barrier to adoption. If individuals find e-ID systems challenging to use or navigate, they may be less likely to adopt them, even if they perceive them as useful. This can be especially true for individuals less familiar with digital technologies or who may have difficulty understanding complex technical processes (Lampouw & Fajar, 2019; Strauß & Aichholzer, 2010).

One way e-ID systems can be designed to promote perceived ease of use is by providing clear and simple instructions. This can include providing visual aids or step-by-step guides that walk users through setting up and using their e-ID credentials. Additionally, e-ID systems can be designed with user-friendly interfaces that are intuitive and easy to navigate, reducing the need for extensive technical knowledge or experience. Another way e-ID systems can be designed to promote perceived ease of use is by minimising the effort required to use them. This can involve reducing the number of steps required to access online services or applications or automating certain processes to make them more efficient. For example, some e-ID systems may allow users to automatically fill in their personal information when filling out online forms, reducing the need for manual data entry. Additionally, e-ID systems can be designed to be flexible and adaptable to different user needs and preferences. For example, some systems may allow users to customise their interface or settings to better suit their needs or preferences by adjusting font size or colour contrast.

H2: Perceived Ease of use will influence the intention to use e-ID in Nigeria

2.3. Digital literacy

Digital literacy is a critical factor influencing the adoption and use of e-ID systems. Citizens with higher levels of digital literacy are generally more comfortable using digital devices, software, and online platforms (Chohan & Hu, 2020). For these citizens, e-ID systems can be seen as a useful and convenient way to access government services and complete transactions. They may understand the benefits of e-ID systems, such as improved security and efficiency, and be more likely to use them to conduct their business with the government (Eggrickx et al., 2018).

In contrast, citizens with lower levels of digital literacy may struggle to navigate and use e-ID systems. They may not be familiar with digital devices, may have limited experience with online platforms, or may find the technology confusing or intimidating. As a result, these citizens may be less likely to use e-ID systems, even if they would benefit from doing so. These individuals may not

be familiar with digital devices such as smartphones, tablets, or computers, which are necessary for accessing e-ID systems. They may have limited experience using online platforms and find the technology confusing or intimidating, leading to further difficulties navigating e-ID systems.

H3: Digital literacy will influence the intention to use e-ID in Nigeria

2.4. Access to ICT

Technology accessibility is an important factor influencing the adoption and use of electronic national identity (e-ID) systems (Hilowle et al., 2022). E-ID systems may be more accessible to citizens with easy internet access and electronic devices such as smartphones or computers. This can be particularly important in countries where access to the internet and electronic devices is limited or where there are significant disparities in access to technology between urban and rural areas (Abdulkareem & Ramli, 2021b). Citizens who live in urban areas with good internet connectivity and access to electronic devices are more likely to be able to access and use e-ID systems easily. This is because e-ID systems typically require internet access and electronic devices to complete the registration process and use the system. These citizens are also more likely to be familiar with electronic devices and comfortable using them for various purposes.

In contrast, citizens who live in rural or remote areas may have limited access to these resources, making it difficult for them to use e-ID systems. Lack of internet connectivity and electronic devices can pose significant barriers to accessing and using e-ID systems. In such cases, governments may need to consider alternative means of identification or provide support and resources to enable citizens in these areas to access and use e-ID systems (Van Deursen & van Dijk, 2019).

H4: Access to ICT will influence the intention to use e-ID in Nigeria

2.5. Trust

Trust is a crucial element in any electronic transaction. It is essential to establish trust between the parties involved in the transaction. Trust is the belief that the other party will act in good faith and not cheat or deceive (Abdulkareem et al., 2022). Trust is crucial in online transactions because users cannot physically see the person they are dealing with. Therefore, trust becomes the foundation for online transactions (Shao et al., 2019). The e-ID system is designed to establish trust between the user and the service provider. The e-ID system verifies the user's identity, and the service provider can rely on this verification. E-ID systems use various methods to verify the identity of the user. These methods include verifying the user's name, address, date of birth, social security number, and other personal information. E-ID systems additionally employ biometric data, including fingerprints or facial recognition, to authenticate the user's identity (Eke et al., 2022). E-ID systems provide a secure way of accessing online services. They use encryption to protect the user's personal information and prevent unauthorised access. E-ID systems also use digital signatures to ensure the authenticity of electronic documents. Digital signatures are a way of verifying that the document has not been altered since it was signed. Trust in e-ID systems is essential for their success.

H5: Trust will influence the intention to use e-ID in Nigeria

2.6.   Perceived autonomy

Perceived autonomy is an individual's subjective perception of control over their actions and decisions, which can be influenced by external factors such as social norms, power structures, and technological systems (Ahuja & Thatcher, 2005). Perceived autonomy, or an individual's perception of control over their actions and decisions, can significantly impact their acceptance of electronic identification (e-ID) systems. When citizens feel they have a high level of control over their personal information and its use, they may be more willing to use e-ID systems (World Bank, 2016). This is because they feel they have a greater sense of ownership over their personal information and are more likely to trust the e-ID provider to protect their privacy and security. More so, when citizens feel that they have a choice in whether or not to use an e-ID system, they may be more likely to accept it. This is because they feel that they have a greater sense of control over their actions and decisions and are more likely to view the use of an e-ID system as a voluntary choice rather than a requirement imposed upon them.

The design of e-ID systems can impact perceived autonomy, which in turn can affect acceptance. When an e-ID system requires citizens to provide sensitive personal information, such as biometric data, this can be perceived as invasive and dehumanising (Mordini & Rebera, 2012). Similarly, suppose the authentication process is overly complicated or time-consuming. In that case, individuals may feel they have little control over the process and may be less likely to use the system. The relationship between perceived autonomy and e-ID acceptance has important implications for designing and implementing e-ID systems.

H6: Perceived autonomy will influence the intention to use e-ID in Nigeria

2.7.   Perceived credibility

Perceived credibility is a key factor impacting the adoption and use of electronic identity (e-ID) systems. Perceived credibility pertains to individuals' beliefs about technology's reliability, trustworthiness, and security (Gupta et al., 2019). In e-ID systems, perceived credibility can be a significant factor in determining whether individuals are willing to adopt and use these systems. Several factors can influence the perceived credibility of e-ID systems. These include the system's technical architecture, the security measures in place, and the overall reputation of the organisation responsible for implementing and maintaining the system (Ghareeb et al., 2019).

One of the key ways that organisations can promote the perceived credibility of e-ID systems is by implementing robust security measures. This can include encryption and authentication protocols that ensure that personal information is kept secure and private, as well as monitoring and audit trails that help to detect and prevent unauthorised access or misuse of e-ID credentials. In addition to technical security measures, organisations can also enhance the perceived credibility of e-ID systems by providing clear and transparent information about the system's architecture, privacy policies, and security practices. This can help to reassure individuals that their personal information is being handled responsibly and securely and that they can trust the system to protect their identity and personal data. Another important factor in enhancing the perceived credibility of e-ID systems

is the reputation of the organisation responsible for implementing and maintaining the system. Suppose the government has a history of strong security practices and a commitment to protecting user privacy. In that case, this can help to build trust and confidence in the e-ID system among potential citizens who want to adopt it.

H7: Perceived credibility will influence the intention to use e-ID in Nigeria

2.8. Perceived cultural influence

Culture can significantly shape the behaviour and attitudes towards technology, including using e-ID systems (Van Dijck & Jacobs, 2020). One cultural factor that can affect e-ID adoption is individualism versus collectivism. Individualistic cultures value independence and self-reliance, whereas collectivist cultures emphasise group harmony and social relationships. In individualistic cultures, people may be more likely to embrace e-ID systems to assert their independence and control over their online identity. In contrast, collectivist cultures may be more sceptical of e-ID systems, viewing them as potentially undermining social relationships and trust.

Another cultural factor that influences adoption is attitudes toward privacy and security. Some cultures may place a higher value on personal privacy and be more hesitant to share personal information, while others may be more willing to share information as a way to build trust and establish social connections. This can affect how citizens view e-ID systems, with some seeing them as a convenient way to access online services securely and others viewing them as a potential threat to personal privacy (Srite & Karahanna, 2006). Cultural norms around trust and distrust can also impact e-ID adoption. Cultural attitudes towards technology, in general, can impact e-ID adoption. Some cultures may be more technologically advanced and comfortable with digital technology, while others may be more sceptical or even fearful of technology. This can affect how people approach e-ID systems and their willingness to use them (Van Dijck & Jacobs, 2020).

H8: Perceived cultural influence will influence the intention to use e-ID in Nigeria

Figure 1: Conceptual model
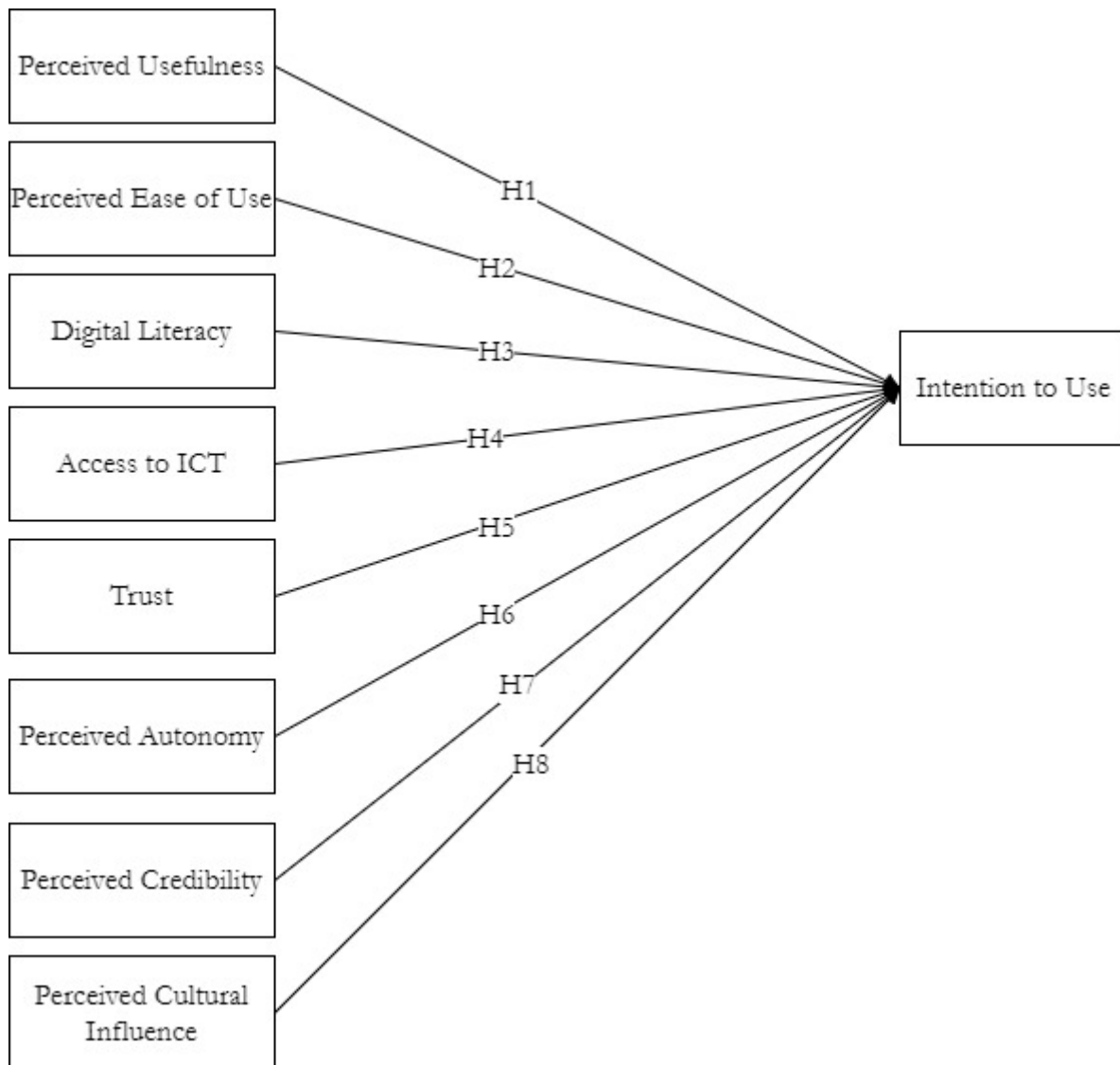
3. Methodology

This research adopted a quantitative research design to explore the factors influencing the adoption of electronic identification (e-ID) in Nigeria. Utilising a self-administered questionnaire, the primary data collection method targeted a convenience sample of 1850 individuals across major urban areas and cities in the six geo-political zones of Nigeria. The choice of convenience sampling was driven by its accessibility and cost-effectiveness. The Gpower software was employed to calculate the minimum sample size, resulting in 153 samples, while the study aimed to retrieve 600 questionnaires to ensure a robust sample for analysis. Developed based on the Technology Acceptance Model (TAM) and Self Determination Theory, the questionnaire included inquiries about perceived usefulness, perceived ease of use of e-ID, digital literacy, access to ICT, perceived credibility, perceived cultural influence, and trust. Responses were recorded on a 7-point Likert scale, ranging

from strongly disagree to agree strongly. Common method bias was examined using Harman's one-factor test.

To validate the questionnaire's content, four public administration experts specialising in e-governance assessed its clarity, relevance, and alignment with the study's objectives. Feedback from the experts informed revisions to enhance the questionnaire. A pilot study involving ten respondents tested the instrument's reliability and validity, leading to minor refinements. The finalised questionnaire was electronically distributed to the convenience sample over five weeks, garnering 692 completed responses. Collected data underwent analysis using Statistical Package for Social Sciences (SPSS) and SmartPLS software. Descriptive statistics, simple percentages, and frequency analysis characterised the sample, while the relationships between variables were assessed for statistical significance, effect sizes, and relevance, employing a significance level of $p<0.05$.

3.1. Constructs measuring items

The items used for measuring the constructs are obtained from the literature. Perceived usefulness, perceived ease of use and behavioural intention to use are adapted from Davis (1989). The measuring items for digital literacy are adapted from (Abdulkareem & Ramli, 2021a) with five items: access to ICT (Abdulkareem & Ramli, 2021b) four items, perceived cultural influence (Srite & Karahanna, 2006), perceived credibility (Gupta et al., 2019) and perceived autonomy (Bhuasiri et al., 2016). The measuring items are displayed in Table 1.

4. Analysis

The study collected data from 692 respondents. The following is a summary of their demographic characteristics, as shown in Table 1. Most respondents are male (58%); female respondents are 42%. Also, most respondents were between 25 and 40 (49%). Respondents aged 18-24 accounted for 26% (180) of the sample, while those aged 41-60 accounted for 22% (152). Respondents aged 60 and above were the least represented, accounting for only 3% (21) of the sample. The respondents had varying levels of education, with the majority (44%) having a secondary school certificate. Those with postgraduate degrees accounted for 25% (173) of the respondents, the respondents with primary certificates are 3% (21), and those with first degree only are 27% (187), while those with no formal education constituted the smallest proportion, accounting for only 1% (7)) of the total respondents. The majority of respondents were self-employed, accounting for 41% (284) of the sample. Civil servants accounted for 30% (208) of the sample, while students accounted for 16% (111). Other occupations, such as artisans, traders, and unemployed individuals, accounted for the remaining 13% (90) of the sample. Similarly, the majority of respondents owned a smartphone, accounting for 85% (588) of the sample. The remaining 15% (104) of the sample did not own a smartphone.

Table 1: Demographic Details of Respondents

Parameters	Percentage	Frequency
Gender:		
Male	58	
Female	42	
Age		
18-24	26	180
24-40	49	339
41-60	22	152
Above 60	3	21
Educational Qualification		
No Formal Education	1	7
Primary School Certificate	3	21
Secondary School Certificate	44	304
First Degree	27	187
Postgraduate Degrees	25	173
Occupation Status:		
Self Employed	41	284
Civil Servants	30	208
Students	16	110
Artisans and Traders	8	55
Unemployed	5	35
Smartphone Ownership		
Yes	85	588
No	15	104

4.1. Measurement model

Table 2 displays the model developed to assess the validity and reliability of the questionnaire items. The model consisted of eight underlying independent variables: Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Digital Literacy (DL), ICT Access (ACT), Perceived Credibility (PC), Perceived Autonomy (PA), Perceived Cultural Influence (PCI), Trust (TR), and one dependent variable Behavioural Intention to Use (BIU). We used Harman's one-factor test to determine if there was a common method bias. The findings demonstrated that the most significant amount of variance explained by a single factor was 25%, largely less than the suggested 50% threshold, indicating no issue with common method bias. Similarly, common method bias

Moreover, we conducted assessments of the measurement model's validity, considering both convergent validity and discriminant validity. The validity was established by examining factor loadings, composite reliability (CR), and average variance extracted (AVE) for each variable, as out-lined in Table 2. The significant factor loadings signify robust convergent validity. Additionally, the CR values, ranging from 0.820 to 0.907, surpass the recommended threshold of 0.7, indicating robust internal consistency. The AVE values, ranging from 0.527 to 0.726, also exceed the suggested thresh-old of 0.5, underscoring the model's sound convergent validity.

Similarly, discriminant validity was determined by calculating the Heterotrait-Monotrait (HTMT) ratio of correlations for all pairs of constructs. The HTMT values are below the 0.9 recommended threshold, indicating strong discriminant validity. As presented in Table 3, these results further supported the distinctiveness and lack of strong correlation between the constructs, indicating good discriminant validity of the measurement model.

Table 2: Measurement model table

Constructs	Items	Item Description	Loading
Access to ICT CR=0.82 AVE = 0.54	AC1	I have reliable and consistent access to the internet to use e-ID.	0.56
	AC2	I have the necessary hardware, such as a computer or smartphone, to access e-ID.	0.68
	AC3	I have access to software or applications required to use e-ID.	0.86
	AC4	I have a stable and secure internet connection to access e-ID.	0.81
Behavioural Intention to Use CR= 0.89 AVE = 0.73	BIU1	I would be willing to use e-ID if it were available to me.	0.86
	BIU2	I would recommend using e-ID to others.	0.83
	BIU3	I am motivated to use e-ID because it aligns with my values and beliefs.	0.87
Perceived Cultural Influence CR = 0.89 AVE = 0.62	CV1	My cultural background influences my perceptions of e-ID.	0.74
	CV2	My cultural values influence my willingness to use e-ID for identity verification.	0.7
	CV3	The cultural norms and practices of my community affect my trust in e-ID.	0.8
	CV4	The cultural expectations of my social network influence my attitudes toward e-ID.	0.85
	CV5	My cultural identity affects my perceptions of the appropriateness of using e-ID.	0.83
Digital Literacy CR =0.88 AVE = 0.59	DL1	I am confident in my ability to use e-ID to verify my identity online.	0.79
	DL2	I am familiar with the features and capabilities of e-ID.	0.61
	DL3	I understand the security and privacy implications of using e-ID.	0.81

	DL4	I know how to manage my personal information with e-ID securely.	0.79
	DL5	I am aware of the benefits of using e-ID for online transactions.	0.82
Perceived Autonomy CR = 0.85 AVE = 0.653	PA1	I feel like I have control over how I use e-ID for identity verification.	0.67
	PA2	Using e-ID allows me to have more control over my personal information.	0.67
	PA3	I perceive e-ID as a tool that enhances my autonomy and independence.	0.73
	PA4	Using e-ID for identity verification gives me more freedom to access online services.	0.82
	PA5	I perceive e-ID as a way to exercise my individual rights and freedoms.	0.74
Perceived Credibility CR = 0.82 AVE = 0.60	PC1	I perceive e-ID as a trustworthy source for verifying my identity online.	0.78
	PC2	I believe that e-ID is reliable and accurate in verifying my identity.	0.81
	PC3	I trust that credible and authoritative institutions or organisations back e-ID.	0.74
Perceived Ease of Use CR = 0.91 AVE = 0.66	PEOU1	e-ID is easy to learn and use.	0.81
	PEOU2	I find the process of using e-ID straightforward.	0.85
	PEOU3	e-ID is user-friendly.	0.83
	PEOU4	The interface for using e-ID is intuitive.	0.79
	PEOU5	I can easily navigate the e-ID system.	0.79
Perceived Usefulness CR = 0.85 AVE = 0.53	PU1	Using e-ID makes it easier for me to access government services.	0.67
	PU2	I find e-ID useful for verifying my identity online.	0.9
	PU3	e-ID helps reduce the time and effort required for identity verification.	0.7
	PU4	Using e-ID saves me money compared to traditional identity verification methods.	0.65
	PU5	I believe that e-ID enhances the security of my personal information.	0.71

Trust CR = 0.87 AVE = 0.63	TR1	I trust that my personal information is secure when using e-ID.	0.78
	TR3	I trust the organisations and institutions that provide e-ID services.	0.83
	TR4	I feel confident in the security measures in place to protect my e-ID from unauthorised access.	0.85

Table 3: Discriminant Validity (HTMT Criterion)

|	1	2	3	4	5	6	7	8	9
1									
2	0.64								
3	0.35	0.45							
4	0.53	0.58	0.62						
5	0.57	0.33	0.39	0.51					
6	0.68	0.57	0.54	0.55	0.55				
7	0.49	0.59	0.56	0.46	0.57	0.48			
8	0.47	0.62	0.62	0.46	0.49	0.51	0.56		
9	0.55	0.68	0.83	0.69	0.68	0.64	0.54	0.67	
Key: 1= ACT 2=BIU 3=PC1 4=DL 5=PA 6= PC 7 = PEOU 8=PU 9=TR									

4.2. Structural model

The outcome of the structural model is detailed in Table 4. Initially, the multicollinearity of the independent constructs was assessed using Variance Inflation Factors (VIF) values, which yielded results less than 3, indicating the absence of significant multicollinearity concerns in the study. The R-square value of 0.685 suggests the model elucidates 69% of the variance in the intention to use e-ID. In terms of hypothesis testing, the results revealed that Perceived credibility exhibited the highest coefficient, displaying a positive and statistically significant impact on the intention to use e-ID ($\beta= 0.540$, $p<0.001$, $f2 = 0.110$). Conversely, Perceived Cultural Influence exerted a negative and significant effect on the intention to use e-ID ($\beta= -0.296$, $p<0.001$, $f2 = 0.089$). Perceived usefulness displayed a positive and significant impact on the intention to use e-ID ($\beta= 0.243$, $p<0.001$, $f2 = 0.086$). Access to ICT did not yield a significant effect on the intention to use e-ID ($\beta= -0.032$, $p>0.05$, $f2 = 0.001$). Perceived Ease of Use demonstrated a positive and significant impact on the intention to use e-ID ($\beta= 0.172$, $p<0.001$, $f2 = 0.033$). Furthermore, Perceived autonomy, Digital Literacy, and Trust all exhibited positive and significant effects on the intention to use e-ID, with coefficients of ($\beta= 0.263$, $p<0.001$, $f2 = 0.066$), ($\beta= 0.198$, $p<0.001$, $f2 = 0.069$), and ($\beta= 0.123$, $p<0.001$, $f2 = 0.014$), respectively.

Table 4: Hypotheses testing

	β	T stat	P value	5.00%	95.00%	F2	VIF
ACT -> BIU	-0.032	0.44	0.333	-0.149	0.085	0.001	2.803
PCI -> BIU	-0.296	4.044	0.001	-0.415	-0.178	0.089	3.116
DL -> BIU	0.198	4.883	0.001	0.129	0.261	0.069	1.817
PA -> BIU	0.263	4.619	0.001	0.17	0.357	0.066	3.342
PC -> BIU	0.325	6.288	0.001	0.243	0.412	0.11	3.037
PEOU -> BIU	0.172	2.477	0.007	0.055	0.284	0.033	2.823
PU -> BIU	0.243	6.401	0.001	0.182	0.305	0.086	2.193
TR -> BIU	0.123	2.069	0.019	0.029	0.226	0.014	3.404
R2 = 0.685							

Figure 2: Structural model result
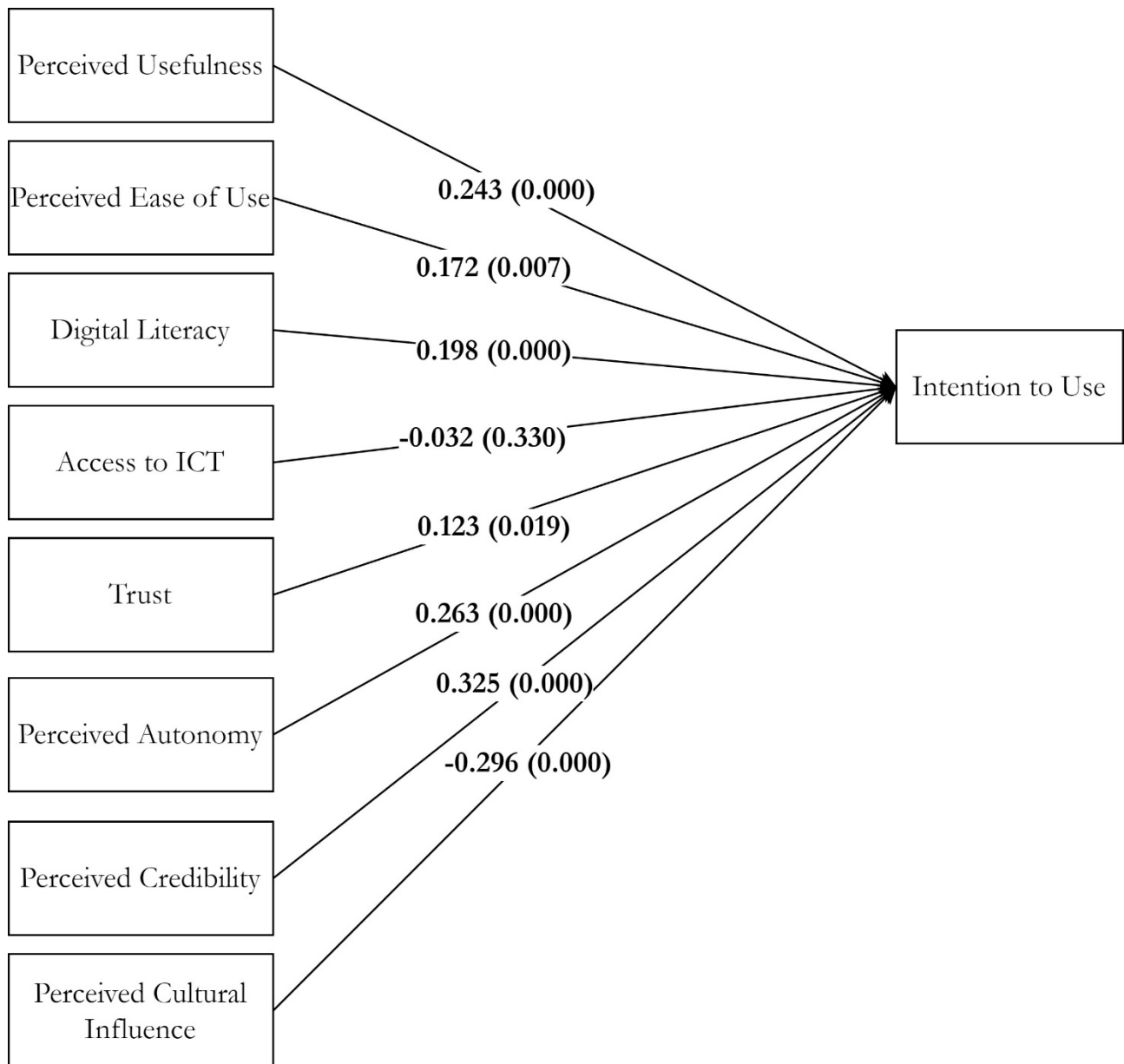
5. Discussion and implications

The outcomes of the study shed light on the factors influencing the adoption of electronic identification (e-ID) in Nigeria. Notably, the study discerned that perceived credibility stands out as the most influential factor driving the adoption of e-ID among the surveyed participants. This aligns with previous research emphasising the pivotal role of trust and credibility in accepting novel technologies. For instance, Alshurideh et al. (2021) asserted the crucial role of trust in predicting individuals' inclination to use emerging technologies. Gefen and Straub (2003) identified trust and credibility as fundamental factors in the acceptance of technology. Therefore, the current study's findings underscore the enduring importance of trust and credibility in the realm of technology adoption. Specifically, perceived credibility exhibited the highest coefficient among all variables,

indicating a robust positive impact on e-ID adoption. This implies that individuals are more inclined to adopt the e-ID system if they trust and have confidence in its reliability. A plausible implication of this finding is that the credibility of the e-ID system may positively influence perceptions of its usefulness, ease of use, and the intention to use it. This discovery aligns with earlier research that has established a connection between perceived credibility and the intention to adopt technology (Kim et al., 2008; Wang et al., 2021).

In addition to perceived credibility, this study highlights perceived usefulness and ease of use as significant factors that strongly impact the adoption of e-ID among participants. These results suggest that individuals in Nigeria are more likely to adopt e-ID technology if they perceive it as beneficial and user-friendly. These findings are consistent with the tenets of the Technology Acceptance Model (TAM), which posits that perceived usefulness and ease of use are pivotal in determining users' acceptance of technology (Davis, 1989). According to TAM, users' perceptions of a technology's utility and ease of use influence their intention to use it, ultimately shaping their actual utilisation of the technology. Consequently, the outcomes of this study lend support to the TAM theory in the specific context of e-ID adoption in Nigeria. The discovery that perceived usefulness significantly predicts e-ID adoption is unsurprising. E-ID technology offers users a range of advantages, including secure authentication, fraud prevention, and convenient access to government services. Potential users will likely perceive these benefits as valuable, thereby increasing their intention to embrace the technology.

The revelation that perceived autonomy significantly and positively influences the intention to use e-ID is a valuable addition to the existing literature on e-ID adoption (Demir et al., 2019; Venkatesh et al., 2003). This finding suggests that individuals who feel they have a greater sense of control over their utilisation of e-ID are more inclined to embrace the technology. The favourable impact of perceived autonomy on e-ID adoption resonates with the principles of the self-determination theory (SDT), which posits that individuals inherently possess a psychological need for autonomy (Deci & Ryan, 1985). When individuals perceive that they have control over their actions, they are more likely to be motivated to engage in those actions. In the context of e-ID adoption, individuals who believe they have control over their use of the technology are likely to be more motivated to adopt it. The positive influence of perceived autonomy on e-ID adoption carries significant implications for the design and implementation of e-ID systems. It suggests that e-ID systems offering users a high degree of control and autonomy over their technology usage are more likely to be embraced. This may involve creating user-friendly and easily navigable systems, providing users with various options and customisation features, and ensuring accessible support and assistance when needed.

Interestingly, access to ICT was not found to be a significant predictor of e-ID adoption. This finding is somewhat surprising given the importance of ICT access in facilitating the use of digital technologies and the result of previous studies highlighting the significance of ICT access (Abdulkareem & Ramli, 2021b). Previous studies have often identified access to information and communication technologies (ICT) as a key enabler of e-ID and e-government adoption (Abdulkareem & Ramli, 2021b; Van Deursen & van Dijk, 2019). However, the current study found that access to ICT did not have a significant impact on e-ID adoption intention in Nigeria. This contrasts with the es-

tablished understanding that the availability and accessibility of technological infrastructure are crucial for the uptake of digital government services. The insignificant finding in the Nigerian context suggests there may be other more pressing factors, such as digital literacy or trust, that override the importance of ICT access in shaping e-ID adoption behaviors. Also, it is possible that the respondents in this study already had sufficient access to ICT. Therefore, access to ICT did not play a significant role in their decision to adopt e-ID.

The present study also found that digital literacy is a significant predictor of e-ID adoption among the respondents. This suggests that individuals more proficient in using digital technologies are more likely to adopt e-ID. This finding is consistent with previous research that has identified digital literacy as an important factor in adopting digital technologies (Van Deursen & Van Dijk, 2014). Digital literacy refers to an individual's ability to effectively access, evaluate, and use digital technologies. It encompasses a range of skills, including the ability to navigate digital interfaces, communicate online, and use digital tools to solve problems. These skills are becoming increasingly important in today's digital world, where many government services and transactions are moving online. The finding that digital literacy is a significant predictor of e-ID adoption has important implications for policymakers and e-ID providers. It suggests that efforts should be made to improve digital literacy among potential e-ID users, particularly those less familiar with digital technologies. This could involve providing training and education programs to help users become more proficient in using digital technologies, such as online tutorials or workshops (Abdulkareem & Ramli, 2021a; Livingstone & Helsper, 2007). Furthermore, the finding that digital literacy is a significant predictor of e-ID adoption also highlights the need to ensure that e-ID systems are designed with usability and user experience in mind. E-ID providers should ensure that their systems are easy to use and navigate, with clear instructions and feedback provided to users. This will help to reduce the learning curve for users with lower levels of digital literacy and improve the overall user experience.

The negative impact of perceived cultural influence on e-ID adoption found in this study is interesting. Existing literature has yielded mixed findings on the role of cultural factors in technology adoption. Some studies have found cultural elements like individualism-collectivism and attitudes towards privacy to be significant predictors (Srite & Karahanna, 2006; Van Dijck & Jacobs, 2020). In contrast, the current study observed a negative perceived cultural influence on e-ID adoption intention in Nigeria. This contrasts with the common assumption that cultural factors may pose barriers to the acceptance of new technologies. This result suggests that individuals who hold strong traditional cultural beliefs may be resistant to the adoption of e-ID. This may be because e-ID adoption requires a change in traditional practices and a shift towards a more digital culture, which may be seen as conflicting with traditional values. Previous studies have also found a negative impact of perceived cultural influence on adopting digital technologies (Cetin & Bilgihan, 2016; Fan et al., 2018). The negative impact of perceived cultural influence on e-ID adoption highlights the importance of considering cultural factors when introducing new digital technologies in a heterogenous society like Nigeria. It is important to understand the cultural beliefs and practices of the target population and develop strategies to address any potential cultural barriers to adoption. This may involve incorporating perceived cultural influence into the design and implementation of the technology or providing education and awareness programs to help individuals understand how the innovative technology aligns with their cultural values.

6. Conclusions and recommendations

This study explored the determinants of e-ID adoption in Nigeria through the lens of the Technology Acceptance Model. The outcomes underscore the paramount significance of perceived credibility in shaping e-ID adoption, with perceived usefulness and perceived ease of use following closely. Additionally, digital literacy and perceived autonomy emerged as noteworthy predictors of e-ID adoption. Contrarily, access to ICT did not demonstrate a substantial impact on e-ID adoption. Furthermore, the findings unveiled a negative perceived cultural influence on e-ID adoption, implying that traditional cultural norms may affect the reception of new technology in Nigeria. The study proposes that policymakers and stakeholders prioritize cultivating trust and credibility when implementing e-ID programs in Nigeria. Additionally, initiatives geared towards augmenting digital literacy and enhancing the perceived autonomy of e-ID users are recommended. In essence, this research contributes valuable insights to the existing literature on citizen technology adoption by delineating the key factors shaping e-ID adoption in Nigeria. The implications of these findings are crucial for the formulation and enhancement of e-ID programs not only in Nigeria but also in similar contexts.

7. Limitations and suggestions for future research

Despite the fact that this study offers insightful information about the aspects that affect e-ID adoption in Nigeria, it is necessary to recognise some limitations. First, the study used a convenience sampling method, which might have influenced the sample's results. To achieve a more representative sample, future research may employ more exacting sampling procedures. Additionally, this study relied on respondents' self-reported data, which can be biased towards social desirability. Additionally, this study ignored the possible effects of organisational and environmental variables in favour of concentrating primarily on the individual-level factors that affect e-ID adoption. Future studies may examine how these elements affect the adoption of e-ID in Nigeria. Another limitation is that the study only looked at Nigeria. As a result, the conclusions of this study may not be applicable in other circumstances. Future studies might look at the use of e-ID in other African or emerging countries. Given these constraints, we propose that future studies explore the real adoption behaviour of e-ID and how it develops over time using longitudinal data. In addition, future studies might examine the influence of various e-ID deployment tactics on acceptance rates. Finally, future research might look at the influence of e-ID use on other areas including security, privacy, and efficiency.

References

Abdulkareem, A. K., Abdulkareem, Z. J., Ishola, A. A., Bello, M. L., & Oladimeji, K. A. (2022). The influence of openness of public organizations and social media use on e-participation: the mediating effect of trust in e-government. International Review of Public Administration, 1-16.

AbdulKareem, A. K., Bello, M. L., Ishola, A. A., & Jimoh, L. A. (2020). E-Government, information and communications technology support and paperless environment in Nigerian public universities: issues and challenges. Journal of Technology Management and Business, 7(1), 65-74.

Abdulkareem, A. K., & Ramli, R. M. (2021a). Does digital literacy predict e-government performance? An extension of Delone and Mclean information system success model. Electronic Government, an International Journal, 17(4), 466-493.

Abdulkareem, A. K., & Ramli, R. M. (2021b). Evaluating the Performance of E-government: Does Citizens' Access to ICT Matter? Pertanika Journal of Social Science and Humanities 3 (29), 1507-1534.

Ahuja, M. K., & Thatcher, J. B. (2005). Moving beyond intentions and toward the theory of trying: Effects of work environment and gender on post-adoption information technology use. MIS Quarterly, 427-459.

Alshurideh, M. T., Al Kurdi, B., Masa'deh, R. e., & Salloum, S. A. (2021). The moderation effect of gender on accepting electronic payment technology: a study on United Arab Emirates consumers. Review of International Business and Strategy, 31(3), 375-396.

Bhuasiri, W., Zo, H., Lee, H., & Ciganek, A. P. (2016). User Acceptance of e-government Services: Examining an e-tax Filing and Payment System in Thailand. Information Technology for Development, 22(4), 672-695.

Borak, M. (2023, December 21). Malaysian digital ID available to public from July 2024: Biometric Update. Biometric Update | Biometrics News, Companies and Explainers. https://www.biometricupdate.com/202312/malaysian-digital-id-available-to-public-from-july-2024

Cetin, G., & Bilgihan, A. (2016). Components of cultural tourists' experiences in destinations. Current issues in tourism, 19(2), 137-154.

Chohan, S. R., & Hu, G. (2020). Strengthening digital inclusion through e-government: cohesive ICT training programs to intensify digital competency. Information Technology for Development, 1-23.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319-340.

Deci, E. L., & Ryan, R. M. (1985). The general causality orientations scale: Self-determination in personality. Journal of research in personality, 19(2), 109-134.

Demir, M., Burton, S., & Dunbar, N. (2019). Professor–student rapport and perceived autonomy support as predictors of course and student outcomes. Teaching of Psychology, 46(1), 22-33.

Eggrickx, B., Klargaard, O., Lefort, M., & Régnard, P. (2018). E-government: a curse or an opportunity for Posts? In New Business and Regulatory Strategies in the Postal Sector (pp. 235-249). Springer.

Eke, D., Oloyede, R., Ochang, P., Borokini, F., Adeyeye, M., Sorbarikor, L., Wale-Oshinowo, B., & Akintoye, S. (2022). Nigeria's Digital Identification (ID) Management Program: Ethical, Legal and Socio-Cultural concerns. Journal of Responsible Technology, 11, 100039.

Fan, A., Shen, H., Wu, L., Mattila, A. S., & Bilgihan, A. (2018). Whom do we trust? Cultural differences in consumer responses to online recommendations. International Journal of Contemporary hospitality management, 30(3), 1508-1525.

Ferrand, C., Martinent, G., & Durmaz, N. (2014). Psychological need satisfaction and well-being in adults aged 80 and older living in residential homes: Using a self-determination theory perspective. Journal of Aging Studies, 30, 104-111.

Gefen, D., & Straub, D. (2003). Managing user trust in B2C e-services. e-Service, 2(2), 7-24.

Ghareeb, A. M., Darwish, N. R., & Hefney, H. A. (2019). E-government adoption: literature review and a proposed citizen-centric model. Electronic Government, an International Journal, 15(4), 392-416.

Gupta, K. P., Manrai, R., & Goel, U. (2019). Factors influencing adoption of payments banks by Indian customers: extending UTAUT with perceived credibility. Journal of Asia Business Studies, 13(2), 173-195.

Hilowle, M. M., Yeoh, W., Grobler, M., Pye, G., & Jiang, F. (2022). Towards Improving the Adoption and Usage of National Digital Identity Systems. 37th IEEE/ACM International Conference on Automated Software Engineering,

Kim, D. Y., Park, J., & Morrison, A. M. (2008). A model of traveller acceptance of mobile technology. International Journal of Tourism Research, 10(5), 393-407.

Kirfi, M. M., & Ishola, A. A. (2018). E-government Implementation in Nigeria: Exploring Panacea for Good Governance. Kashere Journal of Humanities, Management and Social Sciences, 2(1), 85-97.

Lampouw, Y. F., & Fajar, A. N. (2019). Evaluation of e-kelurahan information systems at subdistrict of pancoran mas depok using technology acceptance model. J. Theor. Appl. Inf. Technol, 97(3), 714-726.

Livingstone, S., & Helsper, E. (2007). Gradations in digital inclusion: Children, young people and the digital divide. New Media & Society, 9(4), 671-696.

Mir, U., Kar, A. K., & Gupta, M. P. (2022). AI-enabled digital identity–inputs for stakeholders and policymakers. Journal of Science and Technology Policy Management, 13(3), 514-541.

Mordini, E., & Rebera, A. P. (2012). No identification without representation: constraints on the use of biometric identification systems. Review of Policy Research, 29(1), 5-20.

Pöhn, D., Grabatin, M., & Hommel, W. (2021). eID and self-sovereign identity usage: an overview. Electronics, 10(22), 2811.

Rodríguez, B., & Manuel, P. (2018). User Centric Services Under the Web 2.0 Era. Coproduction, Execution and Efficiency of Public Services. In User Centric E-Government (pp. 137-158). Springer, Cham.

Shao, Z., Zhang, L., Li, X., & Guo, Y. (2019). Antecedents of trust and continuance intention in mobile payment platforms: The moderating effect of gender. Electronic Commerce Research and Applications, 33, 100823.

Shibayan, D. (2022, Sep. 16, 2022). Pantami: Nearly 90m Nigerians have registered for NIN — but there are still challenges. The Cable.

Srite, M., & Karahanna, E. (2006). The role of espoused national cultural values in technology acceptance. MIS Quarterly, 679-704.

Strauß, S., & Aichholzer, G. (2010). National electronic identity management: the challenge of a citizen-centric approach beyond technical design. International Journal on Ad-vances in Intelligent Systems, 3(1).

Sukarno, M., & Nurmandi, A. (2023). E-Government Development Index Impact on world governance indicator index in Southeast Asian countries. Journal of Contemporary Governance and Public Policy, 4(1), 97–114. https://doi.org/10.46507/jcgpp.v4i1.106

Tahar, A., Riyadh, H. A., Sofyani, H., & Purnomo, W. E. (2020). Perceived ease of use, perceived usefulness, perceived security and intention to use e-filing: The role of technology readiness. The Journal of Asian Finance, Economics and Business, 7(9), 537-547.

Van Deursen, A. J., & van Dijk, J. A. (2019). The first-level digital divide shifts from inequalities in physical access to inequalities in material access. New Media & Society, 21(2), 354-375.

Van Dijck, J., & Jacobs, B. (2020). Electronic identity services as sociotechnical and political-economic constructs. New Media & Society, 22(5), 896-914.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS Quarterly, 425-478.

Wang, J., Zhao, S., Zhang, W., & Evans, R. (2021). Why people adopt smart transportation services: An integrated model of TAM, trust and perceived risk. Transportation Planning and Technology, 44(6), 629-646.

World Bank. (2016). World development report 2016: Digital dividends. World Bank Publications.

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