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Integrating perceived system quality with the technology acceptance model to analyze the intention to use mobile government applications in Qatar

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Abstract: This study examines the factors influencing end users' intention to use mobile government applications in Qatar through a regression-based path analytic approach. Drawing on the Technology Acceptance Model and incorporating System Quality from the DeLone and McLean IS Success Model, the research investigates key determinants of mobile government application adoption. Data were collected from a quantitative survey administered to 1,872 participants, including 1,025 Qatari nationals and 847 white-collar expatriates. The questionnaire, developed from a comprehensive literature review, was validated using exploratory factor analysis to confirm construct structure and reliability. Composite scores representing each latent construct were then analyzed using regression-based path analysis to estimate associations among variables. The findings reveal that System Quality, Perceived Ease of Use, and Perceived Usefulness significantly influence the intention to use mobile government applications, while demographic characteristics also show meaningful associations. These results offer valuable insights for policymakers aiming to enhance mobile government application adoption by improving system quality and strengthening user perceptions of ease of use and usefulness. By integrating Technology Acceptance Model with system quality within a regression-based analytic framework, this study contributes to a more comprehensive understanding of digital government adoption in Qatar and offers a rigorous yet practical model for future research and implementation.

Keywords: Mobile government, Open government data, Perceived ease of use, Perceived usefulness, System quality, Technology Acceptance Model

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1. Introduction

The rapid advancement of digital technologies has reshaped citizens' expectations of how they interact with government institutions, leading to growing dissatisfaction with conventional, in-person service delivery models (Al-Hubaishi et al., 2017). In response, governments worldwide have increasingly embraced digital technologies to strengthen electronic interactions with citizens and improve the efficiency and accessibility of public services (Khalid & Yang, 2024; Reddick & Zheng, 2017). The widespread diffusion of wireless networks and mobile devices has further accelerated this transformation, prompting a shift from traditional electronic government (e-government) toward mobile government (m-government). This shift has been supported by improvements in Internet infrastructure, the proliferation of smartphones, and targeted government awareness initiatives (Hasan et al., 2024). M-government is commonly defined as the use of mobile technologies to deliver and enhance e-government services and information to citizens, businesses, and government agencies (Alonazi et al., 2020).

Despite the increasing prominence of m-government, empirical research on its implementation and citizen adoption remains limited in developing countries (Eid et al., 2021). As mobile Internet technologies become integral to public administration, understanding citizens' intention to adopt m-government services has become a critical research priority (Zhang et al., 2023). Qatar represents a particularly relevant context in this regard. As a technologically advanced country in the Gulf region, Qatar has made substantial efforts to ensure broad access to digital technologies and mobile-based public services (Othman et al., 2023).

Mobile government applications (MGAs) differ from other digital service delivery models due to their inherent mobility, enabling citizens to access government services anytime and anywhere through personal mobile devices (Eibl, 2022). MGAs streamline service delivery by offering unified platforms that allow users to complete transactions such as paying bills, settling fines, and booking appointments with minimal effort (Rouibah et al., 2018). By reducing the need for physical visits to government offices, MGAs have the potential to improve administrative efficiency and enhance citizen engagement.

As part of the broader contextual background, m-government applications (MGAs) also increasingly incorporate access to open government data (OGD). Over recent decades, governments worldwide have launched open data initiatives to improve transparency and promote innovation through unrestricted access to public datasets (Khurshid, 2022). OGD is defined as "interoperable data that is shared by public organizations (publishers) for anyone (users) to reuse without restrictions to create new digital products and services" (Crusoe and Ahlin, 2019, p. 213). These initiatives enhance transparency, accountability, and citizen participation (Quarati and Albertoni, 2024). Among Gulf

Cooperation Council (GCC) countries, Qatar stands out for its advanced OGD metadata quality (Chokki et al., 2023). According to El-Kassem and Al-Kubaisi (2025), Qatar's OGD demonstrates a "performance surplus," reflecting substantial progress toward customer-driven services. This integration of OGD within MGAs is exemplified by Qatar's Ehteraz application, which illustrates how government data is operationalized through mobile platforms. Imposed by the Qatari government during the COVID-19 pandemic, Ehteraz provided citizens and residents with real-time, government-verified public health data, including vaccination updates, cumulative confirmed cases, daily new cases, active cases under treatment, recoveries, and deaths. This mandatory integration demonstrates how OGD functions as an enabling layer within MGAs, supporting transparency, rapid information dissemination, administrative coordination, and governmental responsiveness (El-Kassem, 2025). However, Khurshid (2022) highlights that despite global attention to OGD, limited research examines its adoption and diffusion among citizens, especially in developing countries such as Qatar.

From a digital governance perspective, citizens' adoption of MGAs extends beyond a purely technical decision and reflects broader evaluations of governance performance, including service efficiency, accessibility, and responsiveness. Nevertheless, empirical research examining how citizens perceive and engage with digital public services in Qatar remains scarce. In particular, limited attention has been paid to how system quality and user perceptions jointly shape citizens' intention to engage with mobile government services.

This study addresses this gap by empirically investigating the factors influencing citizens' intention to adopt mobile government applications in Qatar. Drawing on the Technology Acceptance Model (TAM) and extending it through the inclusion of System Quality, the study examines how Perceived Ease of Use and Perceived Usefulness interact with system-level characteristics to shape behavioral intentions. By conceptualizing citizens' intention to adopt mobile government applications as an indicator of digital governance performance—reflecting perceptions of efficiency, accessibility, and responsiveness—rather than solely a technology acceptance outcome, this study advances digital governance scholarship and provides evidence relevant to policymakers seeking to enhance citizen engagement and digital inclusion.
Guided by the above discussion, this study addresses the following research questions:

- What are the key factors influencing users' intention to adopt mobile government applications (MGAs) in Qatar?
- How do System Quality, Perceived Ease of Use, and Perceived Usefulness interact to shape users' behavioral intention toward MGA use?
- To what extent do demographic characteristics (e.g., nationality, age, education) moderate the relationships among these factors?

2. National context: Qatar

Qatar offers a distinctive context for studying mobile government adoption due to its advanced digital infrastructure, strong policy framework, and commitment to citizen-centered governance. Guided by the Qatar National Vision 2030 (QNV 2030), the country has prioritized digital

transformation as a driver of economic diversification and social progress. According to El-Kassem (2025), Qatar's digital transformation is accelerating as interconnected technologies increasingly shape interactions between citizens, infrastructure, and institutions. This evolution signals a deliberate effort to embed digital solutions within governance structures, enhancing the translation of technological capabilities into effective public policy outcomes. Within this framework, the Ministry of Communications and Information Technology (MCIT) launched the Smart Qatar (TASMU) initiative to accelerate the transition toward a knowledge-based, digitally connected society. TASMU integrates emerging technologies—such as artificial intelligence, Internet of Things (IoT), and big data—to enhance the efficiency and accessibility of public services.

MGAs represent a cornerstone of this transformation. Qatar's official Metrash2 application, for example, enables users to perform numerous government transactions, including paying fines, renewing documents, and accessing essential public services through a single mobile platform. These initiatives underscore the government's focus on convenience, efficiency, and user experience.

Qatar has also taken a leading role in promoting open government data (OGD). The national open data portal facilitates unrestricted access to datasets related to governance, infrastructure, and the economy, fostering transparency and innovation. Studies indicate that Qatar ranks highest among Gulf Cooperation Council (GCC) countries in OGD metadata quality (Chokki et al., 2023), while El-Kassem and Al-Kubaisi (2025) report that its open data system demonstrates a "performance surplus," surpassing regional benchmarks for accessibility and usability.

From a comparative perspective, Qatar differs from Western societies in several ways that shape digital service adoption. Socially and institutionally, digital initiatives are typically implemented through centralized, government-led mechanisms rather than through decentralized or market-driven arrangement (Elayah, & Alassi, 2025). In addition, Qatar's demographic composition—characterized by a large expatriate population alongside a relatively small citizen population—creates adoption dynamics that are rarely present in Western contexts. These features make Qatar a non-Western and analytically distinctive setting for examining mobile government adoption.

Despite strong institutional support and technological readiness, research examining citizen adoption of MGAs in Qatar remains limited. Understanding how factors such as system quality, perceived usefulness, and ease of use influence behavioral intention is crucial for ensuring the long-term success of digital government services. Qatar's experience, therefore, provides valuable insights for other developing economies pursuing similar digital governance strategies.

3. Literature review

3.1. Mobile government in Qatar

M-government is an extended component of e-government that facilitates interactions with government services through mobile devices. In fact, "mGov is a new trend in reforming, restructuring, and reengineering public services that can enhance and upgrade existing eGov services with more competitive and versatile applications" (Shareef et al., 2014, p.128). It delivers

critical services that leverage real-time government data, such as terrorism alerts, traffic and road condition updates, severe weather forecasts, police investigations, disaster management, and land inspections (Shareef et al., 2014). According to the Ministry of Transport and Communications in Qatar, governments are increasingly leveraging mobile technology to align with the changing habits and expectations of their citizens. Mobile is not merely another delivery channel or a smaller version of a computer; rather, it introduces new opportunities for governments to interact with the public. Globally, government agencies are expanding their digital platforms to offer content specifically designed for smartphones and tablets. It is no longer adequate for agencies to simply share policy updates, regulatory decisions, data, and other information on static websites. Citizens, businesses, and the workforce have grown accustomed to the user experiences provided by consumer-based mobile technology, and expect now the same level of intuitiveness and efficiency from government services. Mobile services offer better, faster access at any time and from anywhere, while also enhancing workforce productivity and increasing administrative efficiency through automation and information sharing. "Government must accelerate its customer service approach with anytime, anywhere efforts to keep up" (Ministry of Transport and Communications, 2017, p. 5). Qatar's ambitious strides toward digital transformation are evident in its Qatar Digital Government (QDG) Strategy 2020. "As part of our commitment to digital transformation, QDG aims to digitalize %100 of the government services, enabling seamless online interactions for our citizens with an exception for only certain services that require mandatory in-person government interactions. By understanding the intricate connection between these aspirations and their detailed components, we can align our efforts, measure our progress, and ensure that each step we take brings us closer to our collective digital future" (p.13).

In Qatar, several notable m-government applications facilitate interaction between the state and its citizens. The Hukoomi Mobile App, part of the Qatar e-Government Portal, provides users with access to various governmental services, updates on the latest news, and events organized within the state. It also includes a directory for contacting various government entities. Tawtheeq, the National Authentication System app, serves as a unified system for verifying the digital identity of citizens, residents and businesses when accessing various e-government services. Tasdeeq application serves as a collaborative platform, enabling individuals, government agencies, and private entities to interact through a unified interface for document verification and authentication. It also supports secure information exchange using credentials from the National Authentication System. The Ministry of Communications and Information Technology in Qatar offers comprehensive details about these applications on their website. Additionally, the Metrash2 application from the Ministry of Interior provides citizens and residents with the convenience of accessing a wide range of services through their cell phones. These services include traffic services, visit visa services for personal and corporate sponsorships, resident permit services, exit permit services, electronic gate (e-Gate) services, and general-purpose queries. Furthermore, the Ehteraz app is the official contact tracing application for the State of Qatar and is owned, operated, and approved by the Ministry of Public Health (Mousa, 2022). It is designed to help limit the spread of COVID-19 and promote health awareness among people in Qatar by providing tips and techniques for protective measures. Additionally, Ehteraz displays the latest official statistics related to COVID-19, including the total number of positive cases, the number of new cases in the last 24 hours, the number of active cases under treatment, and other important information regarding the virus (Mousa, 2022). The Al Mahakem

application, developed by the Supreme Judiciary Council of the State of Qatar, offers an extensive array of services to the public such as case tracking, electronic payments, and hearing schedules (Al Mahakem application).

3.2. Demographic characteristics

Demographic characteristics play a significant role in influencing technology adoption. For instance, age has been found to significantly affect the intention to adopt Open Government Data (OGD) portals (El-Kassem & Al-Kubaisi, 2023). Meyer (2011, p.305) notes that "compared to employees younger than 30 years, an older workforce is negatively related to the probability of technology adoption." Additionally, education levels also impact technology use, as "a higher level of education is associated with more usage of technology" (Abu-Shanab, 2011, p. 324). Gender differences also emerge, with research showing that "males move through the technology adoption stages at a more rapid rate than females do" (Li et al., 2008, p.271). These factors together illustrate how demographic characteristics influence the pace and likelihood of technology adoption.

3.3. System quality

The DeLone and McLean Information Systems (IS) Success Model, introduced in 1992, is a widely established framework for assessing the success of information systems. In this model, system quality serves as a foundational element, influencing users' perceptions of ease of use and directly impacting their willingness to engage with the system. “System quality reflects the access speed, ease of use, navigation and visual appeal. If mobile payment systems are difficult to use and have poor interface design, users may feel that service providers lack ability and integrity necessary to offer quality services” (Zhou, p. 1087). Also, system quality encompasses “reliability, responsiveness, assurance, and personalization” (Zhou, p. 1087). Delivering high-quality system performance demonstrates the provider's competence and goodwill. Conversely, if the system exhibits unreliability and slow responses, users are likely to lose trust in the service. “From a technological perspective, consumers will perceive the mGov service as convenient with high quality if they are able to complete their task with minimum efforts” (Shareef et al., 2014, p. 130). That being said, system quality is not merely a technical attribute but a governance mechanism that shapes citizens’ perceptions of state capacity and reliability. High system quality enhances administrative efficiency by reducing transaction time and operational friction, while also strengthening institutional legitimacy through reliable, secure, and responsive service delivery. Conversely, system failures, slow response times, or poor interface design may signal weak administrative competence, undermining trust in government institutions and discouraging citizen engagement. Accordingly, system quality serves as a critical bridge between technological performance and governance outcomes in mobile government contexts.Rouibah et al. (2018) identified system quality as a critical factor influencing both the initial and continued use of mobile government services in Kuwait. Drawing on the extended DeLone and McLean IS Success Model, their qualitative study showed that system quality, alongside other variables, plays a central role in shaping user adoption. These findings underscore the significance of system quality in m-government adoption and highlight the need for further quantitative validation, particularly in developing Arab countries.

3.4. The Technology Acceptance Model

The Technology Acceptance Model (TAM), developed by Davis et al. (1989), is widely utilized in technology adoption research, demonstrating its robustness and versatility across various contexts (El-Kassem & Al-Kubaissi, 2023). TAM "can predict the use of information technology and the determinants of acceptance" (Mondego & Gide, 2024, p. 5). Moreover, TAM is praised for its clarity and ease of use, concentrating on Perceived Ease of Use and Perceived Usefulness (Chen & Aklikokou, 2020). Mondego & Gide (2024) report that perceived ease of use and perceived usefulness are the "two most studied TAM constructs" (p. 5). Furthermore, TAM exhibits similarities with other technology acceptance and usage models. For example, performance expectancy in the UTAUT model (Venkatesh et al., 2003) corresponds to perceived usefulness in TAM, and effort expectancy in UTAUT aligns with perceived ease of use in TAM (Jackson et al., 2013). However, TAM does not explicitly address System Quality, although system features have "an indirect impact on the adoption of a new technology as they have a direct impact on users' perceived usefulness and perceived ease of use" (Mondego & Gide, 2024, p. 5). That being said, the DeLone and McLean IS Success Model (1992) and UTAUT also show parallels. Although System Quality is not a distinct construct in UTAUT, it is indirectly related to Facilitating Conditions, which cover external support and resources. In contrast, the DeLone and McLean model explicitly includes System Quality as a key factor affecting the success of an information system and its intention to use. Given these similarities and the established reputation of TAM, our research focuses on TAM for its well-recognized framework and applicability, while also incorporating insights on System Quality from the DeLone and McLean model.

3.4.1. Perceived ease of use

Ease of use is a fundamental concept in TAM, reflecting the extent to which a system is regarded as being user-friendly and free from complexity. As Hanjaya et al. (2019) explain, "ease of use describes how a system does not require excessive effort when being used" (p. 183). This means that a system is considered easy to use if users can accomplish their tasks with minimal effort and without encountering significant obstacles or frustration. The easier a system is to navigate and operate, the more likely users are to adopt it. In public-sector settings, ease of use also supports inclusiveness by lowering participation barriers and enabling broader segments of society to access government services without disproportionate cognitive or procedural burden. According to Davis et al. (1989), perceived ease of use directly influences users' acceptance of technology, as a system that demands little effort encourages frequent use and reduces the learning curve, making the technology more accessible and appealing to a broader range of users. Therefore, ease of use is a critical factor in assessing whether a new technology will be accepted and integrated into daily routines.

3.4.2. Perceived usefulness

Perceived usefulness is a key concept in understanding technology adoption, as it describes how a system can improve the user's performance (Hanjaya et al., 2019). This concept is critical because it directly influences whether users view the technology as beneficial, which in turn affects their willingness to use it. Understanding the role of perceived usefulness is crucial for designing and

implementing systems that users are more likely to embrace (Davis et al., 1989). In m-government applications, perceived usefulness reflects citizens' assessments of administrative effectiveness and responsiveness, as systems that demonstrably improve task completion and service outcomes contribute to positive evaluations of government performance.

4. Research hypotheses and theoretical model

This study aims to identify the factors that drive the usage of m-government applications among Qataris and white-collar expatriates in Qatar. By investigating how demographic characteristics, system quality, and user perceptions of ease of use and usefulness influence the intention to use these services, the study aims to provide insights that can guide the effective implementation and adoption of m-government services across diverse population groups in Qatar. Drawing from a review of relevant literature on m-government, e-government, and open government data (OGD) adoption, the study formulates four research hypotheses aimed at addressing this research question.

H1: Demographic characteristics such as age, employment, level of education, and gender have a significant effect on users' intentions to use m-government applications (derived from El-Kassem and Al-Kubaisi, 2023).

H2: System quality has a significant positive effect on users' intentions to use m-government applications (adopted from Zhou, 2013).

H3: Perceived ease of use has a significant positive effect on users' intentions to use m-government applications (based on Chen and Aklikokou, 2020; Alonazi et al., 2020).

H4: Perceived usefulness has a significant positive effect on users' intentions to use m-government applications (based on Chen and Aklikokou, 2020; Alonazi et al., 2020).

Drawing from the literature review and the formulated hypotheses, Figure 1 presents the conceptual framework underpinning this study. This framework visually represents the relationships between the key variables examined, offering a structured approach to understanding the dynamics and expected outcomes of the research.

Figure 1: Conceptual Model

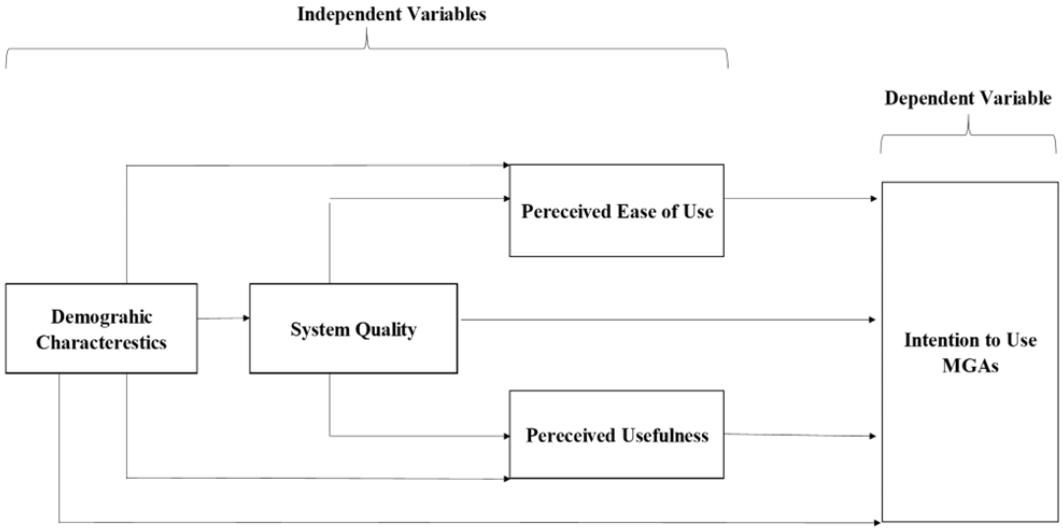


Figure created by Author

5. Methodology

5.1. Sample selection

This study is based on a carefully designed sampling frame aimed at reaching Qataris and white-collar expatriate residents aged 18 and older in Qatar, ensuring appropriate coverage of these groups. To achieve this, the Social and Economic Survey Research Institute (SESRI) in Qatar collaborated with a local cell phone provider to develop a comprehensive sampling frame. SESRI then drew a random sample, giving each telephone number an equal chance of selection. The response rate for the survey was 24.3%. After data collection, a sampling expert at SESRI weighted the sample to ensure representativeness of the target population prior to data analysis. Therefore, no post-stratification weights were applied by the authors.

Two types of non-response were encountered. The first, unit non-response, referred to individuals who did not complete the full questionnaire. To address this, a standardized call protocol was implemented, whereby each number was attempted up to seven times at varying times and days to enhance the likelihood of contact. Cases of unit non-response were excluded from the final dataset. A total of 1,872 adults aged 18 and older in Qatar participated in the survey, including 1,025 Qataris and 847 non-Qataris. The sample consisted of 747 females and 1,125 males.

The second, item non-response, involved participants who completed the questionnaire but omitted responses to specific items. These missing or invalid responses were treated as missing values in SPSS and excluded on a per-item basis during the data cleaning process.

Non-response bias was further addressed through SESRI's sampling and weighting strategy, which modeled response and eligibility probabilities using auxiliary information derived from prior surveys and known population characteristics. These modeled probabilities informed a disproportionate stratified sampling design and subsequent non-response adjustments in the weighting process. The weighting approach assumes that, after calibration to observed demographic characteristics (such as age, gender, and marital status), responding and non-responding units are comparable with respect to key study variables. While these procedures strengthen the representativeness of the weighted sample for the target population of Qatari nationals and white-collar expatriates, the authors acknowledge that some residual bias related to unobserved characteristics cannot be entirely ruled out and should be considered when interpreting the finding.

Skilled and experienced interviewers conducted the data collection in May 2024 using Computer-Assisted Telephone Interviews (CATI). Table 1 below shows the response rate:

Table 1: Response rate

Disposition	Freq.
Completed (C)	1872
Not completed	14278
Eligible (E)	3933
Ineligible	8436
Unknown eligibility (UE)	1909
Raw response rate $\frac{C}{C+E+UE}$	**24.3%**

Table created by the authors with the help of the sampling expert at SESRI using data generated with SPSS Statistics software (IBM Corporation)

5.2. Instrumentation (questionnaire construction)

The questionnaire initially comprised a broad range of items developed based on insights from previous research. The initial pool of measurement items was adapted from established and validated scales in prior studies, including Park and Kim (2022), Mutambik et al. (2021), Alonazi (2019), Talukder et al. (2019), Shiau et al. (2018), and Khurshid (2022). These items were selected to reflect the theoretical constructs underpinning the study.. Each statement was assessed using a 5-point Likert agreement scale. In compliance with the Ethical Review Board of Qatar University's guidelines, "Refused" and "Don't know" options were included for each statement to allow respondents the flexibility to opt out of answering questions they found uncomfortable or for which they did not have an answer. These options were designed to ensure respondents felt respected and unpressured during the survey process.

Additionally, the instrument included questions related to respondents' demographics, providing a comprehensive understanding of the respondents' backgrounds. These demographic data were crucial for contextualizing the findings and examining potential differences across various population segments. The instrument was initially constructed in English and then translated by qualified translators into Arabic. The translated version was then reviewed by bilingual researchers who carefully checked the translation word by word to ensure conceptual, linguistic, and cultural accuracy.

To ensure this, respondents were encouraged to respond to all items honestly without feeling under pressure to provide socially satisfactory responses, and they could skip any item they found uncomfortable. Moreover, all respondents were assured that their privacy was fully protected by not collecting personal data that could be used to identify them.

The instrument underwent a rigorous development and testing process, including a pretest with 23 respondents to ensure clarity and comprehension of the statements. During the pretest, respondents were asked to provide feedback on wording and clarity of both the English and Arabic versions of the questionnaire. Following the pretest, the English and Arabic versions of the instrument were revised accordingly. This rigorous translation and validation process ensured that both language versions were conceptually equivalent and comprehensible, minimizing the risk of any measurement bias across languages.

Additionally, respondents were informed that the questionnaire was designed to allow them to smoothly proceed to later pages of the instrument or specific questions on those pages. Prior to data collection, interviewers received a training program that provided extensive knowledge and skills in the principles of mobile government, as well as actual interviewing techniques.

5.3 Validity and reliability

One of the advanced multivariate analyses known as factor analysis was employed as a data reduction technique to refine the questionnaire and assess its construct validity. Items with low factor loadings, cross-loadings, or weak conceptual alignment with their intended constructs were removed. This iterative process resulted in a final set of 14 items that demonstrated satisfactory factor loadings and internal consistency and were theoretically aligned with the study framework. Each retained item was explicitly mapped to its corresponding theoretical construct, ensuring content validity and conceptual coherence between measurement items and the underlying theory.

This factor analysis was evaluated using three key criteria. The Kaiser-Meyer-Olkin (KMO) test, which evaluates sample adequacy, returned a value of 0.890, significantly surpassing the recommended threshold of 0.50, thus demonstrating excellent sampling adequacy. Bartlett's test of sphericity also produced a statistically significant Chi-Square value of 7106.960 ($p < 0.001$), confirming that the relationships between the questionnaire items were suitable for factor analysis, as shown in Table 2. Finally, oblique factor rotation was applied to obtain the most interpretable factor structure, resulting in four primary factors, based on the eigenvalue greater than one criterion. These four factors explained 61.111% of the total variation, providing a clear and meaningful structure to the data.

Table 2. Factor analysis - KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.890
Bartlett's Test of Sphericity	Approx. Chi-Square	7106.960
	df	91
	Sig.	<0.001

Data reported in this table were produced by SPSS Statistics, IBM Corporation

a) The first factor, "Perceived Ease of Use of Open Government Mobile Applications," explains 34.491 percent of the total variance and is characterized by four statements (Cronbach's alpha = 0.740). The language and terminology used in these three questionnaire items were derived from the studies by Park and Kim (2022) and Mutambik et al. (2021). The four items are:
   i) {Q:PEU4} I believe that mobile government applications are easy to use.
   ii) {Q:PEU3} Using mobile government applications does not require a lot of skills and effort.
   iii) {Q:PEU2} I believe my interaction with mobile government applications to access government services would be clear and understandable.
   iv) {Q:PEU1} Learning to use mobile government applications would be easy for me.

b) The second factor, "Intention to Use Open Government Mobile Applications," accounts for 10.310 percent of the total variance and is characterized by three statements (Cronbach's alpha = 0.804). The wording of these three items was adapted from questionnaires used in similar studies by Shiau et al. (2018, p. 10) and Khurshid (2022, p. 18), with revisions made to align them with the specific context of the present study. The three items are:
   i) {Q:ITU1} I intend to use mobile government applications in the future.
   ii) {Q:ITU2} I intend to use mobile government applications frequently.
   iii) {Q:ITU3} I will use mobile government applications to conduct government transactions.

c) The third factor, "Perceived Usefulness of Mobile Government Applications," explains 8.539 percent of the total variance and is defined by four statements (Cronbach's alpha = 0.684). These statements were developed based on the studies by Talukder et al. (2019). The four items are:
   i) {PUSE6} I think using mobile government applications would save me multiple visits to different agencies when performing my transactions.
   ii) {PUSE2} Using mobile government applications would enable me to accomplish government transactions more quickly.

iii) {PUSE5} The ability to perform government transactions 24/7 will encourage me to use mobile government applications more.
iv) {PUSE7} I believe that using mobile government applications will remind me of important dates for conducting government transactions in sufficient time or at the right time.

d) The fourth factor, "System Quality," accounts for 7.771 percent of the total variance and is represented by three statements (Cronbach's alpha = 0.708). These statements were developed based on the study by Alonazi (2019). The three items are:
   i) {SQ6} I think mobile government applications provide fast responses to my inquiries.
   ii) {SQ7} I think that mobile government applications provide up-to-date information.
   iii) {SQ2} I believe that mobile government applications are easy to navigate (to move between screens and pages) and provide good navigation functions.

It is noteworthy that the factors showed moderate rather than high reliability levels. However, such values are acceptable Saidi and Siew (2019) in exploratory behavioral and technology adoption research, where construct validity is more challenging to establish than reliability—and valid measurements are inherently reliable.

Table 3 presents the descriptive statistics (means, standard deviations, skewness, and kurtosis) for the study factors. Each statement was assessed using a 5-point Likert scale, providing 5 possible responses, ranging from 1 Strongly Agree to 5 Strongly Disagree. The mean scores shown in Table 3 indicate a high level of agreement among respondents, suggesting that participants generally perceived the statement positively. Table 4 displays the Pearson correlation coefficients among the factors, including the sample size (n) and significance level (p).

Table 3. Statistics

		Perceived Ease of Use	Perceived Intention to Use	Perceived Usefulness	Perceived Sytem Quality
N	Valid	1834	1863	1841	1806
	Missing	39	10	32	67
Mean		1.6435	1.2899	1.3636	1.7634
Median		1.5000	1.0000	1.0000	1.6667
Mode		1.00	1.00	1.00	1.00
Std. Deviation		.70822	.54586	.56902	.80824
Variance		.502	.298	.324	.653
Skewness		1.514	2.705	2.336	1.263
Std. Error of Skewness		.057	.057	.057	.058
Kurtosis		2.665	9.575	7.423	1.573
Std. Error of Kurtosis		.114	.113	.114	.115
Range		4.00	4.00	4.00	4.00
Minimum		1.00	1.00	1.00	1.00
Maximum		5.00	5.00	5.00	5.00

Table 4. Correlations

		Perceived Intention to Use	Perceived Ease of Use	Perceived Usefulness	Perceived System Quality
Pearson Correlation	Perceived Intention to Use	1.000	.395	.426	.367
	Perceived Ease of Use	.395	1.000	.426	.487
	Perceived Usefulness	.426	.426	1.000	.413
	Perceived System Quality	.367	.487	.413	1.000
Sig. (1-tailed)	Perceived Intention to Use	.	.000	.000	.000
	Perceived Ease of Use	.000	.	.000	.000
	Perceived Usefulness	.000	.000	.	.000
	Perceived System Quality	.000	.000	.000	.
N	Perceived Intention to Use	1768	1768	1768	1768
	Perceived Ease of Use	1768	1768	1768	1768

	Perceived Usefulness	1768	1768	1768	1768
	Perceived System Quality	1768	1768	1768	1768

6. Results

6.1. Multiple regression analysis

The multiple linear regression model serves as the primary analytical approach for this study, given the cross-sectional design and the observed-measurement framework. The model demonstrates an acceptable overall fit, with a coefficient of determination (R^2) of 0.254 and an adjusted R^2 of 0.251, indicating that approximately 25% of the variance in users' intention to use mobile government applications (MGAs) is explained by the independent variables. The model was statistically significant, $F(7, 1864) = 81.88$, $p < 0.001$, supporting its explanatory adequacy.

The regression analysis confirms the first hypothesis, which posits that demographic characteristics—namely age, employment status, education level, and gender—have a significant effect on users' intentions to use m-government applications. Employment status ($p = 0.009$), age ($p = 0.010$), and gender ($p = 0.016$) were statistically significant predictors. While education level was only marginally significant at the 10% level ($p = 0.083$), its role remains noteworthy. These findings highlight the ongoing influence of individual-level factors in shaping technology adoption behavior. It is worth noting that nationality was excluded as a predictor from the model. The sample consists of Qatari nationals and white-collar expatriates originating from a wide range of countries who came to work in Qatar. Including nationality as a predictor in the model would have required the creation of numerous dummy variables to account for the diverse expatriate groups. This would have added unnecessary complexity to the system and analysis. Therefore, nationality was excluded as a predictor to maintain model simplicity and analytical clarity.

The second hypothesis, which asserts that system quality has a positive effect on intention to use, is also supported ($p < 0.001$). This underscores the importance of technical reliability, responsiveness, and performance—key attributes of system quality in the DeLone and McLean IS Success Model.

The third hypothesis is confirmed as well, with perceived ease of use exhibiting a strong and significant effect on intention to use ($p < 0.001$), consistent with the TAM.

The fourth hypothesis is also supported, showing that perceived usefulness significantly affects intention to use ($p < 0.001$). This further reinforces the TAM framework, which emphasizes that individuals are more likely to adopt a technology if they perceive it as useful in accomplishing tasks or enhancing productivity.

Table 5. Multiple regression analysis

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-4.046	1.765		-2.292	.022
	Perceived Ease of Use	.139	.018	.189	7.531	<.001
	Perceived Usefulness	.236	.022	.254	10.605	<.001
	Perceived System Quality	.103	.016	.162	6.455	<.001
	Education	-.040	.023	-.039	-1.736	.083
	Employment	-.065	.025	-.061	-2.622	.009
	Gender	.028	.011	.054	2.419	.016
	Age	.002	.001	.056	2.576	.010

a. Dependent Variable: Perceived Intention to Use MGAs

Data reported in this table were produced by SPSS Statistics, IBM Corporation

Most scientific investigations employ various theories to explain specific phenomena. In our study, we collected empirical data and constructed the path diagram depicted in the following section, which visually summarizes the observed regression-based associations.

6.2. Path analysis

This study employed a regression-based path analytic approach rather than a full structural equation model (SEM) or partial least squares (PLS) method. Following exploratory factor analysis (EFA), composite scores for each latent construct (Perceived Usefulness, Perceived Ease of Use, System Quality, and Intention to Use) were computed as the means of their retained items. These composite variables, representing the underlying latent constructs, were then used as observed variables in a series of standardized multiple regression equations.

This two-step procedure—measurement validation followed by regression-based path modeling—enabled estimation of both direct and indirect effects among theoretically related constructs while maintaining model simplicity and interpretability. Unlike PLS-SEM, this approach does not estimate latent variables simultaneously but instead relies on reliable composite measures derived from validated scales.

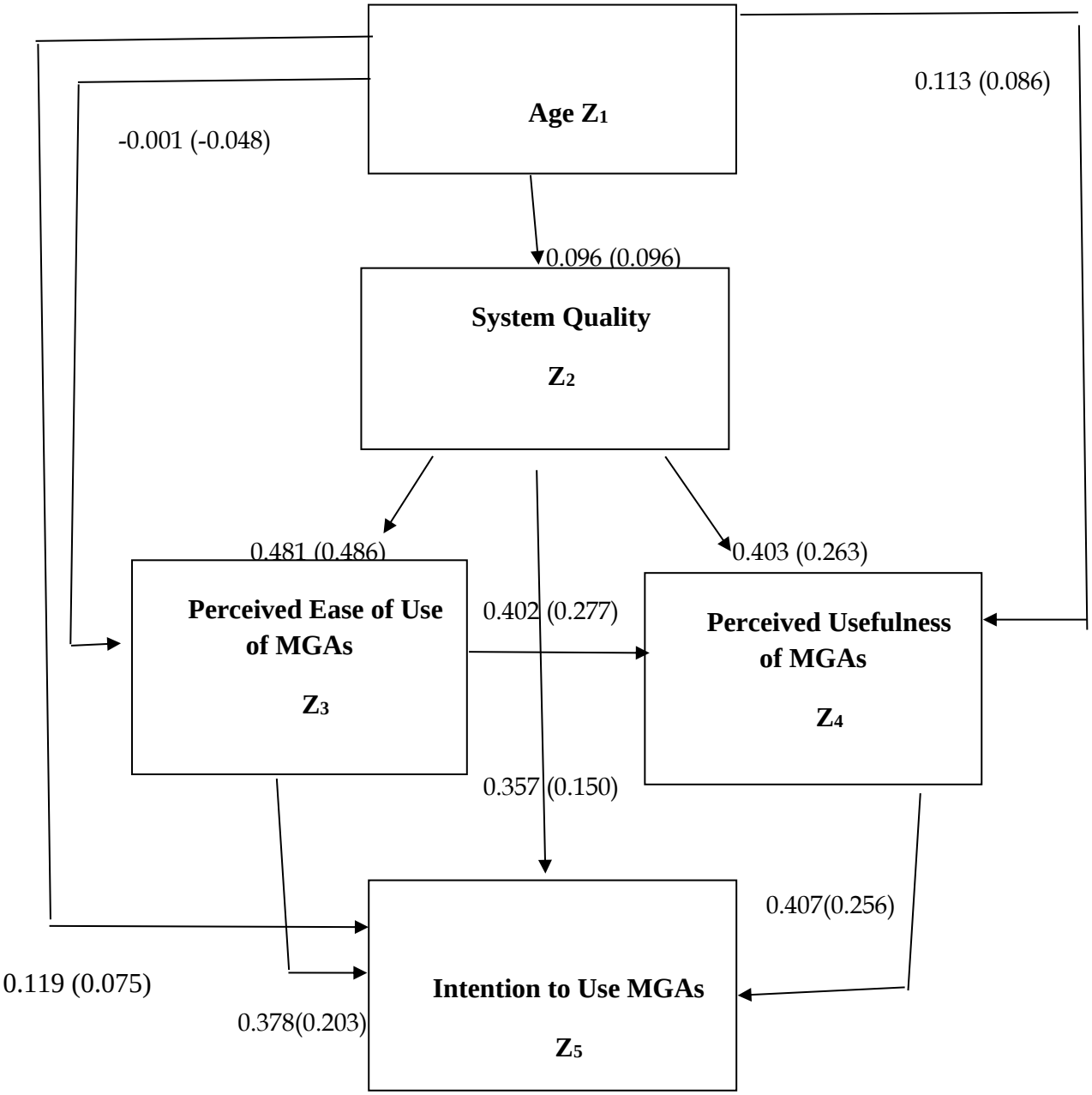
Figure 2 presents an illustrative path diagram derived from multiple and partial regression analyses. The diagram serves as a visual representation of the associative relationships among the study variables rather than a structural equation model. Each path in the diagram includes two numerical values: the first represents the standardized beta coefficient (β) obtained from the regression analysis, reflecting the true direct association between the variables; the value in parentheses represents the zero-order correlation coefficient (Pearson's r), which reflects the total association, encompassing both direct and indirect relationships. The associations are correlational; no structural or causal model was estimated.

The standardized regression equations estimated to obtain the coefficients used in the diagram are as follows:

$$Z2 = \beta 1Z1 + u$$
$$Z3 = \beta 1Z1 + \beta 2Z2 + u$$
$$Z4 = \beta 1Z1 + \beta 2Z2 + \beta 3Z3 + u$$
$$Z5 = \beta 1Z1 + \beta 2Z2 + \beta 3Z3 + \beta 4Z4\ u$$

This regression-based path analysis illustrates how the observed variables are statistically interrelated, showing both their individual (direct) contributions and their shared (total) associations. No latent variable or structural model estimation was performed; therefore, the diagram should not be interpreted as causal but rather as an analytical summary of observed associations among measured constructs.

Figure 2: Path Analysis of the Factors Influencing Intention to Use MGAs in Qatar



As shown in Figure 2, "Perceived Usefulness of MGAs," is shaped by "Age," "System Quality," and "Perceived Ease of Use of MGAs." These factors subsequently influence "Intention to Use MGAs." This underscores the critical role that user perceptions, such as perceived usefulness and ease of use, play in shaping technology adoption behavior. System characteristics, particularly system quality, also emerge as essential determinants. Together, these factors highlight the importance of designing user-centered technologies that are both functional and intuitive, aligning with the principles of the Technology Acceptance Model (TAM) and the DeLone and McLean IS Success Model. The findings reinforce the notion that users are more inclined to adopt technologies that they perceive as easy to use and beneficial and that are supported by high-quality systems. This integration of user perceptions with system attributes provides a comprehensive understanding of the drivers behind technology adoption behavior.

It is noteworthy that while "Marital Status," "Employment," and "Gender" were found to significantly influence the intention to use mobile government applications, these variables were excluded from the path model due to their categorical nature and representation as dummy variables. Employment was coded as 1 for respondents in full-time employment and 0 for all others (including part-time, unemployed, or inactive individuals). Education was coded as 1 for respondents holding a university degree and 0 for those with school-level education or below. Marital status was coded as 1 for respondents who were married and 0 for those who were not married. Although dummy variables can be included in multiple regression analysis, it is generally advisable to avoid their use in path analysis (Lund and Scharen, 1992).

7. Discussion

The results of this study confirm the four hypotheses that demographic characteristics, system quality, perceived ease of use, and perceived usefulness are antecedents to the intention to use mobile government applications. These results align with Davis and colleagues' Technology Acceptance Model (TAM, 1989), which emphasizes that perceived ease of use and perceived usefulness are key factors influencing technology adoption. Additionally, the results are consistent with the DeLone and McLean Information Systems (IS) Success Model, which reports that system quality can affect the intention to use technology. High system quality indeed influences users' inclination to use the technology.

Based on the results of the path causal analysis, "Perceived Usefulness of MGAs" has the highest direct effect (0.256) on "Intention to Use MGAs." This is followed by "Perceived Ease of Use" and "System Quality," with direct effects of 0.203 and 0.150, respectively. These results indicate that perceived usefulness is the most important factor influencing users' intention to use mobile government applications.

Moreover, it is important to note that, "Age" is negatively related to "Perceived Ease of Use of MGAs"; older users generally find technology more difficult to use. The direct relationship between "Age" and ease of use is -0.048, which is much stronger than the total effect of -0.001:

R31 (Total Relation between Perceived Ease of Use and Age) = P31 (direct relation between ease of use and age) + by P32*P21 (plus the indirect relation between age and ease use through system quality denoted) = (-0.048) +(0.486)(0.096)= -0.001

This suggests that the negative impact of "age" on "perceived ease of use" is reduced when "system quality" is high. In other words, the presence of good system quality makes the relationship between "age" and "perceived ease of use" less influential. High-quality systems, with better design elements, clearer instructions, and more intuitive interfaces, can improve older users' perception of ease of use, thereby weakening the negative correlation between "age" and "ease of use."

Additionally, the outcomes of the path causal model reveal that the association between each explanatory variable and the "Intention to Use MGAs" is enhanced by the influence of other independent variables. For instance, the direct relationship between the "Perceived Usefulness of MGAs" and the "Intention to Use MGAs" is 0.237. However, when considering the effects of "Age," "System

Quality," and "Perceived Ease of Use of MGAs," the total relationship increases to 0.407, nearly doubling.

8. Practical implications

This study introduces a research model for m-government adoption with significant practical implications for policymakers, emphasizing their pivotal role in enhancing residents' intentions to adopt. System quality plays a critical role in shaping users' intentions to adopt m-government services. This is particularly relevant for older populations, who often exhibit reluctance toward new technologies. However, when a system is well-designed, intuitive, and meets their specific needs, even older users can be motivated to adopt and use m-government services. Policymakers and developers should, therefore, prioritize enhancing system quality, ensuring it is accessible and appealing to older demographics, thereby encouraging widespread adoption across all age groups. Moreover, understanding residents' perceptions of ease of use of mobile government applications is crucial. Policymakers should prioritize making m-government applications user-friendly to encourage adoption. Increasing awareness of m-government applications among residents can be achieved through effective communication and awareness campaigns, wherein policymakers highlight the benefits and convenience of using mobile government services to garner support and enthusiasm. Public managers can collaborate with influential community leaders and organizations to endorse and advocate for the use of mobile government services.

Additionally, policymakers should prioritize understanding the needs of citizens rather than solely providing services from the government's perspective (Alsaadi et al., 2019). This citizen-centric approach ensures that services are designed and delivered to directly address the requirements and preferences of the citizens they serve, ultimately leading to more effective and user-centric mobile government solutions. By prioritizing residents' needs, governments can increase citizen satisfaction, engagement, and the overall effectiveness of mobile government initiatives. In essence, the findings of the study provide valuable insights for policymakers, not only in Qatar but also in other countries. The practical implications of this research underscore the necessity for policymakers to adopt a holistic approach to the adoption of m-government applications to maximize the effectiveness and success of mobile government initiatives, ultimately enhancing service delivery and residents' engagement.

9. Conclusion

"Achieving a high rate of adoption and acceptance of m-Government services is considered a challenge to a government because it faces several issues related to adoption, implementation and use" (Alonazi et al., 2020, p. 17). This study contributes to the growing body of research on m-government by integrating constructs from the Technology Acceptance Model (TAM) and the DeLone and McLean Information Systems Success Model to examine user adoption in Qatar—a digitally advanced yet demographically diverse society.

The findings confirm that perceived ease of use and perceived usefulness significantly influence users' intentions to adopt m-government services, a relationship supported by previous research in Qatar and other GCC countries (El Kassem & Al-Kubaissi, 2023; Alotaibi, 2017; Al-Neyadi, 2022). In addition, system quality emerged as a direct and important predictor of adoption behavior. While system quality is a well-established construct in information systems research, it remains relatively underexplored in Qatar's m-government context. Its significance in this study reinforces the importance of incorporating service design and technical performance into mobile government adoption models.

Furthermore, the results show that demographic factors—including age, gender, and employment status—continue to influence adoption, even in highly digitized societies. This suggests a need for more personalized and targeted engagement strategies to support inclusive digital service delivery.

Overall, this study provides context-specific insights from Qatar, an underrepresented setting in m-government research. By combining TAM with system quality from the DeLone and McLean model, it offers an empirically grounded extension of existing frameworks and practical guidance for improving the design and implementation of m-government services.

10. Limitations and future research

This study acknowledges several limitations that offer valuable directions for future research. First, the survey was conducted via telephone, with an average completion time of 18.8 minutes. Although no respondents reported dissatisfaction, phone interviews can place greater cognitive demands on participants due to their reliance on auditory processing, which may lead to reduced attentiveness or fatigue. Future studies, if resources allow, may benefit from face-to-face interviews, which can foster a more engaging and interactive participant experience.

Second, the study relied entirely on self-reported data collected at a single point in time. This raises the potential for common method variance (CMV), as well as the limitation of measuring behavioral intention rather than actual usage behavior. While CMV was not addressed through statistical or procedural remedies in this study, we acknowledge this as a limitation. Future research could address this by incorporating multiple data sources and using longitudinal designs to track actual user behavior over time—helping to overcome a well-documented limitation of TAM-based studies.

Third, trust in government and technology, as well as perceived risk, are widely recognized in the literature as important factors influencing e-government adoption. These constructs were not included in the present model in order to maintain focus on core TAM variables and system quality. However, we recommend that future studies consider including trust and risk-related factors to capture a broader range of determinants relevant to m-government adoption.

Fourth, nationality (Qatari vs. expatriate) was not included as a covariate in the current analysis; however, the sample composition was relatively balanced across both groups. Given the primary focus of this study, moderation by nationality was considered beyond the current scope. Future re-

search could examine potential differences in the structural relationships between Qataris and expatriates to further enrich understanding of m-government adoption patterns in Qatar. Similarly, gender, age, and employment status emerged as significant predictors of behavioral intention, highlighting the need for deeper contextual analysis of how these factors operate within Qatar's sociocultural framework.

Finally, future research could adopt qualitative methods such as interviews or focus groups to explore user motivations and lived experiences in greater depth. These approaches can uncover insights that structured surveys may miss. In addition, cross-country comparative studies would enhance the generalizability of the findings and contribute to a broader understanding of m-government adoption across diverse digital, political, and cultural contexts.

11. Ethical clearance

This project has obtained IRB approval from Qatar University (QU-IRB 009/2024-EA), and participants provided informed consent prior to their involvement in the study.

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Author Contribution

Dr. Ali Al-Kubaisi, an expert in digital government, served as the Lead Project Investigator for the Mobile Government Application Usage and Adoption project on which this manuscript is based. He contributed to manuscript review, revisions, and the refinement of the practical implications.

Rima Charbaji El-Kassem, the first and lead author, led the research and was primarily responsible for the conceptualization of the study, literature review, research design, data analysis, and interpretation of results. She drafted and revised all sections of the manuscript and coordinated the overall development of the paper.

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