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The Impact of Harnessing Total Quality Management Studies on the Performance of Smart Applications: A study in Public and Private Sectors in the UAE

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Abstract

This study explores the complex environment of smart applications technology in the UAE's public and private sectors, looking into the complex interactions between technological adaptability and accessibility as well as the effects of Total Quality Management (TQM) studies presented by policies and regulations. Data was collected by a multistage sampling strategy, mixing probability and non-probability methods, using a cross-sectional research design. To ensure impartial item creation and adherence to best practices, a pretested questionnaire underwent extensive examination. Through the revelation of unexpected results, the research tests and expands upon the Technology Acceptance Model (TAM). There is a request for an enlarged TAM framework because there is no substantial correlation found between accessibility and the performance of smart applications. A negative link is resulted, unexpectedly, between technology adaptation and TQM adoption, underscoring the necessity of a cautious integration strategy. The report also emphasizes how important TQM policies and regulations are to the functioning of smart applications, supporting the need for a thorough TAM framework that takes in regulatory dynamics into consideration. Practical implications for stakeholders, quality policymakers, and institutions are presented by the findings, which highlight several adoption aspects beyond accessibility. This research adds a contribution on smart application performance and develops theoretical models for integrating technology in organizational settings. The rigorous design of the methodology highlights the integrity of the study and guarantees the validity of the insights obtained from the investigation.

Keywords: *Smart Applications, Total Quality Management, Digital Transformation, TAM model, UAE, Policies, Accessibility, Technology.*

Introduction

Technology has changed the industry, leading to a major shift in the processes for producing goods and services in recent years. This has forced both public and private businesses to adopt new technologies, improve their quality, and meet the demands of a rapidly changing digital landscape (Amiel & Reeves, 2008; Abdallah et al., 2022; Aljasmi et al., 2022; Habes et al., 2022; Salloum et al., 2017; Núñez-Canal et al., 2022). Being at

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the forefront of technology adoption in both the public and private sectors, the United Arab Emirates (UAE) attracts international entrepreneurs looking for high-quality implementation, professional experiences, or post-study career opportunities (Rubin, 2002; Akyeampong, 2000; Alwaely et al., 2022; Crawford et al., 2020; El Nokiti et al., 2022; Zainal & Salloum, 2021; Alghizzawi et al., 2019; Salloum et al., 2016). Even yet, there are still a number of problems and opportunities to take into account when integrating technology in public and private sectors in the United Arab Emirates.

The digital divide between professionals and staff at public and commercial enterprises is one major challenge (Crawford et al., 2020; Eze et al., 2020; Saada et al., 2022). Disparities in technology access and utilization still exist, despite the increased availability of digital technologies, especially for applications from underprivileged backgrounds (Becker, 2007; DiMaggio et al., 2004; Robinson et al., 2020; Tawfik et al., 2016). The entire efficacy of technology adoption in the public and commercial sectors may be hampered by this digital divide since it may lead to unequal access to opportunities and high-quality resources (Dewan & Riggins, 2005; Lembani et al., 2020; Reddick et al., 2020). The difficulty of maintaining quality in the face of swift technological development has also been highlighted in earlier research (Brynjolfsson & McAfee, 2012; Zhu et al., 2022). Public and private organizations must constantly update their systems and infrastructure in response to technological advancements. This can be very expensive, especially for smaller organizations with tighter budgets (Aburayya et al., 2020; Shahin et al., 2021; Dagiene et al., 2022; Dahu et al., 2022; Potter et al., 2022).

Technology adoption in the UAE's governmental and business sectors offers a number of opportunities despite these challenges. According to Divjak et al. (2022) and Jain et al. (2022), technology has the potential to boost learning outcomes, increase engagement with new applications, and facilitate professional and expert collaboration and communication. Additionally, according to Al et al. (2023) and Nan et al. (2022) technology can enable customized learning and provide access to a range of corporate resources and tools.

Public and private businesses in the United Arab Emirates are about to implement interactive technology such as block chain smart applications in light of these opportunities and concerns surrounding digital transformation (Aburayya et al., 2023; Al et al., 2023; Chengoden et al., 2023; Shwedeh et al., 2023a). Smart applications, a virtual environment where users may communicate with digital items and one another, have drawn interest as a possible tool for improving business procedures in the UAE's governmental and commercial sectors. Improving professional engagement and performance outcomes is one of the most important advantages of smart application performance in both public and commercial enterprises. Businesses can engage in role-playing games and simulations, immerse themselves in interactive, networked settings, and more within the smart applications. Businesses can communicate with partners from a variety of industries and scopes, engage in role-playing operations and simulations, and fully immerse themselves in dynamic, connected ecosystems within the smart applications. Employees are more equipped to meet the needs of the digital era workforce because to this immersive experience, which also fosters deeper access and critical analysis abilities.

However, adopting the smart applications in public and private companies also presents challenges, particularly regarding accessibility and adaptability. Not every employee has access to the devices and programs needed to use the intelligent apps. Not all professionals are equipped with the necessary knowledge and abilities to plan and lead digital activities in this setting. Furthermore, organizations with limited resources may face budgetary constraints due to the regular updates and infrastructure upgrades required by the quick rate of technical progress in smart applications.

In addition to the challenges above and the prospects of adopting technology in public and private companies in the UAE, the role of TQM studies in building the policies and guidelines emerges as a crucial moderating factor. Given the rapid advancement of technology and the potential impact of the smart applications in public and private sectors (Koohang et al., 2023; Salloum et al., 2023) because well-defined TQM policies and guidelines can help address the issues of accessibility and adaptability (Armitage, 2005; Grenon et al., 2023). By ensuring equal access to required technology and applications, TQM policies can close the digital divide that exists between businesses, professionals, and entrepreneurs. Moreover, policies can support businesses' efforts to improve staff members' abilities and knowledge in creating and managing hands-on learning experiences within smart applications (Lasica et al., 2020; Lee & Hwang, 2022; Ravikumar et al., 2022). Therefore, the following goals are the focus of this research:

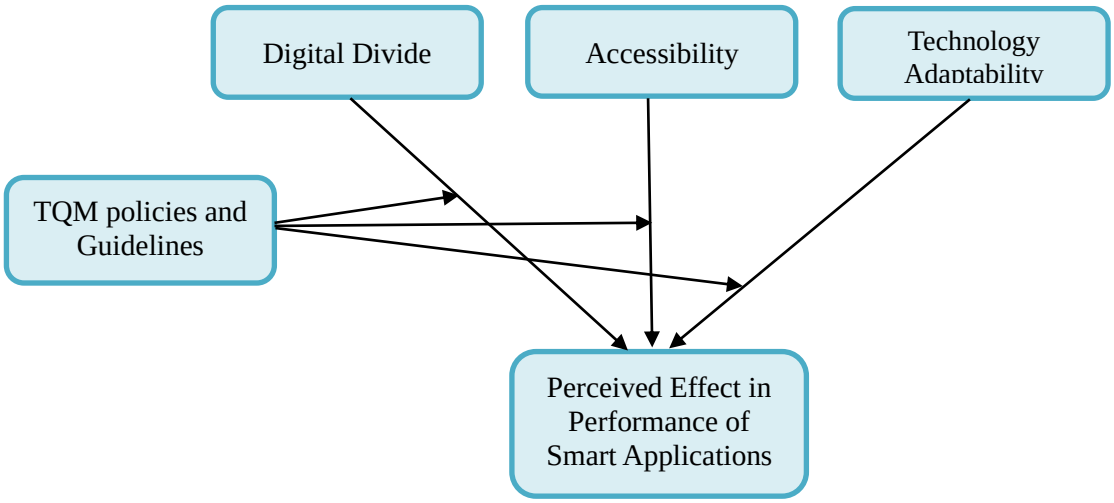
i. To examine investigate the perceived role of the digital divide on the effectiveness of performance of smart applications among public and private companies.

ii. To investigate the significant influence of smart applications technology accessibility on its adoption effectiveness among public and private institutions.

iii. To investigate the perception of employees on the relationship between technology adaptability and effectiveness of performance of smart applications among public and private companies.

iv. To examine the moderating role of TQM policies and guidelines on the relationship between the digital divide, technology accessibility, and adaptability on effective smart applications technology adoption among public and private institutions in the UAE.

Based on these objectives, the research framework is below.



Review of Relevant Literature

The Role of Technology in Smart Applications Performance

The revolution has been brought about by technological innovation, particularly in the corporate sector. According to Collins & Halverson (2018), Green & Gilbert (1995), Shwedeh (2021), Kaddoura & Al Husseiny (2023), and others, it has transformed goods and services. E-commerce has given public and private businesses new ways to access and engage with market information, ranging from walk-in customers to digital businesses (Bogner & Menz, 2009; Jacob & Furgerson, 2012; Gustafsson & Ollila, 2003). Technology has improved business acumen and enables entrepreneurs to learn at their

own pace, claim Green and Gilbert (1995). Similarly, as technology has advanced, entrepreneurs can now customize their businesses to meet their professional goals which is available in many tools like podcasts, movies, virtual worlds, and audio (Díaz et al., 2020; Tugtekin, 2023; Vermesan & Friess, 2013).

Furthermore, integrating technology into the corporate system facilitates easier business communication, fosters teamwork, and offers chances for collaborative learning (Divjak et al., 2022; Jain et al., 2022). Similarly, businesses can collaborate on projects and databases regardless of their geographical location by using digital tools like shared points and blockchain (Sánchez & Hueros, 2010; Suki & Suki, 2011; Wang et al., 2022).

Additionally, the integration of technology into the business system uses smart simulations to produce more engaging and immersive work environments in a global setting. Suppliers can provide smart proposals of supply chains and concepts in a novel way by engaging way with the use of virtual reality platforms (Alwaely et al., 2022; Crawford et al., 2020). Professionals' comprehension and retention of applications, as well as their desire to learn more about the newest cutting-edge facilities, which have been observed to enhance using this operational strategy (Kaddoura & Al Husseiny, 2023; Wang et al., 2022).

Overview of the Smart applications Concept and its Adoption in Public and Private Companies

Technology for smart applications is one of the most recent developments in this field. Blending virtual and physical reality, it is a shared common virtual space (Shwedeh et al., 2021; Mystakidis, 2022; Kye et al., 2021; Spajić et al., 2022). Through a variety of devices, including PCs, cellphones, and virtual reality headsets, users can access this completely immersive and interactive world (Vermesan & Friess, 2013; Díaz et al., 2020; Shwedeh et al., 2020).

In recent years, the concept of smart applications has drawn more attention from both public and private companies because of its potential benefits. These benefits include increasing business motivation and engagement (Chen & Zhang, 2022; Díaz et al., 2020; Joshi et al., 2023; Tugtekin, 2023) and providing immersive learning experiences that simulate real-world scenarios (Akour et al., 2022; Dincelli & Yayla, 2022; Tan et al., 2022). As to the findings of Joshi and Pramod (2023), Jovanović and Milosavljević (2022), and Dincelli and Yayla (2022), smart applications and technology facilitate cooperative monitoring and exchange of knowledge among workers and professionals. A typical example of performance of smart applications is a virtual work environment called Second Life, the University of Texas at San Antonio (UTSA), which allows staff to explore and interact with virtual representations of real-world settings. The project improved learning results and raised staff engagement. Similar to this, implementing smart applications in public and private sectors has its share of challenges, including those related to affordability, accessibility, and flexibility (Allam et al., 2022; Salameh et al., 2022; Dwivedi et al., 2023; Shwedeh, 2024).

Barriers and Challenges to Performance of Smart applications in Public and Private Companies

Notwithstanding the possible advantages of smart application performance, a number of challenges and difficulties are addressed. Concerns about pricing and accessibility are important ones for businesses as well as employees. In order for many professionals to use smart applications-based systems, they may require access to the required infrastructure and technology. In a similar vein, businesses might require additional resources to supply the fundamental framework and assistance needed for smart application performance.

Limited institutional support and lack of user awareness are additional issues that have been found to be barriers to the adoption of smart applications and to their performance

(Abdallah et al., 2022; Chen et al., 2022; Tan et al., 2022; Vermesan & Friess, 2013; Xu et al., 2022). It is possible that many professionals are unfamiliar with the idea of smart applications or lack the abilities and know how needed to successfully integrate it into their work processes. In light of this, Dincelli and Yayla (2022) as well as Hwang and Chien (2022) contended that organizations need to have the technical infrastructure required to support complicated and expensive smart applications-based systems.

The performance of smart applications and their implementation among public and private institutions are also significantly hampered by technical challenges and infrastructure requirements, as evidenced by previous research (Chen et al., 2022; Tan et al., 2022). This is in line with findings from studies by Vermesan and Friess (2013) and Xu et al. (2022), which highlight the importance of technology in providing a quick and dependable internet connection to facilitate seamless user-environment interaction. Similarly, the effective implementation of smart applications in public and commercial organizations depends on the availability of strong hardware to support them (Shwedeh et al., 2020; Akour et al., 2022; Dincelli & Yayla, 2022; Shwedeh et al., 2022a). This can be a challenge for public and private institutions that may need more money to invest in high-end hardware (Green & Gilbert, 1995).

For smart applications to function in both public and private businesses, a number of infrastructure needs must be satisfied. Supporting multiple users in a virtual environment is one of the main needs for infrastructure. Millions of users are expected to benefit from smart applications, thus both public and private businesses need to make sure their virtual environments can support this demand (Díaz et al., 2020; Joshi & Pramod, 2023).

Strong security measures are another essential for infrastructure. Public and private organizations must make sure their virtual environment is safe from cyber attacks since smart apps are a shared virtual space (Chen & Zhang, 2022; Dwivedi et al., 2022). To secure user data, this entails using firewalls, encryption, and other security measures (Qamar et al., 2023; Chen et al., 2022). Furthermore, it is imperative that both public and private establishments acknowledge the possibility of cyberbullying and harassment within smart applications and implement preventive measures accordingly (Alkashami et al., 2023; Joshi & Pramod, 2023; Tugtekin, 2023)

Lastly, consideration needs to assure the privacy and ethical issues surrounding the use of smart applications in both public and private sectors. For example, employing smart applications-based systems platforms that contain sensitive data may affect databases privacy and security vulnerabilities (Kaddoura & Al Husseiny, 2023; Tugtekin, 2023).

Relationship between Smart applications Accessibility and Effective Performance of Smart Applications

In recent years, there has been a significant increase in scholarly interest in evaluating the correlation between the accessibility of smart applications and their effective performance across many industries. Early on, smart applications developed into a social media avalanche where users engaged with the virtual environment. But as time has gone on, the exchanges have shifted to social media and sectors like governmental and private institutions, construction, and health care (Dwivedi et al., 2023; Gupta et al., 2023; Ravikumar et al., 2023).

In light of this, numerous debates concerning the connection between smart application usability and accessibility have been raised. A number of studies, including (Dwivedi et al., 2023), (Gupta et al., 2023), (Talam and Kalinkara, 2022), and (Zallio and Clarkson, 2022), have found a substantial correlation between the accessibility of smart apps and their efficient operation. According to their research, the efficacy of smart application technology increases with managed access. Similarly, a study conducted (Shwedeh et al., 2021) confirms the strong correlation between the practical implementation of smart applications and their accessibility.

On the other hand, (Sharma, 2022) points out that not everyone has access to smart application technologies. Furthermore, the results of the research conducted by (Xu et al., 2022) confirm the important part that accessibility of smart applications plays in guaranteeing the successful adoption of these applications by both public and private enterprises.

Relationship between Digital Divide and Effective Performance of Smart Applications

After a thorough examination of the digital divide's many facets, researchers have identified key factors that contribute to the continuation of this digital divide. The main factors determining digital accessibility and competency include socioeconomic stratum, geographic location, age cohorts, educational attainment, and cultural diversity (Bansode & Patil, 2011; Company, 2001; Salinas, 2003). For underprivileged communities, the lack of a strong digital infrastructure—best represented by dependable internet connectivity—presents a significant obstacle. Moreover, the digital divide unabatedly maintains the inequalities that already exist in society, negatively affecting the ability of marginalized people to obtain materials from businesses, gainful employment, and necessary public services (Budhram, 2014; Gautam, 2021; Pick, Sarkar & Parrish, 2021; Ravikumar et al., 2022).

Parallel to this discussion, the emerging notion of smart applications raises important questions about how the digital gap is being exacerbated. A certain level of digital fluency and unrestricted access to the necessary technological tools are necessary for the successful integration of the smart applications (Davidson, 2022; Tramacchi, 2006). A glaring failure to address the digital divide in the context of smart applications could lead to a situation in which certain people and groups are excluded from the multitude of advantages of virtual social interaction, experience diversity, and emerging opportunities for entrepreneurship. It follows that closing the digital gap must come first as a fundamental requirement for achieving the inclusive and equitable adoption of smart applications.

Nonetheless, it is important to recognize that smart applications may offer ways to address some aspects of the digital divide (Shwedeh et al., 2021; Truong et al., 2023; Wider et al., 2023). Through leveraging its virtual environment, the smart applications have the potential to function as a powerful medium for distance work operations, skill development, and information sharing, which would mitigate the companies' inequalities exacerbated by the digital divide (Ericson, 2001; Lawhead, 2022; Shwedeh et al., 2022b; Ravikumar et al., 2023). Furthermore, the virtual environments created by the smart applications may provide a conducive environment for historically underrepresented voices to be amplified, creating a dynamic platform for advocacy and collective empowerment (Anderson et al., 2021; Venkatesh, 2014).

Relationship between Technology Adaptability and Effective Performance of Smart Applications

A comprehensive review of several studies indicates that there is broad agreement regarding the critical role that technological flexibility plays in determining the effective adoption of smart applications. According to empirical findings, users must quickly assimilate, integrate, and utilize new technological features due to the complex and dynamic nature of smart applications (Khadragy et al., 2022; Shwedeh et al., 2022b; Gómez-Zará et al., 2023). Scholars discourse highlights how higher degrees of technological adaptability enable people and things to effectively traverse the complex virtual environments of the Smart applications, promoting smooth interactions, cooperative interactions, and creative explorations (Diwedi et al., 2022; Ullah et al., 2023). In order to maximize this adaptability, researchers suggest implementing user-centric interfaces and customized educational programs aimed at accelerating technology adoption among potential users of smart applications. However, despite these advancements, issues like the digital divide, natural resistance to new technological

paradigms, and unanticipated, potentially catastrophic outcomes must be acknowledged (Hennessy et al., 2005; Jain & Ranjan, 2020; Hollnagel, Woods & Leveson, 2006; Kaufman, 2012; Aburayya et al., 2023).

Relationship of TQM policies and Regulations for Promoting Equitable and Effective Performance Use of Smart applications in Public and Private Companies

In the last several decades, a number of TQM policies and recommendations have been developed to help public and commercial sectors adopt, implement, and promote smart application use that is equitable and effective (Shwedeh et al., 2022a; Wang et al., 2022). One approach for assessing the efficacy of working efforts based on smart applications has been created by the EDUCAUSE Learning Initiative (ELI). Six categories make up the framework: content, assessment, technology, learning, teaching, and support. Similarly, recommendations for creating and facilitating smart application-based learning experiences are part of the guidelines that the Online Learning Consortium (OLC) has created for the use of immersive virtual environments in smart businesses.

Several academic studies highlight the critical function that TQM policies and regulations play in fostering an atmosphere that is favorable to the broad implementation of smart applications. According to academics, clear, well-organized regulations provide users and businesses using smart applications with a sense of security (Ali & Osmanaj, 2020; Darko & Chan, 2018; Dahu et al., 2023; Salloum et al., 2023a). Therefore, capable TQM policies can successfully allay worries about data privacy, IP rights, and virtual economy operations, building user trust and encouraging increased engagement (Walsh et al., 2019; Salameh et al., 2022).

The relationship between smart applications and TQM regulations is also evident in the economic domain (Allam et al., 2022; Salloum et al., 2023b). Scholarly research suggests that favorable tax incentives and regulatory frameworks might draw investments and stimulate the emerging smart applications-related industries (Dubey et al., 2022; Dwivedi et al., 2022). Regulations that are at odds with the goals of smart applications, on the other hand, may discourage investment and prevent the ecosystem's natural development. Moreover, (Nugroho et al., 2022) provide evidence that disparate TQM policies and regulations may exacerbate the digital divide in society.

The TQM policies and regulations that oversee smart applications are further tightly intertwined with ethical and societal elements. Scholars discuss how important it is for TQM regulations to address issues related to virtual identities, digital citizenship, and online behavior. TQM rules provide the fundamental framework for an inclusive and equitable smart applications environment by establishing normative guidelines for responsible virtual interactions (Dwivedi et al., 2022; Tan, 2021; El Nokiti et al., 2022).

RESEARCH UNDERPINNING THEORY

The theory of acceptance model (TAM) is shown to be a suitable theory to support this analysis. The elements influencing a person's adoption and usage of technology are explained by the widely used theoretical framework known as Technology adoption Model (TAM) (El-Masri & Tarhini, 2017; Kim et al., 2015; Zhang et al., 2019; Shwedeh et al., 2023c). It implies that perceived usefulness and ease of use are important factors in determining whether or not technology is adopted (Sagnier et al., 2020; Suki & Suki, 2011; Sun & Gao, 2020). Perceived usefulness, on the other hand, describes how much a technology is thought to help achieve particular objectives (Davis, 1989; Sun & Gao, 2020), and perceived ease of use describes how much a technology is thought to be simple to use (Sánchez & Hueros, 2010; Suki).

Applying the TAM to performance of smart applications in public and private sectors, researchers can investigate how professionals and administrators perceive the usefulness

and ease of use of smart applications technology and how these perceptions impact their decision to adopt it (Andembubtob et al., 2023). Additionally, the TAM can be used to explore how training and support provided to professionals and administrators influence their perceived ease of use of smart applications technology and, consequently, their willingness to use it (Almaiah et al., 2022; Almarzouqi et al., 2022).

In summary, the Technology Acceptance Model (TAM) offers an extensive theoretical basis for studying the performance of smart applications in both public and private companies, and it offers a valid framework that comprehend the acceptance of new technologies.

METHODOLOGY

In order to investigate the significant influence of specified factors on the effectiveness of performance of smart applications in public and private companies in the United Arab Emirates, this study adopts a cross-sectional research design. The data samples were obtained using a meticulous multistage sampling approach that combined non-probability and probability sampling techniques. First, as a key sample source, a company with a strong background in smart applications technology was chosen. After that, the survey link was sent to both public and private businesses companies. Professionals working for these companies, as well as quality technologists, were recruited to help their contacts who had already adopted smart applications technology in their respective organizations propagate the survey.

An extensive pretesting process comprising three specialists and two quality technologists was conducted on a pre-designed questionnaire prior to this step. The objective of this pretesting was to guarantee objectivity in the item creation, minimize possible mistakes related to the wording and organization of the questions, and comply with accepted best practices (Murray, 1998; Ruel, Wagner III & Gillespie, 2015).

Meanwhile, staff members who worked in technology were randomly given links to the survey, and other staff members received barcodes that took them to the survey website. This method did not help the researchers predict the necessary sample size, therefore they used the G*power 3.1.4 program to perform a power analysis test (Cohen, 2016; Wang & Rhemtulla, 2021; Jasri et al., 2022). A recommended sample size of 130 was obtained from this power analysis for the crucial F-test analysis, which included a multiple linear regression fixed model with an r-squared departure from zero. Over the course of the estimated one-month data collection phase, about 250 replies were obtained. Thus, the reply link was later disabled, and all of the collected data was thoroughly examined.

Variable Definitions and Measurements

This study defined the investigated constructs precisely before measuring the variables (Peter & Churchill Jr, 1986). In doing so, the construct metrics were made explicit. Moreover, Willits et al. (2016) state that the Likert scale was used to quantify the components in this inquiry. One (1) indicates strongly disagree, and five (5) indicates strongly agree.

Digital Divide

The disparity between groups or individuals who have access to and effectively use digital technologies—such as the internet and personal computers—and those who do not—was defined in this study as the "digital divide" (Bansode & Patil, 2011; Compaine, 2001; Salinas, 2003). With this in mind, the items utilized to measure the digital divide construct were modified from research by Bansode and Patil (2011), Company (2001), and Correa, Pavez, and Contreras (2020). Based on data from past studies, it can be concluded that the concept of the "digital divide" is multifaceted, encompassing factors such as differences in location, usage habits, affordability, digital literacy, skills, and

internet speeds and quality; it also includes factors like ownership of internet-access devices and internet penetration. However, by modifying six (6) items from research (Srinuan & Bohlin, 2011; Aburayya et al., 2019; Correa et al., 2020; Badiuzzaman et al., 2021; Khallouk et al., 2021; Mouzaek et al., 2021; Alkashami et al., 2023), this study evaluates the digital divide as a unidimensional construct. The six modified objects are:

i. I have access to the smart application internet regularly.

ii. I can easily connect to the smart application via internet from my location.

iii. I access the network through a smartphone device.

iv. In my company, I have enough gadget by which I can access smart application technology that enhance data sharing and operations.

v. I feel confident using digital technology tools in my company.

vi. I am familiar with different smart platforms provided by my company.

Accessibility

Construct accessibility is defined in this study as a state in which consumers have unconstrained access to digital devices that improve seamless experiences (Roche, 2020; Khadragy et al., 2022) and enable users to effortlessly access online material from smart applications (Neckermann, 2015). Similar to the multidimensional concept of the "digital divide," "digital accessibility" is employed as a single-dimensional construct in this study.

i. In my company, there are many access points to public Wi-Fi.

ii. Professionals of any business background have easy access to smart applications resources by my company.

iii. My company provides the needed infrastructure to ease the hassle of accessing smart applications resources.

iv. I believe the availability of E-Systems with several advanced educational resources (instructions, guidelines) grant easier access to smart resources.

v. Everybody in my locality has direct access to the smart application guidelines that encourages easy access.

Technology Adaptability

According to this study, technological adaptation is the process by which businesses, both public and private, are able to engage with technology advancements in an effective and efficient manner (Dahlman et al., 1987; Ghavifekr & Rosdy, 2015; Shwedeh et al., 2023b). Because of this, the technological adaptability measurement items were derived from a variety of studies, including but not limited to Djokovic and Souitaris (2008), Kintu, Zhu, and Kagambe (2017), Reguera and Lopez (2021), and Selim (1907). In total, six items were developed in this regard. These are:

i. Smart technology tools, such as online interactive meeting, block chain apps, or virtual reality resources, are commonly used in your company.

ii. Professionals demonstrate strong technological competency in effectively interacting with digital tools and resources.

iii. The digital infrastructure, internet connectivity, bandwidth, and technology resources effectively support seamless technology interactions.

iv. The company actively engages in research and innovation related to technology in business and is open to exploring emerging technologies for potential adoption.

v. The company collaborates with technology agencies, organizations, or other smart institutions to stay informed about technological advancements and possibilities.

vi. Adequate training and professional development opportunities are provided to professionals and staff to enhance their technology skills and knowledge.

Performance of smart applications

Performance of smart applications in public and private companies pertains to the active integration and utilization of immersive and interactive virtual environments, known as the 'smart applications,' within business companies. The smart applications encompasses virtual reality (VR), augmented reality (AR), and other advanced technologies, fostering real-time interactions and experiences (Capuyan et al., 2021; Al Husseiny & Abdallah, 2023; Chengoden et al., 2023; Sotolongo, 2023).

i. The company utilizes smart applications-based collaborative research spaces to facilitate cross-disciplinary research initiatives.

ii. Professionals are encouraged and supported in integrating smart applications technologies into their business activities.

iii. The company provides ample opportunities for professionals to engage in experiential learning simulations through smart applications technologies.

iv. The smart applications utilized in the company enhance the depth and quality of business content.

v. The company fosters a culture of innovation and experimentation in using smart applications technologies for business purposes.

vi. The company offers virtual tutorials and orientations using smart applications platforms for prospective professionals.

TQM policies and Regulations

TQM policies and regulations refer to the rules, guidelines, and protocols established by governing bodies and institutions to control virtual reality (VR), augmented reality (AR), and other immersive technologies within virtual environments. To measure policies, items were adapted from studies that include Armitage (2005), Grenon et al. (2023), and Wang et al. (2022). The items are listed as follows:

i. The company has clear guidelines regarding data privacy and security when using smart applications technologies.

ii. The company provides sufficient information about responsible content creation and dissemination guidelines in virtual environments.

iii. The company ensures a safe and secure virtual access environment by enforcing appropriate regulations.

iv. I believe that the smart applications' TQM policies in place contribute to a positive and conducive academic experience for all users.

v. I am aware of the TQM policies and procedures related to intellectual property rights and attribution within the smart applications.

Data Analysis and Findings

The research objectives were achieved by testing the proposed hypothesis, the structural equation modeling (SEM) was employed. The rationale for employing the SEM analysis tool is that it employs causal predictive relations as it maximizes the endogenous variable variance explained (Crocetta et al., 2020; Taryam et al., 2021; Almarzouqi et al., 2022; Alsharhan et al., 2022). Additionally, the reflective-reflective measurement model because the researcher believed that the adopted measures are constructed' proxies; that is, the absence of one item might not have any noticeable effect on the remaining items

(Crocetta et al., 2020). Given this, the measurement model and structural model were assessed to ensure process robustness and informed decision for the investigated model.

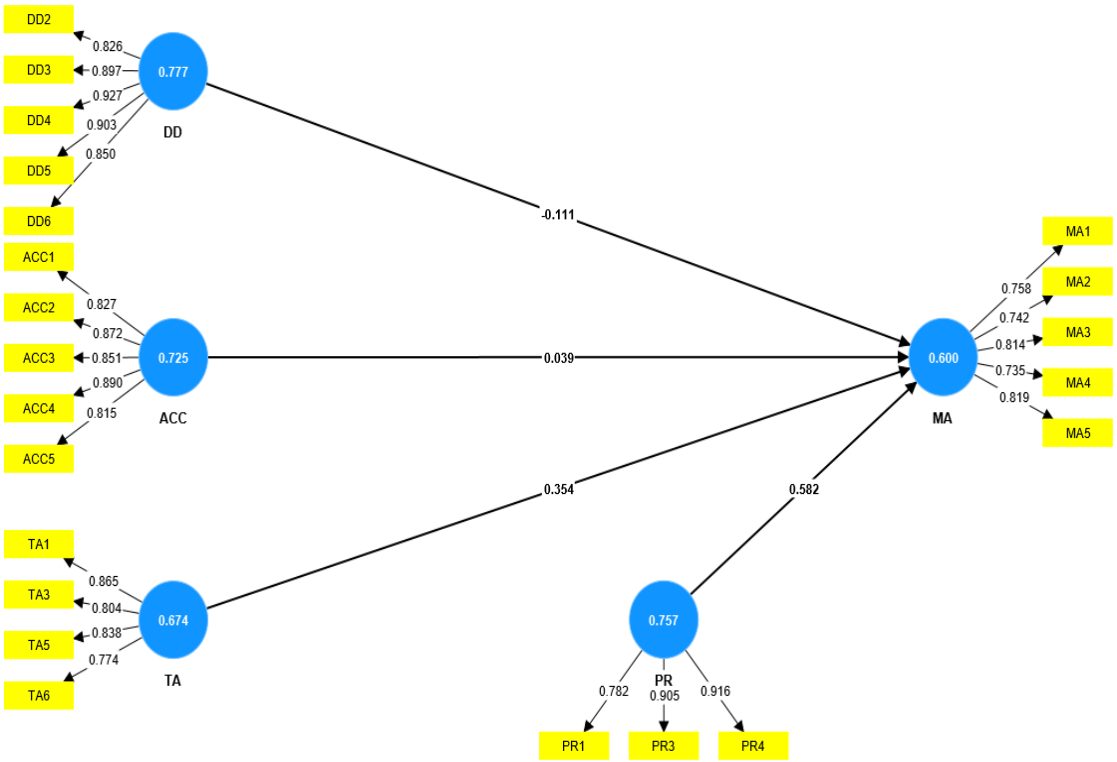


Figure 1: Measurement model

This study employs convergent and discriminant validity as measures to accomplish the task of the measurement model. Hence, the Average Variance Extracted (AVE) was used to measure the convergent validity. Hulland (1999) proposed that the AVE value should be greater than 0.5. As evidenced by the author's proposition, if any construct AVE does not meet this requirement by chance, items with lower or negative loadings should be excluded from the model. This process addresses confirmatory factor analysis in SEM. Given this, items such as (DD1), (PR2 and 5), and (TA2 and 4) having a low item loading were excluded from the model so that the AVE of above 0.5 could be achieved.

Construct validity is often called composite reliability (CR) for the items observed. As Franke and Sarstedt (2019) and Purwanto (2021) proposed, the threshold for CR must be greater than 0.7 but less than 0.95 because a CR value greater than 0.95 is presumed to measure other constructs CR. In contrast, those with less than 0.7 is presumed to fail the reliability test. In line with the assumptions of CR, as proposed by Franke and Sarstedt (2019) and Purwanto (2021), the construct validity test in this study is established.

The table below thus presents the items' loadings, discriminant and composite reliability for the model.

Table 1: Item Loadings

Construct	Item	Item Loadings	CR	AVE	Convergent Validity Decision
ACC	ACC1	0.817	0.916	0.715	Yes
	ACC2	0.862			
	ACC3	0.841			
	ACC4	0.880			
	ACC5	0.805			

DD	DD2	0.816	0.825	0.767	Yes
	DD3	0.887			
	DD4	0.917			
	DD5	0.913			
	DD6	0.750			
MA	MA1	0.748	0.842	0.601	Yes
	MA2	0.732			
	MA3	0.804			
	MA4	0.725			
	MA5	0.809			
PR	PR1	0.762	0.832	0.756	Yes
	PR3	0.915			
	PR4	0.906			
TA	TA1	0.765	0.824	0.673	Yes
	TA3	0.854			
	TA5	0.738			
	TA6	0.764			

Likewise, the researcher also examines the HTMT correlations as proposed by Hair et al. (2021) and Roemer, Schuberth, and Henseler (2021), who recommends that the HTMT correlation threshold should be less than 0.85 or 0.90 at most. In this study, the highest observed HTMT correlation was less than 0.748. Given this, it is evident that discriminant validity is achieved.

HTMT Correlations

	ACC	DD	MA	PR
DD	0.748			
MA	0.473	0.687		
PR	0.141	0.347	0.674	
TA	0.324	0.055	0.324	0.518

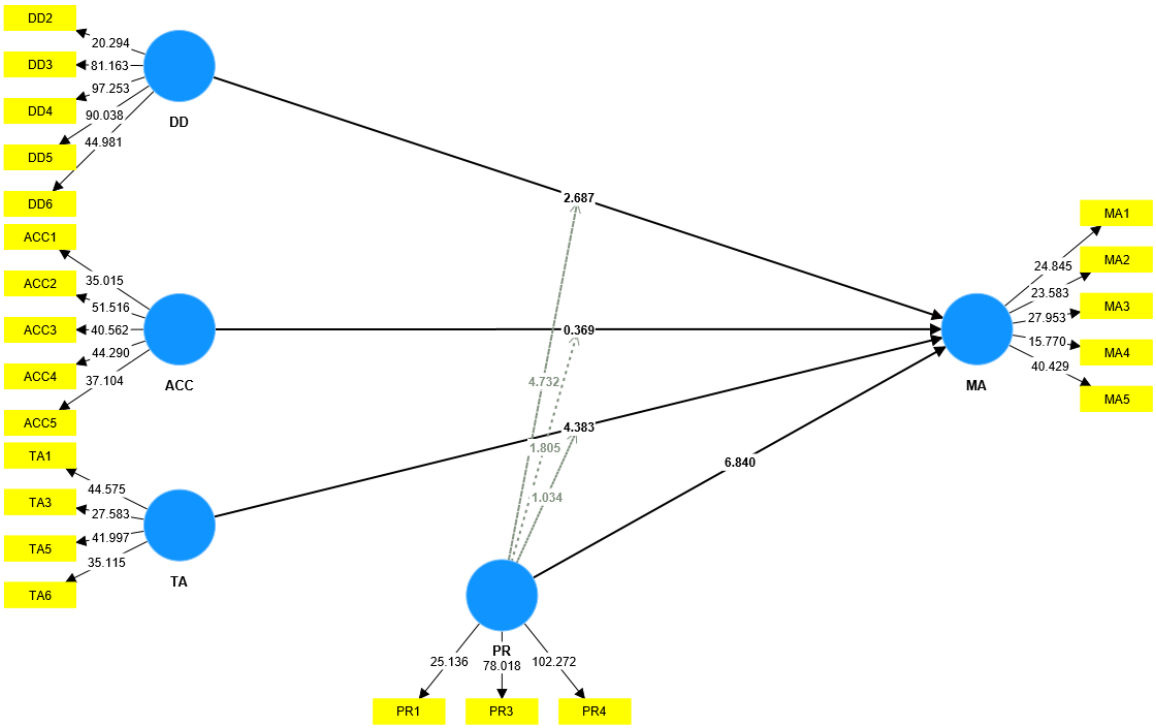
Note: DD = Digital Divide; ACC = Accessibility; PR = TQM policies and Regulations; MA = Performance of smart applications; TA =

Furthermore, the item's cross-loadings were examined. The result in this regard is presented in Table (**). The rationale behind checking the item's cross-loadings is to ascertain that the items have high loadings under their respective construct compared to other constructs in the model.

Table 2

	ACC	DD	MA	PR	TA
ACC1	0.817	0.078	0.068	0.011	0.063
ACC2	0.862	0.482	0.539	0.592	0.534
ACC3	0.841	0.59	0.552	0.425	0.099
ACC4	0.87	0.526	0.079	0.592	0.453
ACC5	0.805	0.351	0.22	0.384	0.305
DD2	0.4	0.816	0.439	0.536	0.247
DD3	0.055	0.887	0.533	0.457	0.184
DD4	0.326	0.917	0.597	0.031	0.343
DD5	0.24	0.901	0.587	0.317	0.424
DD6	0.069	0.840	0.557	0.347	0.003
MA1	0.163	0.552	0.746	0.22	0.229
MA2	0.238	0.425	0.731	0.58	0.152
MA3	0.41	0.487	0.803	0.194	0.076
MA4	0.02	0.34	0.724	0.483	0.486
MA5	0.366	0.554	0.819	0.367	0.203
PR1	0.138	0.395	0.272	0.771	0.352
PR3	0.163	0.087	0.41	0.914	0.414
PR4	0.44	0.207	0.046	0.905	0.358
TA1	0.146	0.058	0.327	0.061	0.854
TA3	0.258	0.425	0.53	0.365	0.813
TA5	0.344	0.005	0.296	0.44	0.827
TA6	0.111	0.506	0.126	0.223	0.763

After satisfying all conditions, the PLS-SEM structural equation modeling was observed. Under this section, the developed hypotheses were statistically tested.



The first step examining was to observe the collinearity between the investigated construct. The study employs the VIF values to satisfy this condition. Dormann et al. (2013) proposed that a VIF value less than five (5) shows that the data set is free from multicollinearity issues; hence, data analysis could be performed. In this study, this condition is fulfilled. The VIF values between constructs and items are less than the proposed threshold of five (5). TABLES XX AND XX PRESENT the VIF values between the construct and the items. Given this, it is ascertained that the research data is free from collinearity and multicollinearity issues that could cause Type I and Type II errors. Hence, we proceed to report the significant relationship between the investigated constructs.

TABLE 3

Construct	r-sq	r-sq Adjusted	f^2	Implication	Q^2predict	RMSE	MAE
MA	0.768	0.762			0.718	0.533	0.410
DD			0.022	Small			
ACC			0.001	Small			
TA			0.110	Medium			
PR			0.298*	high			
PR x TA			0.003	Small			
PR x DD			0.110	Medium			
PR x ACC			0.014	Small			

* Is high if approcimated to the nearest 2 decimal place (dp)

Table 3 presents the R-squared value of 0.768 for this model, indicating that the examined exogenous construct in this study accounts for approximately 70.69% of the variance in effective performance of smart applications. Notably, the construct of TQM policies and regulations exhibits the most substantial influence on effective performance of smart

applications among Public and Private institutions in the UAE, with an effect value of 0.298 (rounded to .30 in two decimal places). Meanwhile, technological adaptability and the moderating role of TQM policies and regulations demonstrate an average effect size on effective performance of smart applications, consistent with Cohen's effect size determination.

Furthermore, the predictive Q2 value surpasses zero, affirming the model's predictive relevance. In addition to the Q2, recent propositions by Shmueli, Ray, Estrada, and Chatla (2016) advocate the incorporation of two other parameters—root mean square error (RMSE) and mean absolute error (MAE)—to ascertain model predictive relevance. Table xx reveals positive RMSE and MAE values in this context, substantiating the model's predictive relevance.

Hypotheses testing and Discussion

	β	STDEV	T-stat	P values
ACC -> MA	-0.026	0.073	0.368	0.711
DD -> MA	-0.144	0.053	2.686**	0.006
PR -> MA	0.541	0.078	6.83***	0
TA -> MA	0.388	0.088	4.382***	0
PR x TA -> MA	-0.067	0.065	1.033	0.301
PR x ACC -> MA	0.130	0.072	1.804	0.071
PR x DD -> MA	-0.298	0.062	4.731***	0

*** implies significant at0.0001 **implies significant at 0.001

As evidenced from the study finding in Table xx, the relationship between accessibility and effective performance of smart applications reveals that there is no significant relationship between the two having $\beta = -0.026$, t-value = 0.368, $p > 0.05$), the observed result indeed contradicts the expectations of the investigators and findings from earlier investigations (Dwivedi et al., 2023; Gupta et al. et al., 2023). It was expected that there should be a significant relationship between these two variables as prescribed by Dwivedi et al. (2023), Gupta et al. (2023), and Xu et al. (2022), where they establish a significant relationship between accessibility and effectiveness performance of smart applications.

However, there is a plausible reason associated with the observed result; these might be associated with the high rate of technology accessibility among those residing in the UAE (Hennessy et al., 2005; Hollnagel et al., 2006; Kaufman, 2012). Therefore the participants in this study might perceive this relationship as a constraint to effective performance of smart applications. In other words, changes in accessibility do not appear to substantially impact the adoption of the smart applications in an effective manner. Additionally, the performance of smart applications process is likely influenced by a complex interplay of multiple factors beyond just accessibility (Jain & Ranjan, 2020).

Similarly, the second hypothesis in this study investigates the relationship between the digital divide (DD) and effective performance of smart applications (MA) having ($\beta = -0.144$, t-value = 2.686, $p < 0.05$), the result shows that the respondents perceived a significant relationship between the two constructs. The findings underscore the objective of adopting smart applications technology into the business activities, specifically among public and private companies (Dewan & Riggins, 2005; Lembani et al., 2020; Reddick et al., 2020). However, the negative beta value of $\beta = -0.144$ reveals that an increase in the digital divide will cause a significant adverse effect on performance of smart applications among those working at public and private companies in the UAE. This finding confirms the investigation of Nugroho et al. (2022), who reports an inverse relationship between the digital divide and performance of smart applications.

The third hypothesis investigates the significant relationship between technology adaptability (TA) and effective performance of smart applications (MA). The SEM result shows that the relationship between technology adaptation and effective performance of smart applications among public and private companies in the UAE is significant; however, with a negative beta value having (β = -0.144, t-value = 4.382, $p < 0.05$). The observed result echoed the statistical significance of this relationship. Hence, the significant relationship aligns with the opinion shared by earlier investigations not limited to Allam et al. (2022), Dwivedi et al. (2023), and Milosavljević (2022), where it was believed that adaptation to rapidly evolving technology is mandatory to achieve competitive advantage.

However, the negative coefficient (β = -0.144) for the relationship between TA and MA indicates that higher levels of technology adaptability are associated with a decrease in the effectiveness of performance of smart applications. This implies that there should be caution in adapting too fast with the evolving technology (Hennessy et al., 2005; Jain & Ranjan, 2020). This finding challenges the assumption that fast technological adaptability might inherently lead to enhanced adoption outcomes in the context of the smart applications among public and private companies (Bansode & Patil, 2011; Compaine, 2001). Nevertheless, fast adaptability must be done with caution to avoid negative consequences (Hollnagel et al., 2006; Kaufman, 2012).

The fourth hypothesis finding reveals a substantial relationship between TQM policies and regulations (PR) and the effective adoption of the smart applications (MA) having PR -> MA = (β = 0.541, t-value = 6.83, $p < 0.05$). These findings suggest that the respondent believed that in the study context, there are sets of well-defined and robust TQM policies and regulations that positively influences the effectiveness of performance of smart applications among various public and private companies in the UAE. This confirms the findings of Wang, Yu, Bell & Chu (2022), where the scholars argue the significant influence of aligning TQM policies and regulations on effective performance of smart applications. It also indicates that as TQM policies and regulations related to the smart applications become more comprehensive and well-implemented (Koohang et al., 2023; Salloum et al., 2023), enhancing and increasing the effectiveness of performance of smart applications. Furthermore, the finding underscores the importance of a favorable regulatory environment in facilitating the successful integration and utilization of smart applications technologies and platforms among public and private companies in the UAE.

Consequently, we checked the moderating role of TQM policies and regulations on the relationship between technology accessibility and effective performance of smart applications among public and private companies in the UAE. The findings reveal an insignificant moderating role of TQM policies and regulations having PR*ACC -> MA = (β = 0.130, t-value = 1.804, $p > 0.05$); the non-significant coefficient suggests that the moderating effect of TQM policies and regulations (PR) on the relationship between accessibility (ACC) and effective performance of smart applications (MA) was not statistically supported in this study. Thus, it can be inferred that the respondents perceived that the presence or absence of TQM policies and regulations did not significantly influence the strength or direction of the relationship between accessibility and effective performance of smart applications. The observation in this regard contradicts the notion posited by Dwivedi et al. (2023), Gupta et al. (2023), Koohang et al. (2023), and Salloum et al. (2023), who argue that the presence of TQM policies and regulations guiding performance of smart applications has a higher potential to ensure its practical adoption.

Furthermore, we examine the significant moderating role of TQM policies and regulations on the relationship between technology adaptation and effective performance of smart applications among public and private companies in the UAE. The SEM findings reveal an insignificant moderating role having PR x TA -> MA = (β = -0.067, t-value = 1.033, $p > 0.05$). The non-significant p-value implies that the interaction effect was not strong enough to produce a discernible impact on the relationship between accessibility

and effective performance of smart applications. This suggests that the impact of TQM policies and regulations on the performance of smart applications technology within public and private companies is limited in this specific context. The findings thus contradict the notion and expectations of the researcher in this regard (Dwivedi et al., 2023; Gupta et al., 2023; Koohang et al., 2023; Zhu et al., 2022).

Concerning the last hypothesis tested in this study, examining the significant moderating role of TQM policies and regulations on the relationship between the digital divide and effective performance of smart applications among public and private companies in the UAE. The findings predict a notable outcome, revealing a statistically significant interaction between policy and regulations and the digital divide in predicting performance of smart applications (β = -0.298, t-value = 4.731, $p < 0.05$). The result implies that the investigated study participants perceived the significant moderating role of effective and robust TQM policies in limiting the digital divide and ensuring an effective smart applications technology adoption among public and private companies in the UAE, conforming with earlier investigations that includes Ali and Osmanaj (2020), Dwivedi et al. (2022) and Tan (2021).

Nevertheless, the findings reveal some palpable caution by having a negative β = -0.298. This indicates that despite the significant moderating role of TQM policies and regulations, a high increase in TQM policies and regulations may probably produce a widen anticipated reduction in the digital divide that ensures effective performance of smart applications among public and private companies in the UAE.

Implications of findings

The implications drawn from this study hold substantial significance for public and private companies' stakeholders, policymakers, and institutions engaged in performance of smart applications. While the unexpected non-significant link between accessibility and adoption challenges conventional wisdom, it underscores the need for a holistic approach to training, encompassing technological proficiency, cognitive adaptation, and regulatory awareness for public and private companies' stakeholders. Informed by the study's robust positive correlation between TQM policies and regulations and effective adoption, policymakers are urged to collaboratively design adaptive regulatory frameworks that balance rapid technological evolution and business activities integration.

Notably, the study's revelation of a negative correlation between technology adaptability and performance of smart applications accentuates the importance of measured and purposeful technological assimilation. To this end, public and private companies are encouraged to cultivate technological fluency through professional development programs, harmonizing technological innovation with pedagogical excellence. A united effort among stakeholders, policymakers, and institutions is essential to ensure the harmonious and transformative integration of the smart applications within the public and private companies' landscape.

Theoretical Implications

The research findings provide noteworthy theoretical implications within the Technology Acceptance Model (TAM) framework, reshaping our understanding of performance of smart applications among public and private institutions in the UAE. The study challenges the TAM's conventional stance by revealing a non-significant relationship between accessibility and effective performance of smart applications. This suggests the presence of distinct factors influencing adoption beyond the TAM's core constructs, prompting the need for an expanded TAM framework that accommodates these domain-specific influences.

Furthermore, the study introduces a novel dimension to the TAM by show casing a counterintuitive negative correlation between technology adaptability and effective performance of smart applications. This finding highlights the complexity of technology assimilation and emphasizes the importance of considering the pace of technological adaptation within the TAM's purview. It underscores the necessity of a nuanced and context-sensitive approach that captures the interplay between rapid adaptation and adoption outcomes.

The study's recognition of a robust positive association between TQM policies and regulations (PR) and effective performance of smart applications resonates with the TAM's premise of external influences on technology acceptance. However, the magnitude of this effect underscores the pivotal role of policy-related factors in performance of smart applications. While the TAM acknowledges external influences, the study underscores the necessity of broadening its scope to encompass the intricate regulatory dynamics and organizational support that significantly shape technology adoption. In sum, the research enriches the TAM's applicability in the smart applications landscape by emphasizing the need for a refined and comprehensive framework that accommodates domain-specific factors, nuances of technological adaptability, and the critical role of TQM policies and regulations.

Practical Implications

The research findings hold practical implications of significance for adopting smart applications technology in public and private sectors. Beyond ensuring accessibility, a focus on user-friendly interfaces and seamless integration can enhance adoption rates. Bridging the digital divide necessitates collaborative efforts, entailing subsidized access and digital literacy initiatives. Exercising caution in rapid technological adaptation is essential, demanding a phased implementation approach and comprehensive training provisions.

The substantial impact of TQM policies and regulations underscores the imperative of strategically crafting a supportive regulatory framework. This framework should balance safeguarding user interests with fostering adoption. Collaborative research endeavors and interdisciplinary teams can yield comprehensive insights, while continuous monitoring and evaluation mechanisms ensure the sustained alignment of performance of smart applications with institutional objectives.

By implementing these recommendations, public and private companies can adeptly navigate the intricate landscape of smart applications technology adoption, thereby fostering its seamless integration. However, while this investigation contributes significantly, it is acknowledged that the findings are context-specific and subject to potential evolution over time.

Methodological Implication

The integration of SEM within a quantitative research framework and the meticulous selection and operationalization of crucial variables signifies a notable methodological contribution. This approach facilitates a deeper comprehension of the intricate dynamics influencing performance of smart applications and lays a sturdy foundation for future research initiatives on technological application and innovation within business contexts.

Conclusion

In summary, this study elucidates the intricate interplay among accessibility, technology adaptability, and TQM policies and regulations, collectively influencing the effective performance of smart applications technology within public and private companies in the UAE. The discerned relationships underscore the imperative for an expanded and nuanced conceptual framework, extending the Technology Acceptance Model (TAM)

purview to encompass the idiosyncrasies of performance of smart applications. The paradoxical absence of a significant link between accessibility and adoption and the unexpected inverse correlation between technology adaptability and adoption underscores the necessity for a refined TAM that accommodates the smart applications' unique contextual dynamics. Notably, the research highlights the pivotal role of TQM policies and regulations, advocating for an enriched TAM model that adequately encapsulate regulatory nuances. Employing meticulous quantitative methodologies, notably Structural Equation Modeling, this inquiry contributes substantively to comprehending performance of smart applications intricacies and elevating the TAM's pertinence within the evolving terrain of technological paradigms. Thus, the study's insights wield paramount smart-business import, guiding future scholarly endeavors and probing the frontiers of technological innovation in business contexts.

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