Fostering Tech Acceptance: User Experience in E-Gov Services as Path to Digital Transformation
A comparative analysis: Qatar and Singapore

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Abstract- Qatar and Singapore are small nations, collaborate in Digital Transformation (DT), innovation, public administration initiatives. Despite both countries advancing in ICT infrastructure, challenges in technology adoption differ. This study investigates UX impact in the main e-government websites on technology acceptance and DT maturity in both countries. By clarifying UX main enablers make Singapore more advanced in technology acceptance, that leads to higher DT maturity than Qatar continues to face challenges even with the ongoing efforts. The study focuses on understanding user behavior toward technology by using UTAUT model. The comparative analysis of Qatar's "Hookumi" and Singapore's "Developer, using automated tools and manual reports from United Nations and World Bank datasets. The findings show both platforms highlight similarly the role of performance, effort expectancy and facilitating conditions as Internet broadband to behave users toward technology this impacts DT, but social influence was not clear despite both prioritize citizen satisfaction. Qatar advances in accessibility, investing in e-health and e-education services but faces with obstacles in unified e-services platform, technology adoption, and data fragmentation. Singapore demonstrates best practices has effective "one-stop" platform, user-centricity research center, data integration and e-financial services with high CX. The research contributes UTAUT factors influences the value of UX in e-gov services driving technology adoption. The study recommends Qatar's policy and decision makers should make integrated e-services with accurate data, establish a research center to address users' challenges through e-participation and focus on digital literacy to foster DT. While Singapore should enhance accessibility standards as compliance. Both countries should enhance UX testing by involving diverse users including disabilities and AI tools partially. The study guides practitioners, researchers, and institutions to benefit from UX insights to collaborate and make practical partnerships and future research to resolve the limitations, as result the importance of UX in DT journey success.
Keywords- Digital Transformation (DT); Information and Communication Technology (ICT), User Experience (UX); Citizen Experience (CX); Customer Experience (CX); E-Government Services; Technology Acceptance; Qatar; Singapore.

1. Introduction

Few countries prioritize citizen-centric and universally accessible services, with limited citizen involvement in portal design. Only around 40% provides accessibility features for disabilities users, a gap evident even in high-income economies (GovTech Maturity Index, 2022). In 2019, World Bank established GovTech Global Partnership (GTGP) to promote digitalization, citizen-centric solutions, engaging governments, private sectors, academia, and development actors

(Govtech Global Partnership, 2022). However, the digital gap widens as the Global Technology Maturity Index (GTMI) increased from 0.519 to 0.552 in 2022, reflecting advancements in online service delivery via shared platforms (GovTech Maturity Index, 2022). Administrative efforts to enhance e-service quality, particularly for Gen Z are imperative (Agritika et al., 2024).

Despite available Information Communication Technology (ICT) infrastructure, technology projects failures necessitate examining user pain points during e-service utilization and adopting a user-centric perspective by engaging users for iterative enhancements when initiating or renewing services to achieve better UX and meet stakeholder needs (Chatzidakis, 2022; Usability Evaluation, 2023). As Steve Jobs properly stated, "you've got to start with the customer experience and work back toward the technology, not the other way around," underscoring the significance of UX (Guide User Experience, 2023). Central Asia and Europe have advanced GovTech maturity, but Middle Eastern service delivery and citizen engagement face challenges despite progress (GovTech Maturity Index, 2022).

Regardless of the country, citizens often avoid visiting government websites due to outdated interfaces (Researchers, 2022). However, during COVID-19 pandemic increased pressure on governments. This situation arises because some government agencies lack competition, DT investigation, and maintenance teams. Consequently, people visit these sites only for tasks or information. National Digital Transformation Committee (2022) noted low user profile creation on national E-Services Portals (ESP) concerning the Provincial Governance and Public Administration Performance Index (PAPI), indicating user-unfriendly e-government service interfaces' challenges (Enhancing User-Friendliness, 2023). Addressing digital divide and e-service limitations is crucial, along with monitoring usage not just assessing to enhance transparency, citizen engagement, and resilience through DT by public agencies (GovTech Maturity Index, 2022). As a result of the COVID-19 outbreak, societies were compelled to adapt to the digital era through policies that supported this trend (Park et al., 2022).

In our research, we hypothesize that user-friendly and easy-to-use of e-government services positively impact people's attitudes and usage behaviors toward accepting technology, further promoting DT. Studies on e-government service acceptance overlook government efforts to enhance UX with digital services (Kumar et al., 2017). Employing UTUAT framework to test hypothesis and explore how e-service simplicity impacts citizen acceptance of technology and contributing to DT maturity by assuming Singapore advances on Qatar. Analyzing published platforms by automated tools and secondary data from UN and World Bank reports, we assess complex user interfaces' impact on UX and technology acceptance in Qatar and Singapore's e-platforms. The importance of web analytics metrics is utilized to understand current content and user motivations and needs, although we cannot comprehend the reasons behind those actions (Dumas & Loring, 2008). Analyzing government websites from a user perspective bridges theory-practice gaps, identifying digital service maturity, citizen participation, lessons and challenges, and creating public administration value through UX analysis across contexts.

First, the paper will review literature, exploring conceptual and theoretical framework; Digital Transformation, e-government, and UX in e-services. Using the UTAUT framework will examine the relationship between user acceptance behaviors and technology utilization. Second, it will examine the current status of GovTech initiatives and relative global indices in Qatar and Singapore through a comparative analysis. Third, the methodology section will detail data collection and sources used for analysis and result generation. Fourth, we will highlight the

limitations and contributions of our study. Fifth, we'll analyze e-government platforms in Qatar "Hukoomi" and Singapore "developer". Singapore demonstrates superior performance, best practices, compliance, and data integration, while Qatar excels in accessibility despite fragmented data. Differences in citizen participation, perception of simplicity, and demographic moderators influence technology acceptance and e-service maturity. Understanding the advancements and obstacles in both countries and their impact on DT is crucial. Sixth, we'll discuss theoretical and practical contributions and limitations. Lastly, offers recommendations and insights to help ensure the DT journey is a success for users, which is a top priority for government organizations, policymakers, developers, and future researchers.

2. Background

2.1. Conceptual and Theoretical Framework

2.1.1. Digital Transformation and E-government and User Experience

Digital transformation (DT) is not just implementing technology projects; it involves integrating technology across organizational and institutional changes, driven by business goals and customer needs strategically (Bloomberg, 2018). Participants prioritized data-driven and customer-centric outcomes for meaningful business results (Cohen & Neubert, 2019). DT emphasizes the user, while technology is the focus of digitalization and digitization. Information is handled by digitization, operations are managed by digitalization, and an organization's entire strategy is driven by DT (Bloomberg; 2018). So, governments derive advantages from ICT to improve and expand services across various sectors, including healthcare, education, and the economy by emerging new concept “e-Government” (Kartik et al., 2016).

E-Government (e-gov) refers to the use of technology and Internet applications to offer services to society (citizens, employees, governmental entities, private sector, and related organizations) (Layne & Lee, 2001, p. 123, Svärd, 2017). United Nations (UN) initially defined e-Government as using ICT for online government service delivery. Then, exchange information to facilitate governance innovation by expanding to include citizen, businesses, and government entities participation and open data (UN E-Government Knowledgebase, 2022). E-government as argued by Fang (2002), Aldemir and Şen (2021) advanced ICT and web applications to offer convenient access to government information and services, for enhancing service quality and promoting democratic participation, particularly in local government decision-making. E-government initiatives aim to publicize information widely through web-based applications for bidirectional communication in society and shifts in behaviors by delivery services aligned with users’ exceptions (Archmann & Iglesias, 2010; Richard, 1999; Worthy, 2010).

User Experience (UX) is tied to the overall quality of user experience (Wechsung & De Moor, 2014). Usability evaluates features of technology or communication services to measure user satisfaction in meeting their needs (Möller, 2023). ISO 9241-210 defines UX as the perception of an individuals before, during, or after using a service or system, encompassing reflections on their behaviors, preferences, comfort, and emotions, alongside the efficient achievement of goals (Introduction to User Experience, 2023). Improving user acceptance for technology relies on Human-Computer Interaction (HCI) design expertise in technology utilization (Hassenzahl & Tractinsky, 2006). That aims the efficiency of information systems with focusing on the human user in digital service and technology contexts. Hassenzahl and Tractinsky (2006) emphasized the importance of addressing and mitigating user frustration, which arises from human-machine

interactions to ensure success. Understanding user behavior and accessibility level of new technology from various abilities users is paramount, as it facilitates the development of enhanced interactions and acceptance (Möller, 2023; Othman et al., 2024).

2.1.2. E-government and Citizen's participation

While only 30% of countries publish citizen engagement statistics, there is a deficiency in sharing citizen input and government responses in policymaking. Despite progress in data access regulations and enforcement lags existing laws (GovTech Maturity Index, 2022). E-Government Development Index (EGDI) rankings emphasized the importance of risk mitigation and government agencies collaboration for DT success (Escobar et al., 2023; Sangolt & Keitsch, 2016). Citizen-government participation through providing multichannel communication strategy led to improve online self-service applications (Madsen & Kræmmergaard, 2016; Nielsen, 2016). Marzooqi et al. (2017) stressed citizen-centric approaches fostering technology acceptance, and autonomy across government levels influenced by user behaviors and attitudes (Cahlikova, 2017). Education and high-income level influenced technology adoption, utilization, and acceptance, serving as an indicator of technological service use (Zmud, 1979; Al-Gahtani et al., 2007; Abu-Shanab, 2011).

E-Government initiatives failed due to process prioritization over citizen needs and financial, political, and infrastructure constraints (Rammea & Grobbelaar, 2017; Tchao et al., 2017). Ineffective governance, insufficient digital skills, and strategy misalignment hinder organizations (Deist et al., 2022). Public sector transformation mandates policy/legal adjustments for evolving dynamics (Akomode et al., 2002). For e-Government success: citizen prioritization, robust privacy/security (Layne & Lee, 2001). Organizational culture shaped change success, requiring adaptations, especially in larger entities (Altameem et al., 2006). Executing strategies through defined procedures key for societal/economic benefits (Altameem et al., 2006). Also, mindsets influence DT success (Töytäri et al., 2017). E-service delivery differs impacting loyalty, consumer behavior, and satisfaction (Rowley, 2006). Lee and Lin (2005) prioritized experience to enhance trust with citizens or customers. Satisfaction is attained when online services meet users' needs and offer flexible attributes. Conversely, loyalty and satisfaction suffer from e-service failures (Wachter, 2002; Zhang & Prybutok, 2005). Web and e-government service experiences play pivotal roles in the success of DT governmental projects (Rowley, 2004).

2.1.3. Acceptance of e-services by citizens

Integrating technology enhances organizational performance. Various theories examined factors influencing digital service acceptance and engagement aiding DT. Technology Acceptance Models (TAMs), typically proposed at the organizational level, suggested users perceive digital services as useful and easy to use (Davis, 1985; Park et al., 2022). However, Venkatesh and Bala (2008) criticized TAM for overlooking societal and organizational factors affecting technology adoption then introduced Extended Technology Acceptance Model 2 (TAM2) (Venkatesh & Davis, 2008).

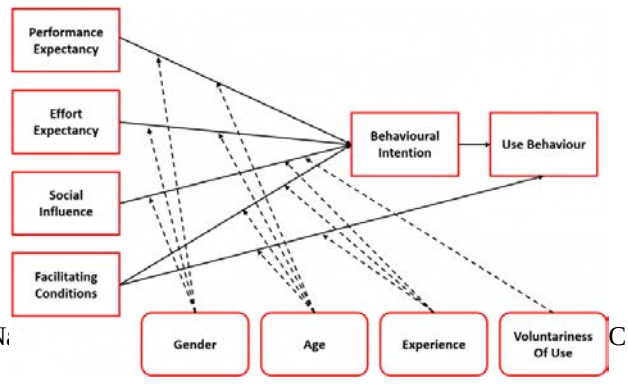

Figure 1 Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003).

Unified Theory of Acceptance and Use of Technology (UTAUT) was proposed to overcome limitations of TAM2A. UTAUT is a key model for understanding user acceptance

of IT in an organization. It explains user intentions and behaviors regarding utilization of information systems and services, focusing on performance expectancy, effort expectancy, social influence, and facilitating conditions, and other moderators as age, gender, experience and voluntary control impact of four main factors (Venkatesh et al., 2003; Unified Theory of Acceptance and Use of Technology, 2023). Social influence and external factors determine the attitude and intention to use the technology. So, the users' perception might change based on gender and experience or age (Venkatesh et al., 2003; UTAUT- Innovation Acceptance Lab, 2023). That is an assessment model of its factors shape our intention which form our behavior toward usage of technology.

E-services comprise various components evaluate individually by visitors (Bauer et al., 2005). Factors like response time, download speed, security, and transaction execution influence customer technology adoption (Chung & Paynter, 2002). E-government services vary in levels, with transactional services exhibiting distinct characteristics, thus influencing UX (Gottschalk, 2009). Consequently, reassessment of e-government services is warranted (Li & Zhao, 2003). Prior studies focused on digitalization success and technology acceptance (Matt et al., 2015), overlooking UX through usage of e-service primarily. We hypothesize that the complexity of e-government services hinders individual acceptance for technology because of negatives in UX, delaying DT maturity. Just emphasizing technology and business strategies is insufficient (Hess et al., 2016); strengthening government-citizen links through contextually tailored digitally systems enhance sustainability and competitiveness (Pittaway & Montazemi, 2020).

Our study emphasizes UX challenges in main e-government platforms, with a comparative analysis of Qatar and Singapore to identify their effects in shaping technology acceptance and influencing the journey of DT. Evaluating the efficacy of these platforms requires addressing potential gaps between high expectations and user's satisfaction in Qatar. By employing UTAUT model and contrasting with Singapore that follows best digital government practices (World Bank, 2022), we discovery insights into users' adoption behavior (User Acceptance of Information Technology, 2003). Selecting both countries for approximately similar populations in 2022 (2,695,122; 5,637,022) and GDP growth rates (4.83%, 3.65%) for Qatar and Singapore, respectively (World Bank Open Data, 2022). GovTech Maturity Index (2020), Qatar ranked 10th in West Asia, the value reflects DT (Nielsen & Ali, 2021). While Singapore leads in digital government (Dener et al., 2021), ranking 7th in the E-Government Development Index in 2018 and 2nd in the Online Service Index out of 193 countries (Digital Government Ranking, 2023). Yet diverse cultural, economic, and political contexts, these digitally transforming nations offer valuable global case studies on the UX and the technology acceptance relationship through established e-government initiatives (Qatar, Singapore, 2022).

2.2. E-Government Metrics: Current Maturity in Qatar and Singapore

Governments are striving to enhance public services particularly during COVID-19 with increasing digital offerings. Incorporating global trends emphasis on customer-centric approaches to enhance citizen satisfaction (Government cx summit, 2024). Qatar and Singapore e-government strategies prioritized DT and technology acceptance for achieving national visions (Qatar Digital Transformation, 2021; Digital Government Blueprint, 2020). While Qatar focused on ICT development and e-service accessibility (TASMU's Experience Policy, 2020), Singapore prioritized collaboration for efficient public service delivery (Researchers, 2022). Utilizing

Figure 2 E-Government Development Index (EGDI) 2022 (UN, 2022).

Customer Experience Index (CXI) assesses customer loyalty through retention and advocacy, driven by meeting needs, accessibility and emotional engagement (Gill, 2023). In 2022, UN E-Government Development Index (EGDI) ranked Qatar 78th (High) and Singapore 12th (Very High) among 193 nations to reflect governmental digitalization initiatives. Among high-income Asian nations, Qatar ranks 12th, while Singapore secures 2nd (Figure 2), Singapore's superior efficiency in delivering online services compared to Qatar (UN EGDI, 2022). Singapore surpasses Qatar regionally and globally, while Qatar trails behind UAE in Western Asia. Singapore excels in Online Service Index compared to Qatar's, both countries score highest (1) related to institutional framework; Qatar had the lowest E-Participation Index while Singapore lacking in content provision, exceled in e-service delivery and e-participation (Figure 3).

Examining Human Capital Index (HCI), Qatar scored 93.46 and 70.56 for adult literacy and gross enrollment ratio, respectively. While Singapore excelled with 97.48 and 100 for the same indicators. In the Telecommunication Infrastructure Index (TII), Singapore and Qatar reflected similarities in in mobile-cellular and active-mobile broadband but lower fixed-broadband rates and Qatar has a high number of Internet users. Globally, while citizen engagement at 0.449 prompts enhanced communication channels. Only 30 nations published data on service delivery performance amidst DT initiatives (GovTech Maturity Index, 2022; Qatar, 2022; Singapore, 2022). Government Technology Maturity Index (GTMI) reported the track of e-governments platforms performance and the progress of DT over time (GovTech Dataset, 2023). It assesses government technology maturity and pinpoints areas for improvement (GTMI, 2022).

The Digital Adoption Index (DAI) focuses on the "supply-side" and availability of digital services and infrastructure over utilization. Qatar ranks 35th, while Singapore leads in 1st position among 180 countries. Upon delving into the DAI sub-indices, Singapore's government achieves the highest DAI value at 0.957, while Qatar scores the lowest at 0.604 (Figure 3). Both countries exhibit closer people-centric

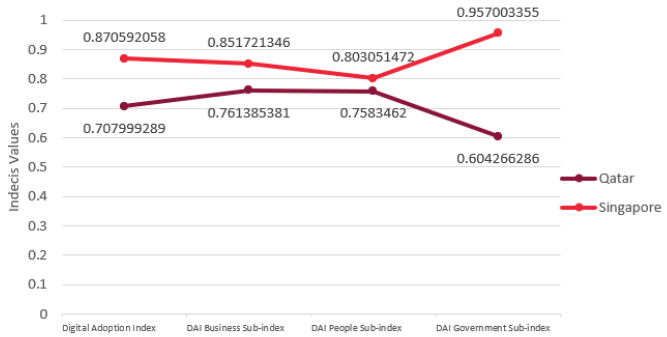

Figure 3 Comparison of Qatar-Singapore Digital Adoption Index (DAI) and sub-indices 2016 (Digital Adoption Index, 2016)

digital adoption values. Promoting digital adoption benefits society through business growth, improved well-being, efficient e-service delivery, and government accountability (Digital Adoption Index, 2016). Qatar aims to elevate e-service usage to 80% by bolstering trust in secure online transactions (Qatar e-Government 2020 strategy, 2020). DT efforts are aligned with Vision 2030, 50% IT adoption by 2024 and universal broadband/5G access (Qatar Digital Transformation, 2021). Hukoomi streamlines citizen-government interaction (Integrated Government Program, 2021) while challenges like awareness and security risks hinder adoption (Qatar e-Government 2020 strategy, 2020). TASMU initiatives drive smart solutions with legal frameworks, accessibility, and security measures underpinning Qatar's e-Government evolution (Government Websites, 2016; TASMU Experience Policy, 2020).

Singapore's DT prioritizes stakeholder needs through skill enhancement and adaptation (Singapore gov, 2021). The Digital Government Blueprint, accelerated by COVID-19, drives Smart Nation initiatives (Digital Government Blueprint, 2020). E-commerce and AI strategies showcase commitment to progress (Erh, 2023). Collaboration with private sectors enhances digital services for efficient transactions. UX remains crucial, with ongoing research and refinement ensuring user-centricity (crUX, 2018). However, persistent challenges in website navigation call for continuous user consultation (Researchers, 2022).

3. Limits and contribution

Recent studies emphasize technology tools creation (Abdullah et al., 2016), DT success factors include e-government initiatives, vision, ICT, education, and legitimization. While individual factors like accessibility and user-friendliness need more empirical research beyond organizational settings (Jeon et al., 2011). Despite advanced technology infrastructure, their usefulness remains debated (Park et al., 2022). Understanding previous findings' applicability in technological and social contexts is imperative. Qatar’s and Singapore’s Global indices reveal technical issues in the GovTech Enablers Index (GTEI) require efforts to enhance performance.

Both countries are small and share similarities but lack a thorough analysis of Singapore's advanced DT in e-government compared to Qatar, particularly in understanding IT's role as an enabler or hindrance. Consequently, the research question aims to identify Qatar e-government platform obstacles and that less advanced with Singapore's. We suppose due to absence of user-friendliness and ease of use of e-government services negatively affecting people's attitudes and behaviors toward technology acceptance. We use analysis main government platforms for both countries expose the potential maturity gap in Qatar and underscoring UX significance, especially for elders or disabled users. The assessment needs to gauge acceptability beyond organizational boundaries. User’s decisions on new technology adoption are influenced by perceived usefulness and ease-of-use; simplicity promotes positive attitudes, complexities hinder acceptance (Technology Acceptance Model, 2024).

The study’s objective is to underscore IT’s role in fostering user-friendly interfaces and enhancing UX is crucial for practical digital service acceptance and success. Our research contributes to add insights that can improve more effective and user-friendly e-government platforms. Our findings mention the importance of ease of use, UX, and data integration from individual perspectives regarding service delivery (Park et al., 2022). Web experiences change impacts on user satisfaction, behavior, and shopping habits (Kumar et al., 2017). In addition, the

research offers practical recommendations assist policy makers, designers and researchers related to refining DT projects.

4. Methodology

Aligning with the research objective of exploring UX and ease of use in e-government platforms Hukoomi in Qatar and developer in Singapore to understand their impact on technology acceptance and DT initiatives. We employ automated tools as Similarweb, Lighthouse, and ADA Site Compliance as appropriate tools. SimilarWeb provided insights into website traffic, prevalent search keywords, audience demographics, geographic location, total visits per period, engagement metrics, and comparative analysis with competing websites (SimilarWeb, 2024). Lighthouse facilitates the evaluation of website performance, compliance to best practices, usability considerations, and content maturity beside highlighting areas need to improvement (Lighthouse Report Viewer, 2024). Notably, the accessibility investigation leveraged established standards to ensure inclusivity for users with diverse abilities and disabilities, as text for images as alternative elements, color contrast and multilingual to make impact and good technology acceptance for all visitors (ADA Site Compliance, 2022).

The methodology is hypered of Quantitively analysis using website analytics and employing Qualitative Comparison Analysis (QCA) to obtain comprehensive insights from comparative multiple cases to identify various combinations of variables leading to similar results or using varying degrees of influence to generate robust findings (Ragin, 1987; Rihoux and Ragin, 2009). This approach is particularly effective for understanding how different independent variables impact outcomes (Rihoux et al., 2011). To examine main e-government platforms' content and interfaces to gain empirical insights to understand level technology acceptance based on websites' performance metrics analyzing.

Incorporating the Context, Content, Process (CCP) model proposed by Devos et al. (2007) and Kimmer (2012), our analysis simplifies cross-case comparisons. This model encompasses indicators, governance, e-Government, and impact assessment. Nielsen (2017) further underscores how each dimension, as discussed by Kimmer (2012), influences the processes, choices, and outcomes in e-service delivery. Employing this framework, we evaluate UX of governmental platforms by focusing on strengths and challenges toward technology acceptance.

The analysis of secondary data from generated reports by previous automated tools, also reputable sources including national government websites and national and international reports from UN and World Bank. Evaluation of EDGI includes sub-indicators such as e-government digital strategies, and the efficiency of public service delivery, exploring their interconnected impact (UN E-Government Development Index, 2022; Qatar, 2022; Singapore, 2022). The analysis focuses on common themes that extract based on UTAUT model like performance expectancy, ease of use and accessibility, social influence and citizen participation related to e-government services, which are crucial for successful DT initiatives and technology acceptance within the public. Also, this paper evaluates legal frameworks and policies, digital infrastructure, user experience (usability, performance, accessibility, feedback mechanisms, content quality), investments, partnerships, innovation, and data-driven decision-making to comprehensively examine e-government UX maturity in both countries.

Collecting data from different sources and using previous tools, thereby analyzed data to patterns as Nielsen (1994) usability evaluations guidelines to promptly identify and resolve usability

issues. He proposed 10 heuristics for evaluating user interaction design: 1) Responsive, unsurprising system actions, 2) Logical alignment between system language and real-world usage, 3) User control over undo/redo and exit, 4) Consistency with platform standards, 5) Error prevention through informative messages, 6) Activation-based information retrieval, 7) Flexibility, 8) Minimalist task instructions, 9) Error explanation and recovery assistance, 10) Easily searchable help documentation to support users (Chatzidakis, 2022).

This paper extends beyond analysis to explore impacts, lessons, and typical approaches in e-governmental services. It highlights how prioritizing user-friendliness in e-government services during design principles. Furthermore, it addresses technological barriers, data issues, and resistance challenges to highlight what might hinder technology adoption and acceptance. Metrics and performance interpretation of both websites contribute usability and accessibility improvement recommendations. Adopting mixed methodologies and comprehensive analysis yields valuable insights into UX understanding of e-government platforms, informs policymakers and developers with practical recommendations for enhancing technology acceptance by citizens into both countries' digital governance landscapes

5. Results and Comparative Analysis

The analysis and findings section includes a comparative study of Qatar's "Hukoomi" and Singapore's "Developer" websites, evaluating UX from the perspectives of end-users and developers (hukoomi.gov.qa., n.d.; developer.tech.gov.sg., n.d.). The evaluation process comprised automated assessments software tools such as SimilarWeb and Lighthouse to analyze key UX features (Table 1). The findings show validated the hypothesis that complexities in Qatar's e-gov platforms negatively influence technology acceptance when compared to Singapore. It indicates Singaporean website exhibits as best practices and resulting to the user centric approach with one stop platform parallel with integrity data and continues improving through user-research center. While Qatari website excelled in accessibility and heavy focusing in e-health and e-education services but struggles in fragmented data and e-services platforms that hinder technology adoption. Results are in both platforms indicate performance and effort expectancy and facilitating conditions impact users' behaviors toward e-services aligns with UTAUT, and the social influence is limited (Figure 4, Table1).

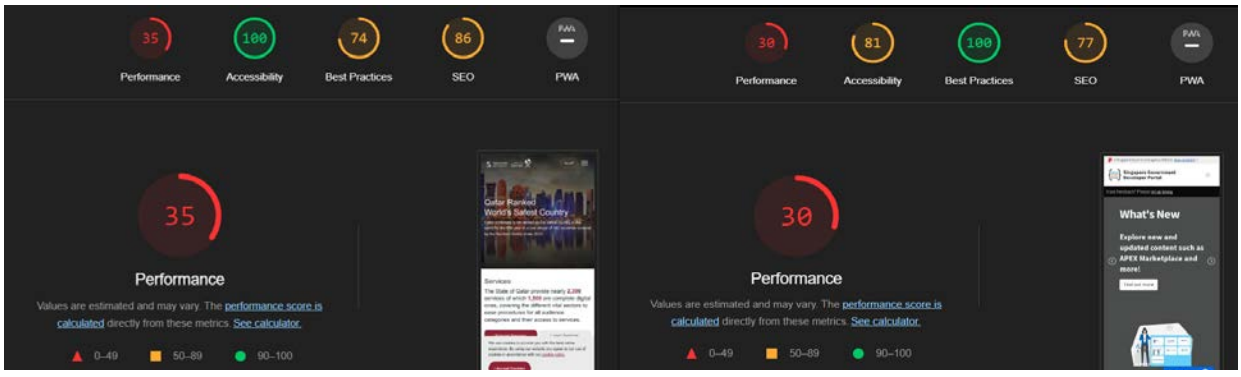

Figure 4 Comparison of Hukoomi (Qatar) and Developer (Singapore) websites using Lighthous tool, 2024 (Lighthouse Report Viewer, 2024)

Category	Qatar (hukoomi.gov.qa)	Singapore (developer.tech.gov.sg)

Performance and Usability	39%	33%
User-Centric e-services	Included	Included
Task Completion time	Found information with error message	Found information with filtering options
Accessibility	Color contrast ensures readability, multilingual support, keyboard navigation, enabled screen reader, zooming-in and out (100% score)	Screen reader compatibility, links based on color who have low vision, (81% score)
Interface Design	Clear and consistent design, easy to use across devices, serves diverse population	Modern, user-friendly design, mobile responsive
Content comprehensiveness	Wide range of services, open government initiatives, interactive tools	One-stop shop, comprehensive information, transparency & accountability, interactive elements
Searchability	Efficient search engine	Efficient search engine
Information Hierarchy	Clear navigation and easy access to content	Information organized and structured logically
Content Quality & Readability	Addresses user needs, accurate and clear content	Addresses user needs, accurate, clear, and well-formatted content
Transparency & Accountability	Needs further investigation, open data initiatives, engagement platforms	Feedback mechanisms, open data initiatives, engagement platforms
Interactive Features	Limited, recently	Diverse feedback mechanisms, engagement platforms
Engagement	Encouraged feedback and suggestions	Encouraged feedback and suggestions, promotes open data and citizen involvement
Satisfaction	High time on page, high click-through rate	High time on page, high click-through rate indication of satisfaction
Users direct feedback	Utilizing Shark platform, alongside online surveys, polls, and forums	Gathering qualitative data on pain points and preferences
Website Traffic Demographics & interests	Most users: 35-44 years old, male & Browsing: Finance > financial planning, management, google, social media, gov	Most users: 25-34 years old, male & Browsing: Computers Electronics and Technology > Programming, developer Software, google, social media, government
Competitor’s websites	mol.gov.qa, moci.gov.qa, nas.gov.qa	mycareersfuture.gov.sg, opencerts.io, smartnation.gov.sg
Top keywords	Health card renewal, تجديد البطاقة الصحية قطر	no data
Traffic from social platforms	Most from WhatsApp webapp then reddit	Most from Linkedin, Meetup
Web-to-web links	No data	To 10 websites, 50% government, education, technology
Properly size images	Not properly, inefficient video format for animated content	Hidden images
best practices	74%	100%
Compliance	45%	52%

Table 1 UX Comparison: Governmental Websites (Qatar, Singapore) (ADA Site Compliance, 2022; hukoomi.gov.qa., 2024; developer.tech.gov.sg., 2024; Lighthouse Report Viewer, 2024; Similar Web, 2024; Participate | Sharek, 2024).

5.1 User Experience in GovTech (Performance and Effort Expectancy)

UX factors in e-government services included time and effort savings, convenience, usability facilitation, transparency and accountability, trustworthiness, and engagement influencing citizen and user behaviors (Table 1) (GovTech Maturity Index, 2022). Conversely, delays in response, service unavailability, outdated information, and transaction failures result in dissatisfaction and necessitate service delivery re-evaluation. Both countries exhibit variations in UX, particularly in website performance and ease of use (hukoomi.gov.qa., 2024; developer.tech.gov.sg., 2024). Moreover, improved acceptance stems from perceived usefulness (Davis et al., 1989). Both countries are committed to accessibility and usability as legal requirements where Qatar advanced, such as screen readers of web pages content for all text and images' alternative text and video text to deliver messages, AI generation text is not used because it is inaccurate and based on human text (Table 1). That aligns with American Disabilities Act (ADA) (2022) outlines accessibility standards to ensure inclusivity and equal access.

Hybrid CX in Hookumi and developer are blending online and human interaction, influences customer loyalty significantly, there is various customer contact channels such as mobile apps, 24/7 phone lines, and chatbots, additionally to human representatives remain crucial for problem resolution to enhance CX quality (Gill, 2023; hukoomi.gov.qa., 2024; developer.tech.gov.sg., 2024). High satisfaction found on both platforms, indicated by high time on page and click-through rates relevance to digital engagement (Table 1) (Lighthouse Report Viewer, 2024). User satisfaction is crucial for e-government service adoption impacting UX, while failures negatively impact it (Seo et al., 2018) aligns with usability definitions encompassing accessibility, operability, user-friendly, and error prevention for effectiveness and satisfaction (ISO 25023, 2016; Sharabati et al., 2015). The monitoring improved the alignment of data-driven services with user needs. Average performance and usability with low in them indicate unused navigation features and unexclusive information (Table 1) (Van Staden et al., 2015).

The availability and maturity of e-services in Singapore depended on the interaction between public and government, delivering public services through unified "one-stop" online platforms (developer.tech.gov.sg., 2024), Singpass is a mobile app that citizens use for over a thousand government services, including online social services, document processing, and identification (Singapore gov, 2021) and GeBiz Singapore's central tender platform aids businesses that provide public services, enhancing efficiency and convenience (Curtin et al., 2003, p. 26). Two applications enhance knowledge sharing between institutions, and improving the efficiency of operations based on usefulness reviews (Curtin et al., 2003, p. 23). Qatar offered a diverse selection of services but not as "one-stop" platform (hukoomi.gov.qa., 2024), the use of distributed ICT management hinders interoperability, increases integration complexities, and hinder service delivery (Curtin et al., 2003, p. 26).

In Singapore, UX Researchers (USER) is an agency with consulting experts guide national and global organizations to enhance UX, making it simple, comfortable, and highly accessible. Well-designed websites contribute to better website performance, providing competitive advantages in all services (Researchers, 2022). This improvement benefits, fosters good governance and builds a positive reputation. Apps share info and aid communication in government services like

banking and healthcare. Financial services rank highest in CX compared to sectors, with a strong emphasis on security, they prioritize quick, simple, and customer-focused delivery, fostering loyalty and advocacy (Customer Experience Excellence Report Singapore Summary, 2019). Qatar has invested in technology initiatives like e-Health and e-Learning through financial investments and institutional e-government reforms (Faisal & Talib, 2015). However, these initiatives faced adoption challenges (Al-Shafi & Weerakkody, 2008), underscoring the importance of optimizing UX for successful implementation.

5.2 Social Influence and citizen participation

Qatar utilized Shark platform, alongside online surveys, polls, and forums, while Singapore gathered qualitative data on pain points and preferences (hukoomi.gov.qa., 2024; developer.tech.gov.sg., 2024). Advancing citizen-centric services mirrors leading GovTech nations' advancement, requiring attention to cultural norms and digital literacy to overcome access barriers (GovTech Maturity Index, 2022). E-participation and e-feedback is pivotal for evaluating digital citizen engagement, employing national platforms for engagement of citizens to policy decision-making, with government responses published. Governments gather user requests and suggestions, enhancing CivicTech through modern technology like chatbots and forums. However, satisfaction levels vary due to demographic disparities, with Singapore showing greater compliance standards (Table 1).

5.3 Facilitating Conditions

Qatar and Singapore as Group A countries enhance GovTech maturity by aligning units with the Prime Minister's Office, promoting government-wide approaches and efficient solutions, monitoring compliance, and enhancing government transparency through public data publication and policy discussions but adoption as forums which are limited (GovTech Maturity Index, 2022). Establishing a comprehensive technical framework of policies across government agencies for unified ICT system design and management across agencies to enhance efficiency and encourage reuse of components (Curtin et al., 2003, p. 26). Government agencies utilize cloud platforms for secure access to public services, but they lack user-centric design. Mobile access is expanding, driving demand for integrated online platforms to deliver streamlined (GovTech Maturity Index, 2022). Slow institutionalization due to resource allocation, coordination, and data management issues (GovTech Maturity Index, 2022). Both governments build public employee capacities, collaborate with academic institutions (Table 1). The national strategies prioritize innovation DT initiatives and policies supporting startups and fostering digital skills (GovTech Maturity Index, 2022). Yet Qatar lacks a policy for e-participation, on the other hand Singapore employs Government Response Mechanism (GRM) for public feedback on service delivery, fostering transparency and responsiveness. Despite Qatar's availability of reports, data on government responsiveness to citizen feedback and service updates remain absent, revealing a disparity between the two countries (GovTech Maturity Index, 2022; Govtech Dataset | Data Catalog, 2023).

5.4 Lessons from UX Singaporean Experiment

ICT training targets diverse age groups and computer skill levels to enhance employability and digital literacy, including Internet skills until development technology (Curtin et al., 2003, p. 25). Human capital capabilities, a clear strategy and a strong ICT infrastructure led to successful e-government initiatives and adapting to change to serve the public, through automation, coordination, then change in the social, technological and commercial areas (Curtin et al., 2003,

p. 21). Implementing an Action Plan focused on; reviewing policies to integrate systems for customer-centric e-services, improving responsiveness, and fostering innovation through experimentation to create new values for government and citizens (Curtin et al., 2003, p. 22). Digital service maturity hinges on robust leadership, sponsorship, user-centric, and governance for sustainable development (Curtin et al., 2003, p. 26).

6. Discussion

The paper is based on the strong theoretical framework of the Unified Theory of Acceptance and Use of Technology (UTAUT) model, focusing on user IT acceptance and the impact on DT journey. It explains intentions and behaviors of users regarding the usage of information systems from various perspectives, including performance expectancy, effort expectancy, social influence, and facilitating conditions addition to moderators such as age, gender, experience, and voluntariness (Venkatesh et al., 2003). The study's results aligned with UTAUT, where performance expectancy impacted users' perceptions toward the benefits of e-government platforms. Effort expectancy, the ease of use of e-government platforms and clear content impacted user perceptions then increasing interactivity. Innovation Diffusion and Technology Acceptance theories' emphasis on simplicity fostering positive IT attitudes, while complexity hinders adoption (Park et al., 2022). The outcomes of a usability assessment on both platforms are consistent with Nielsen's heuristics (1994) factors, that help to evaluate pinpointing areas and implement them lead to tangible improvements in assessing online websites or services.

Social factors are available in different, such as participation from individuals, influenced users' attitudes and behaviors toward using e-government services. Facilitating conditions represented supportive factors or obstacles from the external environment, such as digital skills for individuals, Internet broadband and technical support are found in both countries as initiatives, that affecting users' acceptance of digital government platforms. Controlled variables, demographic factors like age and gender might influence users' behaviors toward the usage of e-services. The study found that most visitors were males aged 30-45 and 25-34 in Qatar and Singapore, respectively, which could impact perceived usefulness and behavioral intentions.

The study's results show both countries prioritize citizen satisfaction, facilitating transactions-level, and e-participation initiatives (GovTech Maturity Index, 2022). Singapore leverages strong e-participation to refine user-centric e-services based on feedback. Developer platform excels in best practice and user-centricity. While Hukoomi emphasizes accessibility with fragmented data. Singapore offers a "one-stop" shop, high-quality data and published, and robust engagement mechanisms. This observation underpins our hypothesis suggested a lower level of UX impacts technology acceptance among citizens in Qatar compared to Singapore.

Our research contributes theoretically to understanding user technology acceptance of e-government platforms. Analyzing the UTAUT model, Performance and effort expectancy are key factors shaping attitudes and usage behaviors. Demographic segments such as age and gender showed a moderating effect, even if it was less significant. Our study underscores the importance of UX design, as understanding user contexts enhances satisfaction, loyalty and fosters positive usage behaviors and acceptance, ultimately increasing the value of e-government platforms. By illustrating user interactions, we extend the theoretical foundations of UTAUT, providing insights into the drivers of technology acceptance for e-government and DT.

The findings have practical implications for policymakers, designers, and practitioners in e-government. Addressing weaknesses retains users whereas successful products refine not reinvent. User-centric design and user involvement strategies should be prioritized when developing e-government platforms to increase user technology acceptance, often by refining existing solutions. Agile methodology adoption is favored for its adaptability and iterative enhancement of customer satisfaction. Thus, iterative improvements in UX embraces diversity ensures everyone has a unique and satisfying interaction to achieve inclusiveness across diverse users with varied expectations, experiences, abilities and provision continuous feedback channels can enhance perceived ease of use, perceived usefulness, and user participation.

The insights contribute to decision-makers' ability to make policies based on baseline analyses of e-government services pain points of users during their use to lead to user-friendly interfaces (What Is Usability Evaluation?, 2023).Achieving accessibility for disabilities users through features like user testing with diverse individuals. That might be overlooked, refining based on their feedback ensures more inclusive design (UX Design, 2024). UX Guidelines there's no Arabic version available in Qatar. Another issue is the absence of governmental forums that could facilitate and publish government-citizens' responsiveness, making it unclear how updates are made based on citizens' feedback. Understanding the audience, ensuring simplicity in design, and meeting expectations are crucial. Team with multilingual skills or cultural consultations help bridge language gaps and understand diverse expectations (UX Design, 2024).

Embracing ICT, optimizing usability and enabling citizen participation via digital channels foster transparency, user satisfaction, and inclusive policymaking by impartially processing requests (Bertot et al., 2012). Enhancing the usability of e-government services cultivates positive UX, corroborating prior research findings (Shareef et al., 2011). Furthermore, citizen engagement through online platforms is highly valued, and incorporating social media facilitates public feedback on policy issues (Bertot et al., 2012; Kumar et al., 2017). The robust Internet connectivity in both countries ensures access to up-to-date government information, with service convenience enhancing citizen attitudes (Bhattacherjee, 2001). Website accuracy was advanced in Singapore side that is crucial for citizen engagement (Cullen & Houghton, 2000). Citizens prioritize e-government services over traditional methods due to ease, speed, and convenience, driving behavioral changes and time-saving benefits (Gilbert et al., 2004; Curran & Meuter, 2005). Consequently, reliable connectivity, accurate information, and user-centric service design foster positive citizen attitudes and adoption of e-government platforms. Government services are distinguished using technology and data, but societal challenges such as data privacy persist. Web Summit enhanced awareness, tackled CX digitalization in global governmental agencies, involved stakeholders, and provided customized solutions for both private and public entities (Governmentcxsummit.Com, n.d.). Achieving GovTech maturity entails investment in e-government enablers and income generation (GovTech Maturity Index, 2022).

While our research has certain limitations, such as the inability of using Google Analytics and challenges in establishing causal relationships between variables, it primarily focused on user behaviors, overlooking influential factors like cultural and social differences, addressing limitations of users and the system is essential for systems' designers, not just addressing as human error on both sides (What Is Usability Evaluation?, 2023).

Future studies could explore technological acceptance dynamics in e-government services through experimental data, particularly in sectors like education or healthcare. Employing tree

testing and usability evaluations could measure the effectiveness of navigation systems, while quantitative metrics might capture user complaints and qualitative data could reveal emotions and initial impressions. Our study's geographical confinement may restrict the findings' generalizability, urging subsequent research to extent diverse platforms and institutional contexts, thereby enriching our understanding of technology acceptance in e-gov services' DT.

2. Conclusion

In conclusion, this study using the extended UTAUT model aims to evaluate the impact of UX on user technology acceptance and maturity of DT in e-gov platforms to understand obstacles make Qatar lags Singapore. The results indicate Performance and effort expectancy are similar for both platforms shaping user behavior toward technology use. Furthermore, facilitating conditions like Internet broadband and technical support play a role in DT initiatives. Social influence does not appear well but a notable observation most of users are male. Qatar excels in accessibility, invested in e-health and e-education services but struggles with challenges in adoption, data fragmentation, and comprehensive e-services availability. Meanwhile, Singapore showcases best practices through owns “one-stop” platform, e-financial services achieve high CX, and data integration.

This study encountered several limitations; primarily much of data related to Qatar was unavailable for public access, and inconsistencies were noted in the information available, leading to ambiguity regarding accuracy. So, Qatar needs centralized platforms for consistent, up-to-date data through inter-agency collaboration, ensuring robust data governance and investment in a data-driven culture (GovTech Maturity Index, 2022), addition to standardized reporting and adopting best practices from Singapore as usage APIs and establishing a research center focused on user-centric challenges could foster effective and efficient solutions to follow Singapore experiment. Time constraints posed challenges in conducting interviews and surveys, particularly for applications in Singapore. Consequently, the analysis relied just on automated methods to investigate UX on the main websites of both countries. As a result, the UTAUT framework requires further data collection to yield comprehensive insights. In addition to lack of real user perceptions from each country, socio-cultural and demographic factors were not considered to measure their direct effect.

The study recommends both countries to establish e-participation multi-channels to address issues encountered by users’ journey on e-government platforms, and the government responds to the evolving needs and changes of citizens, with a focus on accessibility and ease of use for e-services. E-service portals require enhanced DT policies from individuals and businesses view to improve user-friendliness and accessibility for disabled individuals to highlight surfing issues, plan for long-term improvements, and build citizen skills then assessment human capital evaluates ability to use e-services (E-GDI, 2012). That collaboration is between Qatar’s Mada center and Singapore’s Infocomm Media Development Authority (IMAD) and Disabled Peoples’s Association (dpa) then supported by policy makers (Yazid, 2024). The collaboration between academic institutions, government agencies, and digital entrepreneurs and businesses is needed to enhance UX and adherence to unified technical standards should be mandated (Enhancing User-Friendliness, 2023). Use AI to evaluate usability to uncover opportunities and trends but we need human effort to mitigate the bias of AI (What Is Usability Evaluation?, 2023).

Future research CRM research focuses on understanding user behavior and developing tailored solutions to meet their needs effectively (Curtin et al., 2003, p. 29). Investing in secure e-services might promote resilience. Addressing the digital divide and its impact on public-government trust, in addition the existence accountability and transparency might enhance GovTech initiatives' maturity (AlTurky et al., 2021). Digital culture might encourage the mindset shift within society toward technology acceptance. The interaction between the two nations could create better opportunities for improving the usage of e-government services and sharing best practices. Ultimately, Qatar could learn from Singapore's best practices on how to enhance platforms and improve UX by adhering to compliance standards. Singapore could incorporate accessibility improvements based on Qatar's experimentation in this area. By fostering a collaborative environment, both countries can benefit from shared knowledge and experiences, driving the advancement of user-centric e-government services. More, this field could study public policies and guidelines related to UX of online services, or exploring the impact of cultural and social factors on user motivation in these countries, as Baazeem (2019) highlighted user backgrounds influenced technology choices. Incorporating user participation and contextual factors would enhance the understanding of technology acceptance and e-government service adoption.

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References

Abdullah, F., Ward, R., & Ahmed, E. (2016). Investigating the influence of the most commonly u¹sed external variables of TAM on students' Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) of e-portfolios. Computers in Human Behavior. https://doi.org/10.1016/j.chb.2016.05.014

About The ConnectAI - AI Singapore Community. (2022). https://connect.aisingapore.org/home/about/

Abu-Shanab, E. A. (2011). Education level as a technology adoption moderator. 2011 3rd International Conference on Computer Research and Development, 1, 324–328. https://doi.org/10.1109/ICCRD.2011.5764029

Accessibility ADApter™ Information - ADA Site Compliance. (2021). ADA Site Compliance. https://adasitecompliance.com/accessibility-adapter-info/

Agritika, D. F., Hartoyo, H., & Suharjo, B. (2024). *The The Effect of E-Service Quality Through Customer Satisfaction and Customer Trust on Customer Loyalty of Klikindomaret Users*. Indonesian Journal of Business and Entrepreneurship. https://doi.org/10.17358/ijbe.10.1.203

Aldemir, C., & Şen, E. (2021). A model proposal for local governments to increase citizen involvement in the age of information society and e-government: Crowdsourcing. In C. Babaoğlu, E. Akman, & O. Kulaç (Eds.), Advances in Public Policy and Administration (pp. 172–190). IGI Global. https://doi.org/10.4018/978-1-7998-4978-0.ch010

Altameem, T., Zairi, M., & Alshawi, S. (2006). Critical success factors of e-government: A proposed model for e-government implementation. 2006 Innovations in Information Technology, 1–5. https://doi.org/10.1109/INNOVATIONS.2006.301974

AlTurky, K; Elayah, M; AlMawri, A; AlZendani. (2021). The Role of E-Governance in Promoting Transparency for Qatar's Private Sector. http://dspace.univ-ouargla.dz/jspui/handle/123456789/27144

Archmann, S., & Castillo Iglesias, J. (2010). Egovernment: A driving force for innovation and efficiency in public administration. EIPAScope, 2010(1), 29–36. http://aei.pitt.edu/14694/

Baazeem, R. M. (2019). The role of religiosity in technology acceptance: The case of privacy in saudi arabia. In Censorship, Surveillance, and Privacy: Concepts, Methodologies, Tools, and Applications (pp. 1787–1808). IGI Global. https://doi.org/10.4018/978-1-5225-7113-1.ch089

Bauer, R., Koedijk, K., & Otten, R. (2005). *International evidence on ethical mutual fund performance and investment style*. Journal of Banking and Finance. https://doi.org/10.1016/j.jbankfin.2004.06.035

Bertot, J. C., Jaeger, P. T., & Grimes, J. M. (2012). *Promoting transparency and accountability through ICTs, social media, and collaborative e-government*. Transforming Government: People, Process and Policy. https://doi.org/10.1108/17506161211214831

Bhattacherjee, A. (2001). Understanding information systems continuance: An expectation-confirmation model. MIS quarterly, 351-370.

Cahlikova, T. (2017). The uptake of e-Democracy and e-Participation in the Swiss Federal administration. 2017 Fourth International Conference on eDemocracy & eGovernment (ICEDEG), 182–188. https://doi.org/10.1109/ICEDEG.2017.7962531

Chatzidakis, F. (2022). *Usability evaluation methods, an overview - Bootcamp*. Medium. https://bootcamp.uxdesign.cc/usability-evaluation-methods-an-overview-4574c1d50020

Chung, W., & Paynter, J. (2002). Privacy issues on the Internet. Proceedings of the 35th Annual Hawaii International Conference on System Sciences, 9 pp.-. https://doi.org/10.1109/HICSS.2002.994191

Citizen Customer Experience Software for Government Organizations. (2024). NICE. https://www.nice.com/solutions/government

Cullen, R., & Houghton, C. (2000). *Democracy online: an assessment of New Zealand government web sites*. Government Information Quarterly. https://doi.org/10.1016/s0740-624x(00)00033-2

Curran, J. M., & Meuter, M. L. (2005). Self-service technology adoption: comparing three technologies. *Journal of services marketing*, *19*(2), 103-113.

Curtin, G. G., Sommer, M. H., & Vis-Sommer, V. (2003). The world of e-government. Journal of Political Marketing, 2(3–4), 1–16. https://doi.org/10.1300/J199v02n03_01

Customer Experience Excellence Report Singapore Summary. (2019). KPMG. https://assets.kpmg.com/content/dam/kpmg/sg/pdf/2019/12/2019-customer-experience-report-summary.pdf

Davis, F. D. (1985). A technology acceptance model for empirically testing new end-user information systems: Theory and results (Doctoral dissertation, Massachusetts Institute of Technology).

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. Management science, 35(8), 982-1003.

Deist, M., Reuschl, A. J., & Barwinski, R. (2022). Digital mess up- why digital organization initiatives fail. Academy of Management Proceedings, 2022(1), 16646. https://doi.org/10.5465/AMBPP.2022.16646abstract

DesignPeers (2023). دليلك للوصول إلى التصميم الأكثر فعالية وملاءمة لشركتك *#UserExperience*. [Post]. LinkedIn. Retrieved December 13th, 2021, from https://www.linkedin.com/feed/update/urn:li:activity:7039599876132810752/

Developer *Traffic Analytics*. (2024). Semrush. https://rb.gy/fo2fag
developer.tech.gov.sg. (2024). Similarweb. Retrieved February 28, 2024, from *https://www.similarweb.com/website/developer.tech.gov.sg/competitors/*
Devos, G., M. Buelens and D. Bouckenooghe (2007). "Contribution of content, context, and process to understanding openness to organizational change: Two experimental simulation studies." The Journal of social psychology 147(6): 607-630.
Digital adoption index. (2016). [Text/HTML]. World Bank. Retrieved February 8, 2024, from https://www.worldbank.org/en/publication/wdr2016/Digital-Adoption-Index
Digital Government Blueprint. (2020). Retrieved September 16, 2023, from https://www.tech.gov.sg/digital-government-blueprint/
Digital Incubation Center (2023). *#DesignThinking*. [Post]. LinkedIn. Retrieved January 25th, 2024, from https://shorturl.at/ruwQR
Digital transformation based on ICT innovations for the development of the digital economy. (2021). ITU. Retrieved January 16, 2024, from https://rb.gy/scenkq
Drive Digital Transformation. (2024). NICE. https://www.nice.com/solutions/drive-digital-transformation
Dumas, J. S., & Loring, B. A. (2008). *Moderating usability tests: Principles and practices for interacting*. Elsevier. https://shorturl.at/cjovX
Ease of doing business: World Bank Open Data: 2020.
E-Commerce Guidelines User Experience. (2019). Ministry of Transportation and Communications (MOTC) State of Qatar. https://ecommerce.gov.qa/wp-content/uploads/2019/07/3.-eCommerce-Guidlines-User-Experience.pdf
E-Government Readiness Survey Database: 2018. %7BUNDESA - United Nations Department of Economic and Social Affairs, 2016 #778%7D. Accessed: 2018-11-16.
Enhancing user-friendliness and policies to promote e-government services. (2023). UNDP. Retrieved February 3, 2024, from https://www.undp.org/vietnam/press-releases/enhancing-user-friendliness-and-policies-promote-e-government-services
Erh, J. (2023). Singapore's Digital Transformation Journey. Journal of Southeast Asian Economies, 40(1), 4–31. https://doi.org/10.1355/ae40-1b
Escobar, F., Almeida, W. H. C., & Varajão, J. (2023). Digital transformation success in the public sector: A systematic literature review of cases, processes, and success factors. Information Polity, 28(1), 61–81. https://doi.org/10.3233/IP-211518
Fang, Z. (2002). E-government in digital era: concept, practice, and development. International journal of the Computer, the Internet and management, 10(2), 1-22.
Gartner | stock price, company overview & news. (n.d.). Forbes. Retrieved January 18, 2024, from https://www.forbes.com/companies/gartner/
Gilbert, D., Balestrini, P. P., & Littleboy, D. (2004). *Barriers and benefits in the adoption of e-government*. International Journal of Public Sector Management. https://doi.org/10.1108/09513550410539794
Gill, M. (2023). Highlights from the uk banking cx index rankings, 2023—How do uk banking brands earn loyalty? *Forrester*. https://www.forrester.com/blogs/highlights-from-uk-banking-cx-index-2023-how-do-uk-banking-brands-earn-loyalty/
Gottschalk, P. (2009). *Maturity levels for interoperability in digital government*. Government Information Quarterly. https://doi.org/10.1016/j.giq.2008.03.003
Government of Qatar selects Sprinklr to deliver unified digital citizen experience. (2023, March 22). Bizness Transform. https://www.biznesstransform.com/government-of-qatar-selects-sprinklr-to-deliver-unified-digital-citizen-experience/
Government Websites and e-Services Framework (version 2.0). (2016). Ministry of Transportation and Communications (MOTC) State of Qatar. https://www.mcit.gov.qa/sites/default/files/government_website_and_e-services_framework_version_2.0.p
Govtech dataset | data catalog. (2023). Retrieved February 17, 2024, from https://datacatalog.worldbank.org/search/dataset/0037889/about:blank
GovTech Maturity Index . (2022, December). worldbank.org. Retrieved February 14, 2024, from https://openknowledge.worldbank.org/server/api/core/bitstreams/5e157ee3-e97a-5e42-bfc0-f1416f3de4de/content
Gtmi. (2022). World Bank. Retrieved February 13, 2024, from https://www.worldbank.org/en/programs/govtech/gtmi
Guide User experience of government digital solutions and products v.1.0. (November 20, 2023). Ministry of Transport, Communications and Information Technology (Sultanate of Oman). https://oman.om/docs/default-source/default-document-library/uiuxar.pdf
Hassenzahl, Marc, and Noam Tractinsky. "User Experience - a Research Agenda." Behaviour & Information Technology, vol. 25, no. 2, Mar. 2006, pp. 91–97. DOI.org (Crossref), https://doi.org/10.1080/01449290500330331.
Hess, T., Matt, C., Benlian, A., & Wiesboeck, F. (2016). Options for formulating a digital transformation strategy. MIS QUARTERLY EXECUTIVE, 15(2), 123–139. https://eres.qnl.qa/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=edswss&AN=000377109100003&site=eds-live&scope=site
HOME Doha Qatar – governmentcxsummit.com. (n.d.). Retrieved January 21, 2024, from https://governmentcxsummit.com/home-doha-qatar/
Hukoomi *Traffic Analytics*. (2024). Semrush. https://www.semrush.com/analytics/overview/?q=https%3A%2F%2Fwww.developer.tech.gov.sg%2F&protocol=https&searchType=domain
hukoomi.gov.qa. (2003). Similarweb. Retrieved February 28, 2024, from https://www.similarweb.com/website/hukoomi.gov.qa/#overview
Human-Computer Interaction. Guide Books, https://doi.org/10.5555/561701. Accessed 17 Jan. 2024.
Integrated Government Program (i-Gov) | Ministry of Communications and Information Technology. (2021). Retrieved October 3, 2023, from https://www.mcit.gov.qa/en/qatar-digital-government/i-gov
International Organisation for Standardisation (ISO). (2016b). Systems and software enginnering - Systems and software quality requirements and evaluation (SQuaRE) - Measurement of system and software product quality (ISO Standard No. 25023:2016).
J. Akomode, A. Taleb-Bendiab, A. Evangelidis and M. Taylor, "UML Approach to Risk Assessment Modelling for eGovernment", Proceedings of the Second European Conference on e-Government ECEG'2002, 2002.
Jeon, S. H., Kim, Y., & Koh, J. (2011). Individual, social, and organizational contexts for active knowledge sharing in communities of practice. Expert Systems With Applications. https://doi.org/10.1016/j.eswa.2011.04.023
Kumar, R., Sachan, A., & Mukherjee, A. (2017). Qualitative approach to determine user experience of e-government services. Computers in Human Behavior, 71, 299–306. https://doi.org/10.1016/j.chb.2017.02.023
Layne, K., & Lee, J. (2001). Developing fully functional E-government: A four stage model. Government Information Quarterly, 18(2), 122–136. https://doi.org/10.1016/S0740-624X(01)00066-1
Lee, G., & Lin, H. (2005). *Customer perceptions of e-service quality in online shopping*. International Journal of Retail & Distribution Management. https://doi.org/10.1108/09590550510581485
Li, G., & Zhao, X. (2003). *Properties of concrete incorporating fly ash and ground granulated blast-furnace slag*. Cement and Concrete Composites. https://doi.org/10.1016/s0958-9465(02)00058-6
Lighthouse Report Viewer. (2024). https://shorturl.at/iqsty
Lighthouse Report Viewer. (2024). https://shorturl.at/sDRU7
Madsen, C. Ø., & Kræmmergaard, P. (2016). How to succeed with multichannel management: A case study of cross-organizational collaboration surrounding a mandatory self-service application for danish single parents. International Journal of Public Administration in the Digital Age (IJPADA), 3(4), 94–110. https://doi.org/10.4018/IJPADA.2016100107
Marzooqi, S. A., Nuaimi, E. A., & Qirim, N. A. (2017). E-governance (G2c) in the public sector: Citizens acceptance to E-government systems - Dubai's case. Proceedings of the Second International Conference on Internet of Things, Data and Cloud Computing, 1–11. https://doi.org/10.1145/3018896.3025160
Matt, C., Hess, T., & Benlian, A. (2015). Digital transformation strategies. Business & Information Systems Engineering, 57(5), 339–343. https://doi.org/10.1007/s12599-015-0401-5
Mitigation Suite - ADA Site Compliance. (2022). ADA Site Compliance. https://adasitecompliance.com/mitigation-suite/#wpcf7-f20605-p16214-o1
Möller, S. (2023). Motivation and Objectives, Quality and Usability. Springer eBooks. https://doi.org/10.1007/978-3-662-65615-0_1
National AI Strategy Summary. (n.d.). Retrieved September 18, 2023 https://www.smartnation.gov.sg/files/publications/national-ai-strategy-summary.pdf
National Profile of the Information Society in Qatar. (2007). ESCWA. Retrieved October 4, 2023, from https://www.unescwa.org/sites/default/files/inline-files/Qatar-07-E.pdf
Nielsen, J. (1994). Heuristic Evaluations. In: J. Nielsen & R.L. Mack. (Eds), Usability Inspection Methods. New York: John Wiley & Sons.
Nielsen, M. M. (2016). Digitising a small island state: A lesson in faroese. Proceedings of the 9th International Conference on Theory and Practice of Electronic Governance, 54–59. https://doi.org/10.1145/2910019.2910042
Nielsen, M. M. (2017). eGovernance Frameworks for Successful Citizen Use of Online Services: A Danish-Japanese Comparative Analysis. *EJournal of EDemocracy & Open Government*, *9*(2), 68–109. https://doi-org.eres.qnl.qa/10.29379/jedem.v9i2.462
Nielsen, M. M., & Ali, W. K. M. (2021). Governing and Monitoring the Digital Transformation: Assessing the Qatari Experience since 2003. In Proceedings of the 14th International Conference on Theory and Practice of Electronic Governance (ICEGOV '21). https://doi.org/10.1145/3494193.3494227
Othman, A., Dhouib, A., Chalqhoumi, H., El Ghoul, O., & Al-Mutawaa, A. (2024). The acceptance of culturally adapted signing avatars among deaf and hard-of-hearing individuals. IEEE Access, 12, 78624–78640. https://doi.org/10.1109/ACCESS.2024.3407128
Park, I., Kim, D., Moon, J., Kim, S., Kang, Y., & Bae, S. S. (2022). Searching for New Technology Acceptance Model under Social Context: Analyzing the Determinants of Acceptance of Intelligent Information Technology in Digital Transformation and Implications for the Requisites of Digital Sustainability. Sustainability. https://doi.org/10.3390/su14010579
Participate | Sharek. (2024). Sharek. https://www.sharek.gov.qa/en/page/participate
Pittaway, J. J., & Montazemi, A. R. (2020). Know-how to lead digital transformation: The case of local governments. Government Information Quarterly, 37(4), 101474. https://doi.org/10.1016/j.giq.2020.101474
Qatar Digital Government Strategy 2023—2025 | Hukoomi Qatar E-Government. (n.d.). Retrieved September 30, 2023, from https://hukoomi.gov.qa/en/strategy
Qatar e-Government 2020 strategy, Executive Summary. (2020). Ministry of Information and Communications (ictQatar). https://ecommerce.gov.qa/wp-content/uploads/2019/07/3.-eCommerce-Guidlines-User-Experience.pdf
Qatar Open Data Portal. (n.d.). Retrieved October 4, 2023, from https://www.data.gov.qa/pages/home/
Qatar Research, Development, and Innovation (QRDI) Council (2023). *QRDI Portal*. [Post]. LinkedIn. Retrieved January 25th, 2024, from https://rb.gy/1a7kg5

Qatar. (2022). UN.org. Retrieved February 17, 2024, from https://publicadministration.un.org/egovkb/en-us/Data/Country-Information/id/137-Qatar
Ragin, C. C. (1987). The comparative method. Moving beyond qualitative and quantitative strategies. Berkeley, Los Angeles and London: University of California Press.
Rammea, L., & Grobbelaar, S. S. (2017). The evaluation of e-government implementation: A case study of the Lesotho Company Registry System. 2017 IEEE AFRICON, 504–511. https://doi.org/10.1109/AFRCON.2017.8095533
Researchers, U. E. (2022). Top reasons government-owned websites need user experience consulting. *USER Experience Researchers - UX UI Design & Research Company in Singapore*. https://www.user.com.sg/top-reasons-government-owned-websites-need-user-experience-consulting/
Richard, E. (1999). Tools of governance, digital democracy, discourse and decision making in the information age, Routledge, London (1999).
Rihoux, B., & Ragin, C. C. (2009). Configurational comparative methods. Qualitative Comparative Analysis (QCA) and related techniques (Applied Social Research Methods . Thousand Oaks and London: Sage.
Rihoux, B., Rezsöhazy, I., & Bol, D. (2011). Qualitative Comparative Analysis (QCA) in Public Policy Analysis: an Extensive Review. *German Policy Studies/Politikfeldanalyse, 7*(3).
Rowley, J. (2004). *Online branding*. Online Information Review. https://doi.org/10.1108/14684520410531637
Rowley, J. (2006). *An analysis of the e-service literature: towards a research agenda*. Internet Research. https://doi.org/10.1108/10662240610673736
Sangolt, M. S., & Keitsch, M. (2016). Service design in digitization of governmental service. DS 85-1: Proceedings of NordDesign 2016, Volume 1, Trondheim, Norway, 10th - 12th August 2016, 012–021. https://www.designsociety.org/publication/39279/Service+Design+in+Digitization+of+Governmental+Service
Seo, D. B., Tan, C. W., & Warman, G. (2018). Vendor satisfaction of e-government procurement systems in developing countries: An empirical research in Indonesia. Information Technology for Development, 24(3), 554–581. https://doi.org/10.1080/026 81102.2018.1454878
Sharabati, M. M. N., Sulaiman, A., & Mohd Salleh, N. A. (2015). End user satisfaction and individual performance assessments in e-procurement systems. International Journal of Computer Theory and Engineering, 7(6), 503–509. https://doi. org/10.7763/ijcte.2015.v7.1010
Shareef, M. A., Kumar, V., Kumar, U., & Dwivedi, Y. K. (2011). *e-Government Adoption Model (GAM): Differing service maturity levels*. Government Information Quarterly. https://doi.org/10.1016/j.giq.2010.05.006
Singapore gov't handpicks user for agile ux and development. (2021). *USER Experience Researchers - UX UI Design & Research Company in Singapore*. https://www.user.com.sg/singapore-govt-handpicks-user-for-agile-ux-and-development/
Singapore. (2022). UN.org. Retrieved February 17, 2024, from https://publicadministration.un.org/egovkb/en-us/Data/Country-Information/id/154-Singapore
Svärd, P. (2017). 1—E-Government development and its impact on information management. In P. Svärd (Ed.), Enterprise Content Management, Records Management and Information Culture Amidst e-Government Development (pp. 1–11). Chandos Publishing. https://doi.org/10.1016/B978-0-08-100874-4.00001-6
TASMU Experience Policy. (2020). TASMO. Ministry of Information and Communications. https://tasmu.gov.qa/themes/custom/tasmu/assets/pdfs/TASMU-Experience-Policy-EN.pdf
Tawtheeq Qatar National Authentication System (Guide 2023). (2021). Tawtheeq Qatar National Authentication System (Guide 2023). https://www.dohaguides.com/tawtheeq-qatar-guide/
Tchao, E. T., Keelson, E., Aggor, C., & Amankwa, G. A. M. (2017). E-government services in ghana—Current state and future perspective. 2017 International Conference on Computational Science and Computational Intelligence (CSCI), 624–631. https://doi.org/10.1109/CSCI.2017.108
Technology acceptance model. (2024). Wikipedia. https://en.wikipedia.org/wiki/Technology_acceptance_model
Telecommunication Development Conferences. (2006). ITU. Retrieved October 7, 2023, from https://www.itu.int:443/en/history/Pages/TelecommunicationDevelopmentConferences.aspx?conf=4.160
The crUX of the matter—A pleasant user experience. (2018). https://www.tech.gov.sg/media/technews/the-crUX-of-the-matter-a-pleasant-user-experience
The govtech global partnership. (2022). [Text/HTML]. World Bank. Retrieved February 14, 2024, from https://www.worldbank.org/en/programs/govtech/partners
Töytäri, P., Turunen, T., Klein, M., Eloranta, V., Biehl, S., Rajala, R., & Hakanen, E. (2017). Overcoming institutional and capability barriers to smart services. Hawaii International Conference on System Sciences 2017 (HICSS-50). https://aisel.aisnet.org/hicss-50/da/service_science/6
UN E-Government Development Index. (2022). un.org. Retrieved February 17, 2024, from https://publicadministration.un.org/egovkb/en-us/data-center
Unified theory of acceptance and use of technology. (2023). Wikipedia. https://en.wikipedia.org/wiki/Unified_theory_of_acceptance_and_use_of_technology
United Nations (2012), E-Government Survey 2012. E-Government for the People, New York. https://www.ifo.de/DocDL/dicereport412-db2.pdf
User Acceptance of Information Technology: Toward a Unified View on JSTOR. (n.d.). www.jstor.org. https://www.jstor.org/stable/30036540
User research campaign. (2023). USER Experience Researchers - UX UI Design & Research Company in Singapore. https://www.user.com.sg/user-research-campaign/
Ux design. (2024). Singapore Government Developer Portal. https://www.developer.tech.gov.sg/guidelines/development-and-iteration/ux-design
van Staden, C. J., van Biljon, J. A., & Kroeze, J. H. (2015). eModeration: Towards a user experience evaluation framework. In Proceedings of the 2015 Annual Research Conference on South African Institute of Computer Scientists and Information Technologists (pp. 1–11). https://doi.org/ https://doi.org/10.1145/2815782.2815821
Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. Decision Sciences, 39(2), 273–315. https://doi.org/10.1111/j.1540-5915.2008.00192.x
Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. Management Science, 46(2), 186–204. https://doi.org/10.1287/mnsc.46.2.186.11926
Wachter, J. A. (2002). *Portfolio and Consumption Decisions under Mean-Reverting Returns: An Exact Solution for Complete Markets*. Journal of Financial and Quantitative Analysis. https://doi.org/10.2307/3594995
Wechsung, Ina, and Katrien De Moor. "Quality of Experience Versus User Experience." Quality of Experience: Advanced Concepts, Applications and Methods, edited by Sebastian Möller and Alexander Raake, Springer International Publishing, 2014, pp. 35–54. Springer Link, https://doi.org/10.1007/978-3-319-02681-7_3.
What is Usability Evaluation? (2023). The Interaction Design Foundation. https://www.interaction-design.org/literature/topics/usability-evaluation
Worthy, B. (2010). More open but not more trusted? The effect of the freedom of information act 2000 on the united kingdom central government. Governance, 23(4), 561–582. https://doi.org/10.1111/j.1468-0491.2010.01498.x
Yazid, M. (2024, January 26). *Ensuring Digital Inclusion for Persons with Disabilities in Singapore*. Disabled People's Association. https://dpa.org.sg/ensuring-digital-inclusion-for-persons-with-disabilities-in-singapore/
Zhang, X., & Prybutok, V. R. (2005). A consumer perspective of e-service quality. *IEEE transactions on Engineering Management, 52*(4), 461-477.

