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The Influence of National Digital Identities and National Profiling Systems on Accelerating the Processes of Digital Transformation: A Mixed Study Report

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Abstract: The United Arab Emirates (UAE) is a frontrunner in digitalising government services, demonstrating the successful implementation of National Digital Identity (NDI) systems. Unlike many developing nations with varying levels of success with electronic ID systems due to legal, socio-cultural, and ethical concerns, the UAE has seamlessly integrated digital identities into various sectors, including security, transportation, and more, through initiatives like UAE Pass. This study draws on the UAE's functional digital ID systems, such as those utilised in the Dubai Smart City project, to highlight the potential efficiencies and productivity gains in public services while addressing the associated risks of cybersecurity and privacy. This paper provides a comprehensive understanding of the UAE's NDI and its impact on the nation's digital transformation agenda, offering a thorough analysis of the effectiveness and challenges of NDIs, explicitly focusing on the UAE's approach.

Keywords: national digital identity (NDI); digital transformation; digital ID systems; digital governance; smart city initiatives; public sector efficiency

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1. Introduction

The UAE is one of the leading countries when it comes to the digitalisation of government services. Whereas many developing nations have implemented national electronic ID systems with different levels of success, the UAE has successfully implemented various aspects of National Digital Identities, including the UAE Pass, which has had a considerable impact in many sectors, from security and surveillance to transportation, among others. The slow adoption of digital identities in less developed and developing countries results from legal, socio-cultural, and ethical concerns [1]. Various studies reviewed multiple national identity policies and identified the specific challenges that these policies faced. The main concern in countries such as the UK, the US, and Canada was that these identities could expand the state's role. It could create a 'big brother' surveillance state [2]. Focusing on the case of the UAE Pass, this study explored the influence of a National Digital Identity (NDI) and national profiling system on accelerating the processes of digital transformation.

1.1. Defining Digital Identities

Digital identity refers to information about a person, entity, or electronic device existing within an online platform [3]. A digital identity consists of multiple pieces of information recognising an external agent. The information can include names, usernames, social security numbers, passwords, etc. Consistent with these features, Chalaemwongwan and Kurutach defined digital identity as a digital file that defines a person's unique behaviours or attributes [4]. Digital IDs also help a person receive government assistance without a passport or any other physical ID [5]. In other cases, digital identities are used to reveal a

person's civil identity. Therefore, digital identity is not only an online identity but a critical component of a person's social identity.

1.2. Digital ID Ecosystem

Several stakeholders are involved in the development and implementation of secure digital identities. The parties, technologies, and stakeholders are called the digital identity ecosystem [6]. For example, identity helps determine one's credit rating, confirm an individual is at the legal alcohol consumption age, or verify an individual as a qualified driver. In this case, digital identity can be a set of verifiable, credible personal credentials and attributes accessible to the digital world or that assist in the unique identification of the person on online and offline platforms [5].

1.3. National Digital Identity (NDI)

Governments worldwide are investing in digital identification systems. They consider these systems secure online platforms where citizens can access government services. Mir and others noted that a single-citizen digital identity system ensures that all citizens can access particular services equally, thus eliminating biases associated with physical identification [7]. NDI systems are used at different levels by various governments around the world. Germany, the UK, the United States, France, Australia, New Zealand, and Canada have all implemented some form of digital identities. For example, the United Kingdom's One Login programme allows users to create their government accounts, which they can use to access services online or through an app [8].

1.4. NDI Case Studies

As already highlighted, several countries worldwide have successfully implemented NDI systems. Some differences in NDI systems implemented by countries can be seen in the case studies of Estonia, Tunisia, and India.

1.4.1. Tunisia

Tunisia's NDI system was designed as a project to enhance the quality of administrative operations and services. The law establishing the national identity card was enacted in July 2016 [9]. Before this law, Tunisia's ID card contained a unique identifier number and barcode. The law adds an electronic chip to the card for more personal information. In the post-revolution era, the law was viewed positively as an attempt by the government to combat corruption and advance administrative reforms [10].

1.4.2. India

The Unique ID (UID) is India's national ID programme, popularly known as 'Aadhaar'. The ID programme was launched in 2008 [7]. The system is considered the largest NDI system in the world, with more than 1 billion enrollees. The government's aim in introducing the Aadhaar Unique ID was to assist the government in narrowing the gaps in welfare delivery systems by ensuring better targeting and enhancement of the efficiency of welfare delivery systems through technology [11]. The Unique Identity Authority of India (UIDAI) administers the Aadhaar ID programme. The system helps authenticate requests sent by various agencies to the Central Identities Data Repository (CIDR) database. The system also has a 'know-your-customer (KYC)' feature to help private entities authenticate and verify their customers. Over the years, Aadhaar has become the main pillar of the Union Government's Digital India programme for government services. It enables Aadhaar to tie up with several services, including banking and the internet [11]. Despite the system's relative success, it has been criticised based on several factors, such as implementation, privacy, and security and surveillance issues.

1.5. Integration of NDI in UAE's Digital Transformation Agenda

Digital technologies continue to define social, political, cultural, and economic indicators today. Over 80 per cent of the global adult population is estimated to use a digital device [12]. In addition, digital technologies are encroaching on how people raise and teach children. They have become pervasive technologies that cannot be ignored in all human operations. In this regard, the UAE government leverages smart technologies such as NDI, UAE Pass, and the national profiling system to offer high-quality, readily accessible public services to the people. Digital identification and registration are security measures that enable the government to detect unexpected activities and respond appropriately. According to Althunibat and others, internet accessibility in developing countries like the UAE has pushed the use of digital technologies to over 70 per cent [13]. The digital transformation in these countries has been aided by futuristic policies, effective enforcement of privacy and data protection rules, and transformational leadership [14]. These factors are important pillars of digital transformation in any country.

NDI is a significant pillar in most governments' transition towards a digital economy. This review showed that these governments were leveraging NDI's potential to offer public services such as welfare, healthcare, education, registration, etc. Figure 1 is based on various elements of the digital identities ecosystem.

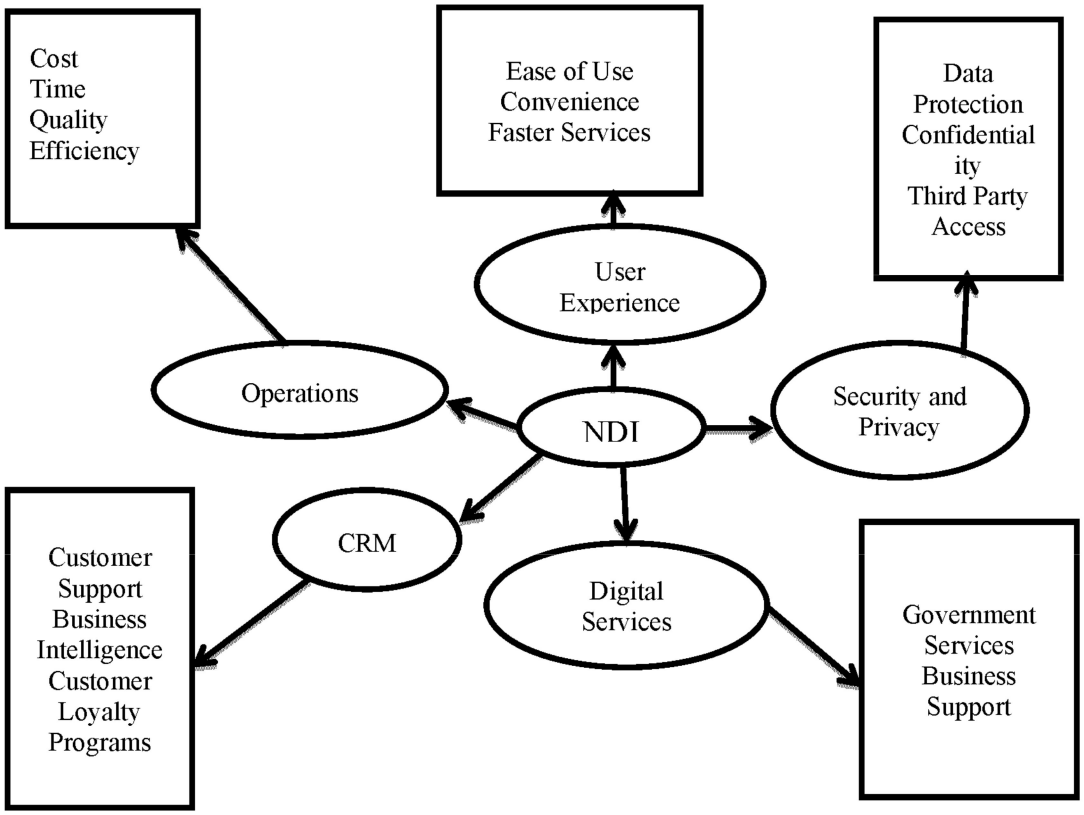

Figure 1. Conceptual model.

The model shows that NDI consists of multiple elements, including supporting digital services for governments and business support, customer relationship management, security and privacy, operations, and user experiences. The model suggests that NDI helps deliver digital services to the private and public sectors, providing business support and facilitating customer relationship management. Therefore, the model is consistent with the primary research hypothesis that predicts that the UAE's NDI adoption will positively impact the attainment of the nation's digital transformation agenda.

The review revealed that a National Digital Identity and profile system would benefit the UAE. Most importantly, these systems would enhance the access to and efficiency of

public and private services. However, the review did not determine the extent to which these systems will enhance the digital transformation of the UAE. From the review, after evaluating journal articles, conference papers, book chapters, and official organisations' website articles and reports, it was evident that some studies investigated governments adopting a national profiling system. For example, the case study of India, Tunisia, and Estonia highlighted how these governments were implementing NDI and the challenges they were facing. In addition, specific studies on the UAE showed that the country was making considerable progress towards a comprehensive national profiling system by implementing the UAE Pass. In addition, the evaluated data reported the progress and obstacles faced by countries in all parts of the world, including Singapore, Thailand, Germany, Canada, and Nigeria, among others, concerning NDI implementation.

Despite the opposition to mandatory national ID systems in many countries due to the identified concerns, many countries, including the UAE, are implementing National Digital Identity systems. These electronic ID management systems are implemented nationally and locally [11]. Moreover, they are being implemented as centralised or decentralised digital infrastructures. Nonetheless, none of the approaches are perfect. They have their weaknesses in different contexts. For instance, many existing electronic ID management systems have reported cases of abuse and concern, especially those using centralised systems [7]. Whereas decentralised systems received less criticism since citizens remained in control of their ID and data, it was more applicable at local levels, thus making data integration at the national level challenging. Furthermore, decentralised systems were more consistent with the functional ID systems than the foundational ID systems. One example of a centralised digital ID management system was India's Aadhaar system, which received a lot of criticism on privacy and data protection from local and international institutions [15].

Focusing on the UAE, the country is committed to adopting a centralised digital management system. While there are significant concerns about privacy and ethics, the country can draw lessons from its many functional digital ID systems, which have been hugely successful. For example, the country has made considerable strides in the digitalisation of the transport sector. For example, the Dubai Smart City project has made finding services such as parking in the city easier. According to Gao and others, such smart city projects ensure that locals and visitors can efficiently navigate busy cities [16]. While these digital transformation projects have different caveats concerning people's cybersecurity and privacy, a nationwide national profiling and digital identity system raises the stakes considerably [17]. Despite the security and privacy concerns, government and IT professionals have indicated that the system will significantly enhance the accessibility of public services, including security and immigration issues. UAE citizens will be safer and will be served better with these systems. An important pillar of the UAE's digital transformation agenda focuses on efficiency and productivity for the public sector and services [18]. Based on these arguments, this study needs to provide further insights into the role of National Digital Identity and national profiling systems in attaining the UAE's digital transformation goals. In line with this goal, the researcher sought to achieve the following objectives:

I. Describe the idea of National Digital Identity (NDI) and its objectives.
II. Explain the UAE's NDI and national profiling system.
III. Evaluate the relationship between the UAE's NDI and the country's digital transformation agenda.

This research highlights the importance of assessing the system's ability to facilitate the digital transformation agenda by looking at the ecosystem's elements. Intent on narrowing the knowledge gap identified using a systematic literature review process, this research will seek to answer the following questions:

I. How does the NDI system facilitate the delivery of digital services in the UAE?
II. How does the NDI system impact business operations within the UAE?
III. What is the impact of NDI systems on the user experience when accessing digital services?

IV. How is the safety and security of users' data ensured when using NDI systems to access different services and when using them as a national profiling system?

Answering these questions helps to establish how the UAE Pass is similar to or differs from other NDI systems from the digital services perspective. It provides insights into the benefits of business support and customer relationship management (CRM) offered by the NDI system. Finally, it results in a better understanding of UAE residents' perceptions of data protection and privacy with the implementation of the UAE Pass.

The structure of this paper is as follows: Section 3 discusses the materials and methods adopted in conducting the study and the justification for the methods. Section 4 discusses the findings, concludes with a discussion and result analysis.

2. Materials and Methods

2.1. Research Methodology

Our study employs a mixed methodology. A quantitative methodology enables the development of measurable and testable scales for the variables of interest and implementation of robust statistical analyses, as outlined by Khan and others [19]. The focus is on individuals who have engaged with the UAE's National Digital Identity system, UAE Pass. Quantitative methods are characterised by their reliance on numerical data, which is typically fixed and universal, allowing for precise and objective analysis. On the other hand, qualitative methodology provides additional insights into how these citizens use UAE Pass and how they are benefitting from it.

2.2. Population and Sampling

This study targeted all UAE residents aged 18 and older. To ensure a representative sample, we selected 700 participants using convenience sampling. This technique involves choosing individuals who are easily accessible to the researcher. In our study, this meant focusing on those who have interacted with the UAE Pass system. A preliminary sample of 10 individuals was used to pretest the survey, refining the questions for clarity and relevance.

The sample size of 700 is deemed adequate based on statistical guidelines, ensuring that it meets the standard distribution criteria and aligns with the population mean. Despite the exploratory nature of the study, this sample size allows for meaningful interpretation and generalisation to the broader population. Both snowball and convenience sampling techniques were utilised [20].

2.3. Data Collection

Data were collected through a survey and expert interviews. The survey, developed according to Schrepp and others [21], includes 40 questions. Thirty-three of these use a 5-point Likert scale to gauge respondents' attitudes and behaviours towards the UAE's NDI. Two open-ended questions solicit feedback on the challenges and facilitators in implementing the UAE Pass system. The survey, administered via Google Forms, takes less than 15 min to complete and ensures respondent confidentiality and trust [22].

In addition to the survey, expert interviews were conducted to gain deeper insights into the implementation of the NDI system. Interview questions were initially tested with five individuals to ensure clarity and relevance [7]. Following this pretest, interviews were conducted with 24 experts in system development and implementation. These interviews provided qualitative insights into the practical aspects of NDI and its role in the digital transformation agenda [20].

The combination of survey data and expert interviews offers a comprehensive view of NDI acceptance and implementation. The survey provides quantitative data on public attitudes, while the interviews offer detailed expert perspectives, enriching the analysis of factors influencing NDI's success and identifying areas for improvement [20].

2.4. Data Analysis

The analysis of quantitative data involved both descriptive and inferential statistics, with results presented in graphs and charts. SPSS software was used to analyse data from the 5-point Likert scale questionnaire. Correlation analysis determined the relationships between variables and their statistical significance. Spearman's rank correlation was specifically employed to assess the correlation between perceptions of NDI and the UAE's digital transformation agenda.

Qualitative data from expert interviews were analysed using content analysis methods. This approach quantifies and examines patterns, themes, and meanings within the data [23]. Content analysis enables a systematic examination of text data, including oral and written sources. Additionally, data from books, journal articles, and official documents were incorporated to provide a broader context. This method's flexibility allows it to effectively handle both quantitative and qualitative aspects of the data, making it well suited for analysing open-ended survey responses. Findings were compared with existing research on UAE's digitalization programmes and similar initiatives worldwide.

3. Results

The survey and interview were conducted to explain the various uses of the UAE Pass and its impact on the digital transformation of the UAE economy. The data helped to evaluate how the UAE Pass impacts the provision of digital services, customer relationship management, and user experience. The compilation of the results, discussion, implications, and conclusion sections followed procedures and a format similar to those of Burkhardt's dissertation on 'the effects of perceived service quality, customer satisfaction, perceived switching costs, and price sensitivity on personal automobile policy continuance intention', presented and approved by a panel of five professors at Trident University International, USA, published in the university's journal, and available on ProQuest database [24]. The format of Burkhardt's dissertation was adopted as it used a similar methodology to our study. The rest of the sections are as follows.

3.1. Data Cleaning and Coding

Of the 700 UAE residents approached, 585 provided informed consent and met the criteria for participating in the study, translating to a response rate of 83.57%. The participants were required to agree to the non-attributable, anonymous use of their quotes and data sharing for future results [24]. Also, the participants' privacy was protected and they had the right to withdraw from the study.

Of the consenting 585 residents, 5 individuals were excluded as they had not registered for the UAE Pass; thus, only 580 participants proceeded to answer the questions. After administering the surveys, 8 responses were found incomplete and subsequently removed from the analysis, implying that only 572 respondents out of a sample of 585 completed the survey, translating to a response rate of 97.78%. The response rate was high, which resulted in sufficient data to proceed with the analysis. Consequently, 572 complete survey questionnaires were numerically coded in an MS Excel sheet and then exported to an SPSS sheet for further analysis.

3.2. Participants

Data from 572 UAE citizens were used in this study analysis. These participants are summarised as shown in Table 1 below:

Table 1. Sample demographic characteristic table.

Baseline Characteristic	N	%
Age		
18–24 years	85	14.8
25–34 years	115	20.1

Table 1. *Cont.*

Baseline Characteristic	N	%
35–44 years	207	36.1
45–54 years	132	23.0
55–64 years	28	4.9
65 years and older	5	0.9
Gender		
Male	338	59.0
Female	232	40.5
Prefer not to say	2	0.3
Length of Use of UAE Pass		
Less than 1 year	66	11.3
1–2 years	169	29.0
2–3 years	146	25.3
>3 years	191	33.3
Frequency of Use		
More than once a week	125	21.8
Once a week	249	43.5
Once a month	110	19.2
Once in three months	45	7.9
Once in six months	29	5.1
Once a year	14	2.1

As shown in Table 1, all the participants in the survey were above 18 years old, with 36.1 per cent being between 35 and 44 years old, while 23.1 per cent were between 45 and 54 years old. The participants were 59.0 per cent male and 40.5 per cent female. A proportion of 98.6 per cent of the participants had registered for the UAE Pass. It is important to note that most of them have used the UAE Pass for more than one year and use it at least once a week. The demographic statistics for the survey indicate that they had attained the age of consent, had vast knowledge about the UAE Pass, and could answer the survey questions adequately.

3.3. Correlation Analysis

Based on the survey responses, a correlation analysis was conducted to determine the relationships of the variables identified in the literature. First, a correlation analysis was performed to establish the nature of the association between the usage of the UAE Pass in digital services and efficiency in government processes, as shown in Table 2. This analysis aimed to assess if the utilisation of the UAE Pass correlates with enhanced efficiency and streamlined interactions in government services.

Table 2. Correlation between usage of digital services and efficiency of government services.

		Efficiency in Government Services	Usage in Digital Services
Pearson Correlation	Efficiency in Government Services	1.000	0.863
	Usage in Government Services	0.863	1.000

The analysis found a strong positive correlation between the usage of digital services and the efficiency of government services ($r = 0.863$, $p < 0.05$). It showed that increasing the use of the UAE Pass in one service or one unit improved the efficiency of the government services by 0.863 units.

Second, a correlation analysis was performed to establish the relationship between the integration of the UAE Pass in banking and non-government services and the impact of

digitalisation, as shown in Table 3. This analysis aimed to evaluate the extent to which the adoption of the UAE Pass in banking and other sectors contributes to digital transformation.

Table 3. Correlation between integration of UAE Pass in banking and non-government services and the digitalisation impact.

		Digitalisation Impact	Integration of UAE Pass in Banking and Non-Government Services
Pearson Correlation	Digitalisation Impact	1.000	0.588
	Integration of UAE Pass in Banking and Non-Government Services	0.588	1.000

The analysis found a moderate positive correlation between the integration of the UAE Pass in banking and non-government services and the digitalisation impact ($r = 0.588$, $p < 0.05$). The findings showed that using the UAE Pass in one banking or non-government service impacted digitalisation by 0.588 units.

Third, the correlation analysis sought to determine the correlation between adopting the UAE Pass in business operations and market intelligence and customer data management, as shown in Table 4. The analysis established how leveraging the UAE Pass affects businesses' operations, particularly in gathering market intelligence and managing customer data.

Table 4. Correlation between adoption of UAE Pass in business operations and market intelligence and customer data management.

		Market Intelligence and Customer Data Management	Adoption of UAE Pass in Business Operations
Pearson Correlation	Market Intelligence and Customer Data Management	1.000	0.558
	Adoption of UAE Pass in Business Operations	0.558	1.000

The analysis found a moderate positive correlation between adopting the UAE Pass in business operations and market intelligence and customer data management ($r = 0.558$, $p < 0.05$). Using the UAE Pass in one business operation improved market intelligence and customer data management by 0.558 units.

Fourth, the correlation analysis evaluated the relationship between user engagement with the UAE Pass and perceptions of ease of use and security, as shown in Table 5. The analysis focuses on the user engagement levels with the UAE Pass and how this influences their perceptions of its usability and security.

Table 5. Correlation analysis of user engagement with the UAE Pass and perceptions of ease of use and security.

		Perceptions of Ease of Use and Security	User Engagement with UAE Pass
Pearson Correlation	Perceptions of Ease of Use and Security	1.000	0.496
	User Engagement with UAE Pass	0.496	1.000

The analysis showed that there is a moderate positive correlation between the user engagement with UAE Pass and the perceptions of ease of use and security (r = 0.496, $p < 0.05$). The findings suggest that an improved user engagement with the UAE Pass resulted in enhanced perceptions of ease of use and security of transactions using the UAE Pass.

Fifth, a correlation analysis was conducted to establish the relationship between the utilisation of the UAE Pass and the progress in the digital transformation agenda, as shown in Table 6. The analysis intended to synthesise the overall usage of the UAE Pass and its direct impact on accelerating the UAE's digital transformation.

Table 6. Correlation between overall utilisation of the UAE Pass and the progress in the digital transformation agenda.

		Progress in Digital Transformation Agenda	Overall Utilisation of UAE Pass
Pearson Correlation	Progress in Digital Transformation Agenda	1.000	0.756
	Overall Utilisation of UAE Pass	0.756	1.000

The correlation analysis in Table 6 shows a strong positive correlation between UAE Pass utilisation and progress in the digital transformation agenda (r = 0.756, $p < 0.05$). It suggests that an increase in the overall utilisation of the UAE Pass by 1 unit implied progress in digital transformation agenda by 0.756 units.

3.4. Correctness and Reliability of Statistical Tests

The statistical results from the survey and correlation analyses appear robust and reliable. With a substantial sample size of 572 UAE citizens, the demographic characteristics indicate a well-distributed representation across various age groups and usage patterns of the UAE Pass, which supports the generalizability of the findings. The correlation analyses show consistent and significant relationships across different variables. Specifically, a strong positive correlation (r = 0.863) between UAE Pass usage and government service efficiency suggests that increased usage is closely associated with enhanced service efficiency. Moderate correlations were also observed between UAE Pass integration in banking and non-government services and the impact on digitalization (r = 0.588), as well as between its adoption in business operations and market intelligence (r = 0.558). The results regarding user engagement and perceptions of ease of use (r = 0.496) and overall UAE Pass utilisation and digital transformation progress (r = 0.756) further validate the reliability of the tests. These correlations, all significant at $p < 0.05$, indicate that the analyses are statistically sound and provide meaningful insights into the UAE Pass's role in digital transformation.

Additionally, the reliability of the survey instrument was confirmed with a Cronbach's alpha coefficient of 0.89, indicating the high internal consistency of the scale items. This suggests that the survey questions reliably measure the constructs of interest and enhance the credibility of the results. Overall, the combination of the significant correlation findings and high Cronbach's alpha underscores the reliability and validity of the statistical analyses conducted.

3.5. Interpretation of Findings

The UAE Pass possesses the features of an NDI and national profiling systems. It associates the NDI with a person's unique data on the internet. These views were similar to those of the Global Government Forum [8], which explained that an NDI includes people's biometric data to increase the security and safety of identification systems in terms of privacy and data protection risks. Biometric data are a person's unique features, such

as fingerprints, facial features, and stride recognition. In line with these descriptions, Medaglia and others indicated that an NDI is the unique personal data that are used to identify, verify, and authenticate an individual on online platforms [1].

A correlation analysis confirmed another important feature of NDIs. That is, governments use NDIs to enhance the efficiency of providing government services. The correlation analysis confirmed this argument after finding a strong positive correlation between the usage of the UAE Pass and the efficiency of government services ($r = 0.863$, $p < 0.05$). This finding adds to other past studies that showed similar results. For example, Ho and Sule et al. showed that digital identification systems have several advantages for the government and users [25,26]. According to Sule and others, the primary objective of these NDI management systems should be the facilitation of government access [26]. Some of the benefits of the NDI system include enhanced verification and authentication standards, increased accuracy in identification, better security, reduced operational costs, better customer experiences, and the integration of government agency services [2]. Authentication involves establishing the party trying to access a digital service that controls another or more valid authenticators linked to the person's identity.

The UAE Pass has not only impacted government service delivery but has also considerably impacted access to banking and other private sector services. The analysis found a significant moderate positive association between the integration of the UAE Pass in banking and non-government services and the digitalisation impact ($r = 0.588$, $p < 0.05$). As the interviewees indicated, the UAE Pass can access multiple online transactions and services. For instance, the system can help access social benefits and business registration. These findings are consistent with Sullivan and Burger's study, which showed that an NDI was helpful in facilitating banking and financial services [27]. For instance, NDIs can be incorporated into online banking platforms to improve security and streamline processes.

Similarly, citizens can use their digital identities to access their bank accounts, make transactions, apply for loans, and manage their finances securely. Mcloughlin et al. suggested that NDIs were vital for healthcare and education services [28]. It facilitated the creation of healthcare scheduling, telemedicine services, and personal health records. The researchers noted that patients can use their digital identities to authenticate themselves when accessing healthcare portals and interacting with medical professionals. Concerning education, NDIs streamline administrative processes within educational institutions, allowing students to enrol in courses, access academic records, submit assignments, and communicate with their faculty securely. Additionally, digital identities can be used for online certification programmes and e-learning platforms.

The study found that the UAE Pass facilitates customer relationship management and business intelligence. For instance, the correlation analysis found that the adoption of the UAE Pass in business operations, market intelligence, and customer data management ($r = 0.558$, $p < 0.05$) was consistent with the interview data. For example, the participant in Interview III explained that the UAE Pass helped to enhance the security of online shopping and retail services by enabling secure authentication and payment processes. Customers can use their UAE Pass to access e-commerce platforms, track orders, and make purchases without the need for multiple passwords or account registrations. In line with this suggestion, Krishna explained that NDIs such as Aadhar in India provided secure authentication and identification [29]. Additionally, digital identities can be used for online check-in, boarding passes, and loyalty programmes within the travel and hospitality industries. Additionally, NDIs can be integrated into telecommunications services, enabling customers to manage their accounts, purchase mobile plans, and access customer support securely. Digital identities can also facilitate the portability of phone numbers and the activation of new services.

Similarly, Al-Khouri suggested that government-owned NDI systems such as the UAE Pass support businesses and consumers in several ways. For instance, the system can help streamline the registration and authentication processes of different services and access. Further, the systems help secure digital payments and contracts [30]. Various industries

use the technology in customer data collection while enabling their know-your-customer initiatives. According to Sullivan and Burger, digital IDs streamline the relationship between the private sector and the government in areas such as taxation, business registration, permits, and authorisations [27]. As such, the technology minimises operational costs while supporting regulatory compliance and offering fraud-secure solutions to businesses. Sullivan and Burger added that functional digital IDs facilitate the societal transition towards fully adopting digital solutions [27]. Governments' involvement in digital identities is critical due to the sensitive nature of the technology. Even when the government decides to outsource the technology, it should retain control of the digital ID framework.

Also, the correlation analysis found a moderate positive correlation between the user engagement with the UAE Pass and the perceptions of ease of use and security ($r = 0.496$, $p < 0.05$). Authentication consumer innovations like the UAE Pass improve consumer convenience. Due to digital technological innovations, customers have numerous choices in authentication and authorisation methods [31]. Customers can use facial recognition or behaviour biometrics for more secure authentication. As these developments continue, businesses must leverage innovations that assure more significant and reliable access and security. However, they must acknowledge that all authentication methods have risk profiles. Therefore, when compromised, the best authentication method should allow for quick and painless replacement [31]. As such, UAE Pass integration facilitated the progress of the country's digital transformation agenda ($r = 0.756$, $p < 0.05$). The positive correlation confirms that the UAE Pass improved the efficiency of access to government services, enhanced operational activities, and supported businesses and customer relationships in terms of intelligence, convenience, and user engagement.

Governments implementing national profiling systems have established laws and regulations that help to ensure compliance and accountability. The legal framework should ensure their digital identity systems are secure and solid. In addition, the digital identity management and governance system should incorporate the interests and expectations of various stakeholders, especially the users' privacy rights and data protection concerns. In addition, introducing a National Digital Identity model for the country should help the government implement better service delivery systems [26]. Although the interviewees agreed that the UAE Pass improved their access to government services, they suggested that it should be available to all segments of the population through user-friendly design and customer support. In addition, they should continually enhance the security features of the UAE Pass to maintain user confidence in the platform's ability to protect their data. However, before a country fully transitions to complete digital identification platforms, it must address the risk factors and uncertainties associated with the systems [32].

4. Discussion

After answering the research questions, this paper suggests implications for theory, practise, and further studies, following Burkhardt's (2022) structure [24].

The research sought to answer four questions on the UAE Pass's use, features, and operations as an NDI and national profiling system. The findings responded to the research questions as follows.

4.1. How Does the NDI System Facilitate the Delivery of Digital Services in the UAE?

In answering this question, the researcher evaluated the specific services that residents of the UAE can access using the nation's NDI system (UAE Pass). It sought to answer questions on how the UAE Pass is similar to or differs from other NDI systems from the perspective of digital services. The research revealed that there was a strong positive correlation between the usage of digital services and the efficiency of government services ($r = 0.863$, $p < 0.05$). The findings are consistent with the interviewees' responses, which showed that the UAE Pass helped governments to deliver various services to citizens, as they were convenient and accessible. The UAE Pass is a trusted channel for identity verification, meticulously designed to cater to a wide array of user needs. These findings

align with those of studies that showed that countries, including the UAE, are creating National Digital Identity and national profiling systems as components of their digital transformation agenda [12].

The study found that the UAE Pass helped the government offer multiple services to citizens. The research, through interviewees and a literature review, found that many countries were implementing NDI systems to enable them to provide secure and convenient ways of accessing online government services. Some government services offered through these platforms included tax filing, social security benefits, and healthcare services [17]. It allows the residents to access their driver's licences and vehicle registration, voting and election services, and education and public assistance programmes. Also, NDIs helped them manage utility accounts, pay bills, and access energy usage information [2,7,33].

Further, NDIs allow for access to education and healthcare services. It helped approve security credentials such as authentication and validating the citizens' identities when accessing services. In this regard, it is crucial to adopt NDIs if the government wishes to ensure greater convenience, reliability, and cost efficiency in accessing their services.

The UAE Pass is an effective platform for assessing different citizens' needs and classifying the services they should receive. For instance, the UAE government offers thousands of services to their citizens. Therefore, the government creates profiles for citizens and other residents, which they can access using usernames and passwords, biometrics, and other forms of identification. Upon gaining access, citizens can access and modify their data. Duneja et al. supported digitalising government services, arguing that it makes it easier for the government to offer services to citizens [34]. In this regard, the UAE created a National Digital Identity (NDI) system to enhance the identification of people seeking government services [3,4,33]. In addition, the UAE Pass is used in place of a national ID. This study showed that the legal framework identifies the UAE Pass as a valid ID for UAE citizens.

The UAE Pass app acts as a platform for residents to engage with the government. On the other hand, the government receives additional feedback, which is essential for improving services. Using a UAE Pass authentication application, the NDI allows people to access services from various utilities and other entities. According to AlHammadi and Lataifeh, the UAE Pass has become the primary user authentication gateway where users can access several digital services securely and conveniently [18]. NDI is, therefore, an essential pillar of the national profiling system that seeks to ensure that all citizens and residents can access various services from the comfort of their homes [32]. The system relies on user biometric authentication [18]. Based on these observations, the research examined how the NDI and national profiling system is accelerating the digital transformation of the UAE. It wants to know if NDI and national profiling systems are differentiators in the UAE's digital transformation agenda. It examined the benefits and weaknesses of an NDI and the national profiling system towards the country's digitalisation.

4.2. How Does the NDI System Impact Business Operations within the UAE?

This research sought to establish how UAE businesses are using NDI systems. In this regard, the research examined the benefits of the NDI system in terms of business support and customer relationship management (CRM). Additionally, this study revealed a moderate positive correlation between the integration of the UAE Pass in banking and non-government services and the digitalisation impact ($r = 0.588$, $p < 0.05$). The findings were supported by studies which indicated that NDIs improve the process of logging in to government or private business services using pre-verified credentials. Mitek explained that digital identities were developed using strict verification and authentication processes [15]. Therefore, for any user to use them, they must pass all the checks needed to create their credentials. The identity is, therefore, secure when the user passes the verification. Due to this, future login processes will be secure and seamless. The NDI systems consolidated identity management across many devices and online platforms. In the past, businesses

and private users navigated many distinct identity systems for every service they needed. Service vendors had to develop their identity infrastructure and implement it effectively [2].

For businesses, NDIs allow users to access several services without needing physical documents. It offers efficiency and convenience. With the UAE Pass, the interviewees indicated that individuals can access government and private sector services seamlessly through a single digital platform. It streamlines processes and reduces the time and effort required for individuals to interact with different entities, enhancing efficiency in business operations [31]. Also, it enhanced efficiency by reducing administrative burdens and associated costs for businesses, making operations smoother and more cost-effective. NDI systems such as the UAE Pass employ advanced encryption and security measures to protect users' data and identities. It also enhances trust and confidence in digital transactions, which is crucial for businesses conducting online operations and transactions. Additionally, NDIs incorporate private sector services, including business-related services such as company registration, licence renewals, visa processing, etc. This integration makes it easier for businesses to promptly fulfil regulatory requirements and access necessary services [5].

Consequently, the UAE government encourages businesses to embrace digital transformation using the UAE Pass to streamline their businesses. It can lead to the development of innovative digital products and services and improved competitiveness in the global market. NDIs such as the UAE Pass create value for businesses. According to Morabito, secure application programming interfaces (APIs) open corporate information silos, thus improving business functionality [32]. APIs support the business model, allowing data sharing with digital ecosystems, mobile devices, and external developers. APIs use digital identities to authenticate participants in data exchange while preventing data leakages. Partners within the identity services framework also depend on consumer identity systems to understand data sources, their sources, and consent requirements [35]. Digital identity systems also support the Internet of Things (IoT), where a network of objects is connected to collect and exchange data based on embedded sensors as they create smart homes and workplaces and support data exchange. Moreover, more than 20 billion devices will be connected by 2025. IoT systems involve the management of securely connected devices and data through multiple connection points, thus making them susceptible to cyberattacks. Digital identities allow companies to reduce vulnerabilities concerning their customer security and privacy [31].

4.3. How Do NDI Systems Impact the User Experience When Accessing Digital Services?

In answering this question, the research examines how users of the NDI system feel about it. It seeks to determine whether adopting the UAE Pass has improved people's experiences regarding access to government services. The research found that the UAE Pass resulted in an improvement in user experience when accessing services. For instance, the UAE Pass enabled access to multiple services with a single set of credentials, implying a simple login process and reducing the need to remember numerous usernames and passwords, thereby enhancing convenience. Van de Sand supported this argument, suggesting that NDIs facilitate seamless access to services across different devices and platforms [36]. Users can start an activity on one device and seamlessly continue it on another without repeatedly logging in or re-entering personal information. Crossman explained that streamlined authentication processes reduced friction in accessing digital services, resulting in smoother user journeys and reducing the likelihood of users abandoning tasks due to frustration with complicated login procedures [6].

The findings demonstrated that NDIs improved user accessibility by providing options for alternative authentication methods, such as voice recognition or fingerprint scanning. This ensures that diverse users can securely access digital services without facing barriers. The personalisation or customisation of services is another way NDIs improve access to services. Service providers can offer personalised experiences tailored to individual users. Overall, NDIs significantly influence the user experience by balancing convenience,

security, personalisation, and trust, ultimately shaping how users interact with and perceive digital services.

4.4. How Is the Safety and Security of Users' Data Ensured When Using NDI Systems to Access Different Services and as National Profiling Systems?

Answering Question 4 provides insights into the security and privacy issues associated with implementing the NDI system. It explores the perceptions of UAE residents regarding data protection and privacy with the implementation of the UAE Pass. This study showed that the UAE Pass was an effective digital identity as it guaranteed the protection of users' data. It ensures that there is sufficient respect for privacy rights, including mechanisms to protect individuals from identity theft, fraud, and other risks associated with digital identities and provides a user-friendly interface that makes it easy for individuals to access and use their digital identities and for entities to verify these identities quickly and efficiently.

NDIs result in an enhanced risk of identity theft or data fraud. For instance, third parties can easily steal identification information; thus, many individuals can use a single identity without detection. According to TechTarget, digital identity correctly captures relationships and behavioural history across many apps and websites with only 95% accuracy [3]. The analysis found that the UAE Pass included features synonymous with a profiling system. For instance, the analysis found a moderate positive correlation between the adoption of the UAE Pass in business operations and market intelligence and customer data management ($r = 0.558$, $p < 0.05$) and a moderate positive correlation between user engagement with the UAE Pass and perceptions of ease of use and security ($r = 0.496$, $p < 0.05$).

Digital identities are exclusive to specific services or multiple services. Verification refers to determining if the claimant possesses or controls the authenticator or identity using the authentication protocol [1]. As the world becomes hugely dependent on digital technologies, blockchain digital identity has become essential in developing National Digital Identity management systems. However, the technology still faces challenges with legal and political rights and its range of applications.

This research indicated that NDI and national profiling systems contribute to the digitalisation of a country in several ways. The UAE Pass is an example of an NDI and a national profiling system as it allows for gathering, identifying, verifying, and authenticating UAE residents' identities. As an NDI, users can use it as a valid ID to access government services, including healthcare, social security, education, and employment needs, amongst other things. They can also use it to access services that private entities such as banks and insurance companies offer. In addition, businesses use IDs to maintain customer records and facilitate customer relationships, thus allowing them to offer better services. Also, the UAE Pass, as a national profiling system, helps the government verify and authenticate citizens accessing any service. It can also be used to facilitate security investigations as the NDI database includes fingerprints and other biometric data that make it easier to identify people. While it is evident that the UAE Pass aligns with the country's digital transformation agenda, the system raises significant privacy, security, and data protection issues. As seen in other case studies on NDIs, privacy and data protection measures can be the difference between the success and failure of a national profiling system. Therefore, the UAE government should ensure that they implement initiatives that improve users' privacy and data protection.

4.5. Weaknesses of the Evidence

The evidence from this research presents several limitations that impact the overall conclusions. Despite the strong positive correlation between UAE Pass usage and the efficiency of digital services, this study's reliance on interviewee responses and existing literature may introduce bias or a narrow perspective on its effectiveness. The correlations observed between UAE Pass integration and various business and user benefits, while

significant, are moderate and do not establish causation, leaving room for other factors influencing these outcomes. Additionally, while the research addresses the UAE Pass's impact on convenience and security, it may not fully capture the nuanced privacy concerns and potential risks of identity theft inherent in such systems. This study also highlights the UAE Pass's role in national profiling, but lacks an in-depth analysis of the broader implications of data aggregation and surveillance on personal privacy. Therefore, while the findings are promising, they must be interpreted with caution, and further research is needed to explore these dimensions comprehensively.

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