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A Multidimensional Framework for Telehealth Adoption in Libya: The Role of Trust in Technology

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Abstract

Telehealth has the potential to revolutionize healthcare delivery in resource-constrained environments, offering improved access to medical care and enhanced healthcare system efficiency. However, its adoption in developing countries, particularly in fragile states like Libya, faces significant challenges. This study proposes a comprehensive, multidimensional framework for understanding telehealth adoption in Libya, emphasizing the mediating role of trust in technology. The framework integrates the Technology-Organization-Environment (TOE) model, Diffusion of Innovation (DOI) theory, and the Unified Theory of Acceptance and Use of Technology (UTAUT) while highlighting how trust in digital health systems influences the relationship between technological, organizational, environmental, and individual factors and actual telehealth usage. Libya's unique socio-political context, characterized by fragmented healthcare governance, limited ICT infrastructure, and cultural resistance to digital healthcare, necessitates a nuanced approach to telehealth implementation. The findings demonstrate that while technological readiness, leadership support, and regulatory frameworks are crucial for adoption, trust in technology, shaped by perceived system reliability, data security, and institutional reputation, emerges as a significant mediator. The study contributes to the literature by addressing the underexplored role of trust in telehealth adoption, particularly in low-income and middle-income countries. It also offers practical insights for policymakers and healthcare administrators aiming to enhance telehealth implementation in Libya, suggesting strategies to build trust, improve digital literacy, and enhance institutional support. This research provides a framework that can be adapted to other developing countries navigating similar challenges in telehealth adoption.

Article Info

Keywords:
Telehealth adoption, Trust in technology, Libya, Healthcare infrastructure, Digital health systems

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INTRODUCTION

Access to quality healthcare is a fundamental determinant of national well-being and economic stability, particularly in post-conflict and developing countries like Libya. Amidst its ongoing political and infrastructural challenges, Libya's public healthcare sector continues to struggle with limited resources, workforce shortages, and stark disparities in healthcare accessibility across urban and rural regions (Fitzgerald, 2023; WHO, 2023). Although healthcare services are offered free of charge in public facilities, nearly 1.3 million Libyans lack access to essential medical care (WHO, 2023). The urgent need to optimize healthcare delivery mechanisms has made the integration of Information and Communication Technology (ICT) in healthcare, specifically telehealth, a critical strategic avenue.

Telehealth is defined as the delivery of healthcare services and information via telecommunications technologies, bridging the gap between patients and providers separated by distance (CDC, 2023). Beyond real-time video consultations, telehealth encompasses remote patient monitoring, store-and-forward imaging, mobile health (mHealth) applications, and virtual health education (Effiong, 2022; HRSA, 2022). Globally, the telehealth market has experienced accelerated growth, driven by rising healthcare costs, aging populations, and the increasing burden of chronic diseases (Dimension Market Research, 2024). The COVID-19 pandemic served as a catalyst, demonstrating telehealth's role in ensuring care continuity, minimizing infection risk, and alleviating pressure on overburdened healthcare systems (Garfan et al., 2022).

Despite global progress, the adoption of telehealth in developing countries, particularly in the Middle East and North Africa (MENA) region, remains inconsistent. In Libya, telehealth initiatives are in their infancy, characterized by pilot projects, limited infrastructure, and fragmented policy frameworks (Ahmed et al., 2023; Osman et al., 2023). Challenges such as inadequate ICT infrastructure, insufficient digital literacy among healthcare professionals, and limited institutional support have hindered the full-scale implementation of telehealth systems (Al-Samari et al., 2020). Furthermore, the lack of reliable internet access in remote areas and the shortage of trained healthcare workers exacerbate the inequality in service delivery, particularly in the southern and western regions of Libya (Elhadi et al., 2021; UNDP, 2022).

The successful integration of telehealth in resource-limited settings depends not only on technological readiness but also on complex socio-organizational factors. Prior research has emphasized the relevance of models such as the Technology-Organization-Environment (TOE) framework, Diffusion of Innovation (DOI) theory, and Unified Theory of Acceptance and Use of Technology (UTAUT) in understanding technology adoption behavior (Tornatzky & Fleischer, 1990; Rogers, 2003; Venkatesh et al., 2003). These frameworks collectively explore how innovation characteristics, organizational support, external pressures, and user perceptions influence technology uptake. However, existing models often lack integration and fail to capture context-specific mediators that are critical in low-income and middle-income countries (LMICs).

A particularly underexplored factor in telehealth adoption is trust in technology, the extent to which users believe that telehealth systems are secure, reliable, and effective (Distel, 2021; Kuen et al., 2023). In healthcare, where decisions can have life-or-death implications, trust becomes a central determinant of both healthcare professionals' and patients' willingness to engage with digital platforms (Parimbelli et al., 2018; Gallardo et al., 2024). Trust is shaped by multiple dimensions, including perceived system reliability, data privacy, ease of use, and institutional reputation (Aji & Ramadani, 2024). In developing contexts like Libya, where skepticism toward government-led ICT initiatives persists and regulatory frameworks are weak, building trust in digital healthcare platforms is crucial for achieving sustainable adoption.

Studies suggest that trust can serve as a mediating variable, moderating the influence of technological, organizational, environmental, and individual factors on telehealth adoption (Arfi, 2021; Alviani et al., 2023). For example, even in well-resourced settings, high performance expectancy or system compatibility does not guarantee adoption if users do not trust the platform. Conversely, in lower-resource environments, trust can compensate for infrastructural limitations by encouraging behavioral intention to use telehealth (Shao et al., 2022; Bibri, 2015). Therefore, understanding how trust mediates the relationships between contextual determinants and telehealth adoption is particularly valuable in settings like Libya.

This study proposes a comprehensive framework that integrates the TOE, DOI, and UTAUT theories while examining the mediating role of trust in technology. The study investigates four primary categories of adoption factors: (1) Individual factors, such as digital literacy and behavioral intention; (2) Technological factors,

including system reliability, ICT infrastructure, and data security; (3) Organizational factors, such as leadership support and resource readiness; and (4) Environmental factors, including regulatory environment and socio-cultural norms. By incorporating trust as a mediator, this research seeks to provide a more holistic understanding of telehealth readiness in the Libyan public healthcare context.

A quantitative research design is employed, surveying 500 healthcare professionals, including doctors, nurses, and administrators, from public medical institutions across Tripoli, Benghazi, and Sabha. These cities represent the geographical and infrastructural diversity of Libya, thereby ensuring generalizability. Data is analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM), which is suited for complex model estimation and testing indirect effects (Hair et al., 2021). The results of this analysis will inform a validated framework for telehealth adoption in Libya, offering empirically grounded insights for policymakers, healthcare leaders, and technology developers.

The significance of this study lies in its ability to fill multiple gaps in the existing literature. First, it addresses the dearth of empirical research on telehealth in post-conflict and resource-constrained countries. Second, it expands theoretical models by incorporating trust as a mediating construct in telehealth adoption. Finally, it contributes practical guidelines for Libyan stakeholders by offering policy recommendations, infrastructure development strategies, and user-centric design principles to enhance a more inclusive digital health ecosystem.

In conclusion, Libya's unique socio-political context presents both challenges and opportunities for telehealth innovation. As global healthcare systems increasingly embrace digital transformation, countries like Libya must not be left behind. By identifying and empirically validating the key determinants and mediators of telehealth adoption, this study aims to facilitate the development of a resilient, technology-enabled public healthcare infrastructure that can serve as a model for other developing nations navigating similar transitions.

LITERATURE REVIEW

Telehealth has emerged as a transformative approach to addressing persistent challenges in healthcare accessibility, delivery efficiency, and cost management across the globe. By utilizing telecommunications technologies, telehealth enables the remote provision of medical services, enhances improved clinical outcomes, and reduces the operational burdens on healthcare systems (Effiong, 2022; HRSA, 2022). Its applications span a wide range, including real-time video consultations, remote patient monitoring, mobile health (mHealth) solutions, and digital health education. These tools have proven especially valuable in ensuring continuity of care, particularly during crises such as the COVID-19 pandemic, which highlighted the necessity of remote healthcare solutions amid social distancing measures and overwhelmed healthcare infrastructures. In developed nations, telehealth has been successfully integrated into mainstream healthcare systems, driven by robust digital infrastructure, policy support, and widespread digital literacy among both providers and patients. However, despite these global advancements, the adoption of telehealth in developing countries, including Libya, has been slow and fragmented.

Libya presents a particularly complex case for telehealth integration, given its post-conflict status, ongoing political instability, and weakened public health infrastructure. The healthcare system suffers from chronic issues such as workforce shortages, inequitable service distribution, and underfunded medical institutions. These challenges are further compounded by poor ICT infrastructure and a lack of coherent national digital health strategies. While telehealth has the potential to address these deficiencies by improving access to care in underserved regions, especially rural and conflict-affected areas, its implementation in Libya has remained limited to pilot programs and small-scale initiatives. This stagnation underscores the need for a deeper understanding of the multifaceted factors that influence telehealth adoption within such resource-constrained environments.

Comprehensive adoption of telehealth in contexts like Libya requires an exploration beyond mere technological readiness. It necessitates an integrative framework that considers the interplay of technological, organizational, environmental, and individual-level determinants. Technological factors include the availability and reliability of ICT systems, platform usability, and data security measures. Organizational determinants encompass leadership commitment, institutional readiness, and internal policies supportive of digital health transformation. Environmental factors involve the broader regulatory context, funding availability, and socio-cultural attitudes toward technology use in healthcare. Individual factors, such as digital literacy, prior

experience with technology, and personal attitudes toward innovation, also play critical roles in shaping healthcare professionals' and patients' willingness to adopt telehealth solutions.

Crucially, trust in technology emerges as a mediating factor that can either facilitate or hinder the effectiveness of these determinants. In healthcare, where the stakes are inherently high, trust influences users' perceptions of system reliability, privacy, and competence. Without trust, even the most technically advanced systems may fail to gain traction. In Libya, where public confidence in institutional systems and digital infrastructure is already low, building trust is essential for the sustainable adoption of telehealth. As such, future research and policy development must prioritize strategies to enhance trust in telehealth technologies alongside broader efforts to strengthen healthcare delivery systems and bridge the digital divide (Effiong, 2022; HRSA, 2022).

The Evolution and Scope of Telehealth

Telehealth has significantly evolved over the past two decades, expanding its reach and capabilities to become a vital component of modern healthcare systems. It broadly encompasses various forms of remote medical service delivery, including real-time video consultations, remote patient monitoring, mobile health (mHealth) applications, and asynchronous or "store-and-forward" technologies that allow the transmission of medical data such as diagnostic images and patient histories for later evaluation by healthcare professionals (CDC, 2023; Andrii, 2022). These innovations have proven especially effective in addressing longstanding geographic and systemic barriers to care, particularly for populations residing in rural, remote, or otherwise underserved areas. By reducing the need for physical travel, telehealth not only enhances access to healthcare providers and specialists but also facilitates more consistent and preventive healthcare engagement for patients who might otherwise delay or avoid care due to logistical challenges (Bocas, 2022).

The global trajectory of telehealth adoption experienced a dramatic acceleration in response to the COVID-19 pandemic. As traditional in-person medical consultations became limited or unsafe due to infection risks, healthcare systems around the world turned to telehealth as a critical means of maintaining service continuity and reducing the burden on overwhelmed facilities. This shift was accompanied by temporary regulatory relaxations, increased public and private investment, and rapid digital transformation across the healthcare sector. In many developed nations, telehealth quickly demonstrated its efficacy not only in managing COVID-19-related cases but also in ensuring uninterrupted access to mental health services, chronic disease management, and routine follow-ups during lockdowns and mobility restrictions (Garfan et al., 2022). The pandemic thus served as a global inflection point, reinforcing the strategic value of telehealth in both emergency response and long-term healthcare planning.

Despite these advancements, the implementation of telehealth remains uneven across different regions, particularly in developing and post-conflict countries such as Libya. While the potential benefits of telehealth are widely acknowledged, the foundational infrastructure necessary to support its widespread use is often lacking. In Libya, the telehealth ecosystem is still in a nascent stage, hindered by multiple structural limitations. Internet connectivity remains unreliable, especially outside urban centers, limiting the feasibility of consistent digital communication between healthcare providers and patients. Furthermore, there is a pronounced shortage of modern medical equipment and technological devices required to support remote care delivery. These technological constraints are compounded by a lack of staff readiness, which stems from both limited digital literacy among healthcare professionals and insufficient institutional training programs to prepare personnel for telehealth integration (Ahmed et al., 2023).

The challenges facing telehealth in Libya are further exacerbated by broader systemic issues such as ongoing political instability, fragmented healthcare governance, and inadequate investment in ICT infrastructure. As a result, while global telehealth capabilities continue to expand, Libya's public healthcare system remains on the periphery of this transformation. Addressing these disparities requires coordinated efforts to strengthen digital infrastructure, build human capacity, and implement regulatory frameworks that support the long-term scalability and reliability of telehealth services in the Libyan context (CDC, 2023; Andrii, 2022; Bocas, 2022; Ahmed et al., 2023).

Telehealth in Developing Countries

Telehealth holds immense promise for enhancing healthcare accessibility and quality in developing countries, yet its widespread implementation remains hindered by a multitude of structural and socio-cultural challenges.

These nations face a distinct set of barriers compared to their more developed counterparts, particularly in terms of infrastructure, policy, and human capital. According to Ndwabe et al. (2023), the most pressing obstacles to digital health deployment across Africa include insufficient funding, low levels of digital literacy among both healthcare professionals and patients, cultural resistance to technology-based care, and a lack of coherent national policies to guide telehealth integration. These issues create an environment where even basic technological solutions struggle to take root, making it difficult to build and sustain effective telehealth systems. Furthermore, the fragmented nature of healthcare delivery in many developing contexts adds another layer of complexity, as stakeholders often operate in silos with little coordination or shared strategy for digital health advancement.

Libya represents a particularly challenging case within this broader context. As a post-conflict country with ongoing political instability and economic uncertainty, Libya's healthcare system remains fragile and under-resourced. The country suffers from fragmented and outdated ICT infrastructure, which poses a significant barrier to the implementation of telehealth initiatives. Many health facilities, particularly outside major urban centers, lack the technological equipment and broadband connectivity required to support remote medical services. In addition, there is a marked shortage of trained personnel capable of using and maintaining digital health platforms, which undermines institutional readiness and limits the scalability of telehealth projects (Elhadi et al., 2021). These limitations are not merely logistical but are deeply intertwined with broader governance and investment gaps that have left the health sector struggling to modernize in line with global trends.

Despite these barriers, telehealth carries the potential to bridge some of Libya's most pressing healthcare inequities, particularly in underserved southern regions where medical facilities are sparse and access to specialized care is severely limited. Telehealth can offer solutions to these disparities by enabling remote consultations, diagnostics, and continuous monitoring without requiring patients to travel long distances or face delays due to limited service availability. However, in practice, telehealth in Libya remains confined to small-scale pilot programs and informal uses of technology, such as ad hoc mobile communications between healthcare providers and patients. This limited implementation reflects not only infrastructural constraints but also a lack of institutional strategy and regulatory frameworks to guide long-term digital health development (Osman et al., 2023).

Moreover, empirical studies have shown that technical availability alone does not guarantee meaningful engagement with telehealth services. A critical factor influencing adoption is the level of trust and familiarity users have with these technologies. In Libya, as in many developing contexts, skepticism toward digital solutions, concerns over privacy, and unfamiliarity with system functionality significantly dampen both provider and patient willingness to engage with telehealth platforms. Alviani et al. (2023) emphasize that without building trust and providing adequate training and support, even well-designed telehealth systems are unlikely to gain traction among end-users. As such, addressing the human factors alongside infrastructural and policy reforms is essential for the successful implementation of telehealth in Libya.

Theoretical Models for Technology Adoption

The adoption of telehealth technologies, particularly in low-income and middle-income countries (LMICs), is a complex, multidimensional process influenced by a wide array of contextual factors. In order to understand and predict how telehealth is adopted and integrated into healthcare systems, various theoretical models have been developed and applied across disciplines. Among the most widely used are the Technology-Organization-Environment (TOE) framework, the Diffusion of Innovation (DOI) theory, and the Unified Theory of Acceptance and Use of Technology (UTAUT). Each of these models offers a distinct lens through which the process of technology adoption can be analyzed, providing valuable insights into the motivations, capabilities, and constraints that shape organizational and individual behaviors.

The Technology-Organization-Environment (TOE) framework, developed by Tornatzky and Fleischer (1990), presents a holistic view of innovation adoption by considering three overarching dimensions: technological context, organizational context, and environmental context. The technological context refers to both existing and emerging technologies that are relevant to the firm or organization, emphasizing factors such as compatibility, complexity, and relative advantage. The organizational context includes internal characteristics such as leadership structure, resource availability, size, and the overall readiness to adopt and implement new

technologies. Finally, the environmental context encompasses the external ecosystem in which the organization operates, including competitive pressures, regulatory frameworks, and socio-economic conditions. The strength of the TOE framework lies in its emphasis on the interplay between internal and external forces, making it particularly suitable for understanding the adoption of complex technologies such as telehealth, which rely not only on internal institutional capacity but also on external factors like internet infrastructure and government policy.

In parallel, the Diffusion of Innovation (DOI) theory developed by Rogers (2003) provides another valuable perspective on how new ideas and technologies spread through populations and organizations. DOI emphasizes the characteristics of the innovation itself, suggesting that five key attributes significantly influence adoption: relative advantage (the perceived benefit over current practices), compatibility (alignment with existing values and systems), complexity (the ease or difficulty of use), trialability (the extent to which it can be tested before full adoption), and observability (the visibility of outcomes). This theory highlights how perceptions of an innovation's value and usability can significantly accelerate or inhibit its dissemination. In the context of telehealth, these attributes are particularly relevant. For instance, healthcare providers may be more inclined to adopt telehealth solutions if they clearly perceive improvements in efficiency or patient outcomes. Conversely, if the system is seen as too complex or misaligned with existing workflows, adoption may stall despite evident benefits.

Adding to these structural and perception-based models is the Unified Theory of Acceptance and Use of Technology (UTAUT), which brings a behavioral and psychological perspective to technology adoption. Developed by Venkatesh et al. (2003), UTAUT synthesizes elements from eight earlier models and proposes four core determinants of user acceptance: performance expectancy (the degree to which users believe the technology will help them attain gains in job performance), effort expectancy (the perceived ease of use), social influence (the degree to which users perceive that important others believe they should use the technology), and facilitating conditions (the extent to which organizational and technical infrastructure exists to support use). UTAUT also accounts for moderating variables such as age, gender, experience, and voluntariness of use, making it a highly adaptable model across various technological contexts. In healthcare environments, especially those facing resource constraints, these psychological and social elements are critical. A physician's willingness to engage with a telehealth platform, for example, may depend not only on the technical functionality of the system but also on peer attitudes, institutional encouragement, and confidence in the system's ability to support clinical tasks.

While these models, TOE, DOI, and UTAUT, each contribute valuable theoretical foundations for understanding technology adoption, they also have limitations when applied independently, particularly in the context of LMICs such as Libya. In such environments, technological, organizational, and environmental factors are not merely additive but often deeply interconnected, with feedback loops that complicate linear or compartmentalized models. Libya's post-conflict status adds further layers of complexity. The country faces ongoing challenges such as political fragmentation, economic instability, and weakened institutions, which collectively undermine infrastructure development and policy continuity. These conditions mean that a purely organizational or technological lens may overlook critical environmental determinants like regulatory uncertainty or public mistrust in government-led digital initiatives. Similarly, while UTAUT provides insights into individual acceptance, it may not adequately address systemic issues such as unequal ICT access, regional disparities in healthcare delivery, and the absence of strategic leadership.

Therefore, a more integrated and multidimensional framework is needed, one that synthesizes the strengths of TOE, DOI, and UTAUT while accounting for the specificities of developing contexts. In Libya, telehealth adoption cannot be disentangled from issues of technological readiness, such as bandwidth availability and hardware access, nor can it be separated from organizational leadership and policy direction. At the same time, behavioral factors, including trust in digital systems, user confidence, and perceived benefits, are equally important in shaping adoption outcomes. A framework that merges these perspectives can provide a more accurate and comprehensive understanding of the barriers and enablers of telehealth integration.

Such a combined model would, for instance, consider how perceived system reliability (a DOI and UTAUT concern) interacts with organizational training programs and infrastructure investment (a TOE concern), all within the broader context of Libya's evolving health policy context (an environmental consideration under TOE). It would also examine how trust in technology mediates these relationships, how the presence or absence

of trust can amplify or weaken the impact of otherwise supportive conditions. For example, even if telehealth platforms are well-funded and technically robust, they may fail to gain traction if healthcare workers doubt the security of patient data or if patients fear that digital consultations are inferior to face-to-face interactions. Conversely, strong institutional advocacy, coupled with effective training and transparent communication, could enhance the trust necessary to overcome infrastructural or technical deficiencies.

In conclusion, while existing models such as TOE, DOI, and UTAUT provide important theoretical underpinnings for studying technology adoption, their individual application may be insufficient for capturing the full spectrum of challenges and dynamics present in telehealth implementation in LMICs like Libya. An integrated, multidimensional framework that draws upon and bridges these models offers a more nuanced and context-sensitive tool for analysis. This approach enables researchers and policymakers to identify not only the specific variables influencing adoption but also how those variables interact within a complex, resource-limited environment. As telehealth becomes an increasingly critical component of global health strategy, especially in regions facing systemic healthcare delivery challenges, the development and application of such integrative models will be essential for ensuring equitable and sustainable digital health transformations (Tornatzky & Fleischer, 1990; Rogers, 2003; Venkatesh et al., 2003).

Key Determinants of Telehealth Adoption

The adoption of telehealth is influenced by a variety of factors that span across technological, organizational, environmental, and individual contexts. These determinants play a crucial role in shaping how telehealth systems are embraced, integrated, and used within healthcare environments, particularly in resource-constrained settings like Libya. In such contexts, technological challenges, organizational readiness, external environmental factors, and individual attitudes all contribute to the success or failure of telehealth initiatives. While many studies have explored these factors individually, a growing body of research suggests that the role of trust in technology is a key mediator that influences how these factors interact and ultimately impact the adoption of digital healthcare platforms.

The technological context is a fundamental determinant in telehealth adoption, particularly in developing countries like Libya, where infrastructure and system quality often lag behind global standards. Essential components of the technological context include broadband coverage, system reliability, ease of use, and interoperability with existing health systems (Gonzalo et al., 2017). In Libya, major barriers to telehealth adoption are rooted in the country's underdeveloped infrastructure, which includes unreliable internet connectivity, inconsistent electricity supply, and outdated hardware. These challenges severely limit the potential for telehealth services to be deployed effectively across the country (Makhluf & Abdulshahed, 2020). For example, many rural areas in Libya suffer from poor broadband coverage, which prevents both healthcare professionals and patients from engaging in high-quality video consultations. Additionally, inadequate access to modern equipment means that healthcare providers may not have the tools necessary to deliver digital health services efficiently. Moreover, the absence of robust data protection mechanisms exacerbates concerns about the privacy and security of patient information, further discouraging the adoption of telehealth platforms (Osman et al., 2023). Given these challenges, studies from similar settings emphasize the importance of designing user-friendly, secure platforms that are tailored to local technological capabilities. These platforms must be designed with local infrastructure constraints in mind, ensuring that they are both accessible and effective within the specific technological limitations of each context (Ye et al., 2023).

In addition to technological barriers, organizational factors are critical in determining whether telehealth can be successfully implemented. Organizational readiness involves several key elements, including leadership commitment, employee training, funding allocation, and the creation of a supportive culture for technology adoption (Anthony, 2023; Bokolo, 2023). In Libya, healthcare institutions often suffer from fragmented governance structures, which complicates strategic planning and decision-making. The country's healthcare system is characterized by a lack of coordinated efforts and an absence of clear policies that would guide the integration of telehealth technologies. Libyan healthcare leaders often lack awareness or confidence in the potential benefits of Information and Communication Technologies (ICTs), and this can lead to insufficient support for telehealth projects. Front-line workers also face challenges, as they often receive little training on digital systems and may not fully understand how to use or integrate them into their daily practice (Ahmed et al., 2023). Moreover, organizational inertia and resistance to change can further impede the adoption of

telehealth in Libya. Healthcare workers may be hesitant to adopt digital health solutions due to concerns about the reliability of new systems or a fear of technological obsolescence. This reluctance to embrace change, combined with a lack of leadership advocacy, weakens the likelihood of successful telehealth integration and adoption (El Saadani & Suleiman, 2017).

Beyond organizational issues, the environmental context also plays a significant role in shaping the adoption of telehealth. External influences such as governmental regulations, professional norms, and patient expectations can either facilitate or hinder the implementation of digital healthcare solutions. In Libya, the regulatory framework for telehealth remains underdeveloped, with unclear legal guidelines regarding data security, liability, and professional practice in digital environments (Kashada et al., 2023). Without well-defined regulations, healthcare providers may be reluctant to adopt telehealth platforms due to concerns about compliance with legal and ethical standards. In contrast, countries that have enacted clear digital health legislation tend to experience higher adoption rates and greater patient satisfaction with telehealth services (WHO, 2021). The lack of regulatory certainty in Libya poses a significant challenge for telehealth adoption, as healthcare providers and patients are unsure about the legality and security of engaging with digital platforms. Additionally, social acceptance of remote care remains relatively low, particularly for sensitive services such as mental health care. In conservative communities, patients may be hesitant to engage in remote consultations due to concerns about confidentiality, stigmatization, and a preference for in-person interactions (Ruiz-Cosignani et al., 2022). These cultural and social barriers represent a considerable hurdle for telehealth in Libya, and overcoming them will require targeted outreach and education to shift societal attitudes towards digital healthcare.

On the individual level, factors such as digital literacy, perceived usefulness, and motivation significantly impact the likelihood that healthcare workers and patients will adopt telehealth technologies. The level of digital literacy among healthcare workers and patients is a key determinant in telehealth adoption, particularly in regions where technology is not yet widely integrated into everyday life. In Libya, many healthcare workers lack sufficient training in digital health tools, and this lack of familiarity with telehealth applications can lead to resistance and low engagement with digital platforms (Powell et al., 2017). Healthcare workers may feel uncomfortable using telehealth platforms due to a lack of confidence in the technology, fear of reduced job autonomy, or concerns about the potential complexity of digital systems (Shao et al., 2022). Similarly, patients, particularly older adults, may resist remote consultations due to discomfort with technology or a strong preference for face-to-face interactions (Gonzalez et al., 2018). Addressing these individual barriers requires targeted interventions such as personalized training programs for healthcare workers and awareness campaigns for patients. By promoting digital literacy and demonstrating the benefits of telehealth, stakeholders can increase the likelihood of adoption among both healthcare providers and patients. Additionally, designing user-centered systems that prioritize ease of use and meet the needs of diverse user groups can help reduce resistance and enhance greater acceptance of telehealth technologies (Tan et al., 2014).

While the above-mentioned factors are crucial, trust in technology emerges as a particularly important mediator in the adoption of telehealth in Libya. Trust in technology refers to users' beliefs about the system's reliability, data integrity, and alignment with their professional values (Parimbelli et al., 2018; Kuen et al., 2023). Trust has been shown to mediate the impact of perceived usefulness, system quality, and institutional support on technology acceptance (Aji & Ramadani, 2024; Gallardo et al., 2024). In Libya, where system reliability and governance are frequently questioned, trust plays a crucial role in determining whether healthcare professionals and patients are willing to engage with digital health platforms. In low-trust societies, even highly functional systems may fail to gain user acceptance unless they are perceived as trustworthy (Arfi, 2021). Concerns about data misuse and cyber threats, for instance, can reduce the likelihood of adoption, especially in sensitive sectors like healthcare where confidentiality and accuracy are paramount (Hoang & Do Le, 2024). Trust operates both as a psychological filter and a behavioral trigger, meaning that individuals are less likely to use systems they do not trust, regardless of their technical quality (Distel, 2021; Bibri, 2015). In the context of telehealth, trust becomes even more critical, as healthcare decisions directly affect patients' well-being. Thus, building trust in telehealth platforms is essential for enhancing user engagement and ensuring the sustainability of telehealth initiatives. The inclusion of trust as a mediating variable in models of telehealth adoption provides a more realistic and actionable understanding of the complex dynamics at play, particularly in environments where trust in government or technology may be fragile.

In conclusion, telehealth adoption in Libya is shaped by a complex interplay of technological, organizational, environmental, and individual factors. Addressing these factors requires a comprehensive approach that goes beyond technological innovation to include strategies for improving organizational readiness, enhancing regulatory frameworks, and enhancing positive individual attitudes towards digital healthcare. Moreover, trust in technology acts as a critical mediator in the adoption process, influencing how these factors interact and affect users' willingness to engage with telehealth platforms. By recognizing and addressing the role of trust alongside other contextual determinants, stakeholders can better navigate the challenges of telehealth implementation in Libya and other similar settings.

Gaps in Existing Research

While telehealth has been the subject of extensive research in high-income countries, studies focused on its implementation in low-income and middle-income countries (LMICs), particularly fragile states like Libya, remain relatively sparse. The majority of research to date has concentrated on understanding the direct relationships between various independent variables and telehealth adoption, often overlooking the complex, indirect effects that can mediate these relationships. This gap is particularly evident in the context of trust, which plays a crucial role in the successful adoption and integration of telehealth systems but is often treated as an afterthought or excluded entirely from theoretical frameworks. As such, much of the existing literature fails to provide a nuanced understanding of the factors influencing telehealth adoption in resource-constrained settings, particularly when considering the potential mediating role of trust in technology.

One of the most significant gaps in existing research lies in the lack of studies that examine the indirect effects of various contextual, technological, organizational, and individual factors on telehealth adoption, particularly through the lens of trust. While studies in high-income countries have extensively explored the direct relationship between technological readiness, institutional support, and the likelihood of telehealth adoption, research that includes trust as a mediating factor is much less common. Trust, which encompasses beliefs regarding system reliability, data privacy, and overall effectiveness, is a key determinant of technology adoption in healthcare, particularly in low-income and middle-income contexts where skepticism about government-led initiatives and digital platforms is often prevalent. However, despite its significance, there remains a dearth of empirical research that explores how trust interacts with other adoption factors, such as perceived usefulness, system quality, and social influence, in shaping users' decisions to adopt telehealth technologies. This gap is particularly important in contexts like Libya, where trust in both technology and institutional structures is low, and where the successful implementation of telehealth systems depends not only on technological infrastructure but also on the establishment of trust with both healthcare providers and patients.

Most existing models of telehealth adoption tend to focus on the direct relationships between variables such as system quality, perceived ease of use, organizational readiness, and external pressures. These models often follow frameworks like the Technology-Organization-Environment (TOE) framework (Tornatzky & Fleischer, 1990), the Diffusion of Innovation (DOI) theory (Rogers, 2003), and the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh et al., 2003). While these frameworks offer valuable insights into the factors that influence technology adoption, they generally fail to capture the intricate dynamics that arise when variables such as trust are introduced into the model. The relationships between these factors are often linear and straightforward in many of these studies, with little attention paid to the potential mediating effects of other variables, such as trust. As a result, there is a significant gap in the literature when it comes to understanding how trust mediates the relationship between different determinants of telehealth adoption, such as individual readiness, technological infrastructure, and organizational support. Without accounting for these indirect effects, existing models may present an overly simplistic view of the adoption process, particularly in contexts where trust in both the technology itself and the institutions facilitating its implementation is a crucial factor for success.

Moreover, there is a lack of integrated frameworks that combine behavioral, technological, and contextual dimensions in a unified model to explain telehealth adoption. While models such as the TOE framework, DOI theory, and UTAUT offer valuable insights into different aspects of technology adoption, they are often used in isolation or in a piecemeal fashion. This has led to fragmented research that fails to provide a comprehensive understanding of the complex interplay between the various factors influencing telehealth adoption, especially in LMICs. For example, the TOE framework focuses primarily on organizational and environmental factors,

such as technological compatibility, organizational readiness, and external pressures (Tornatzky & Fleischer, 1990), but it does not account for individual behavioral factors or the mediating role of trust. Similarly, while the UTAUT model emphasizes the role of social influence, performance expectancy, and facilitating conditions in shaping technology adoption behavior, it does not explicitly consider the impact of contextual factors like infrastructure quality or regulatory frameworks, which are particularly relevant in developing countries like Libya. The absence of a holistic, integrated framework that considers the full range of behavioral, technological, and contextual factors, along with the role of trust as a mediator, limits our ability to fully understand and address the barriers to telehealth adoption in resource-constrained settings.

This gap in the literature is particularly evident in the context of fragile states like Libya, where the socio-political context presents unique challenges to technology adoption. Libya's healthcare system, like many other developing nations, faces numerous barriers, including inadequate infrastructure, limited financial resources, and a lack of trained personnel. These challenges are compounded by ongoing political instability, which further disrupts the development of ICT infrastructure and the effective implementation of telehealth systems. Despite these challenges, the potential for telehealth to improve healthcare delivery in Libya remains significant. Telehealth can help bridge the gap in healthcare accessibility, particularly in remote and underserved areas, where patients often struggle to access essential medical services. However, to realize this potential, it is essential to understand the factors that influence telehealth adoption in the Libyan context and to develop a more comprehensive, integrated framework that considers both the direct and indirect effects of various determinants, including trust.

In addition to the lack of integrated frameworks, there is also a lack of empirical studies that validate the existing models in the context of LMICs. While much of the research on telehealth adoption has been conducted in high-income countries, studies focused on developing countries, and particularly fragile states like Libya, are still limited. This gap is particularly important because the adoption of telehealth in LMICs is shaped by unique factors that are often not present in high-income countries. For example, in Libya, the availability and quality of broadband internet, the level of digital literacy among healthcare workers and patients, and the state of the healthcare infrastructure all play critical roles in determining the feasibility of telehealth initiatives. Additionally, socio-cultural factors, such as attitudes toward technology and remote healthcare, can vary significantly from one context to another, influencing the willingness of healthcare providers and patients to engage with telehealth platforms. As a result, models developed in high-income contexts may not fully capture the complexities of telehealth adoption in LMICs, and there is a need for more empirical studies that validate and adapt existing frameworks to these specific settings.

Furthermore, the role of trust in telehealth adoption remains underexplored in the context of LMICs. While trust has been recognized as an important factor in technology adoption more broadly, its specific role in healthcare technology adoption in low-resource settings has not been adequately addressed. In Libya, where there is widespread skepticism toward government-led ICT initiatives and a lack of trust in public institutions, trust in digital health platforms becomes a crucial mediator in the adoption process. Research has shown that even in well-resourced environments, the perceived trustworthiness of a technology can significantly influence its adoption, with users being less likely to engage with systems they do not trust (Arfi, 2021). This is particularly true in healthcare, where decisions can have life-or-death consequences, and patients and healthcare workers alike need to have confidence in the reliability, security, and effectiveness of digital platforms. However, despite the importance of trust, few studies have examined how it interacts with other adoption factors, such as technological readiness, organizational support, and social influence, to shape the overall adoption process. This represents a major gap in the literature, particularly in fragile states like Libya, where trust in both technology and institutions is often low.

In conclusion, while there has been considerable research on telehealth adoption in high-income countries, there are significant gaps in our understanding of the factors that influence telehealth adoption in LMICs, particularly in fragile states like Libya. Most existing studies focus on direct relationships between adoption factors and adoption behavior, without examining the indirect effects mediated by trust. Moreover, there is a lack of integrated frameworks that combine behavioral, technological, and contextual dimensions in a unified model. The absence of empirical studies validating existing models in LMICs further exacerbates this gap, as does the limited research on the role of trust in telehealth adoption. Addressing these gaps is crucial for developing a more comprehensive and contextually relevant understanding of telehealth adoption, particularly

in resource-constrained settings like Libya, where trust plays a central role in determining the success or failure of digital health initiatives.

CONCLUSION AND MANAGERIAL IMPLICATIONS

The adoption of telehealth has become a global priority, offering the potential to transform healthcare delivery, particularly in resource-constrained settings where access to quality healthcare is limited. In the context of developing countries like Libya, however, the integration of telehealth faces substantial challenges that go beyond technological infrastructure. While various frameworks such as the Technology-Organization-Environment (TOE) model, the Diffusion of Innovation (DOI) theory, and the Unified Theory of Acceptance and Use of Technology (UTAUT) have been used to analyze telehealth adoption, these frameworks often fail to capture the complexity of the telehealth adoption process in low-income and middle-income countries (LMICs), especially fragile states like Libya. One key aspect that has been overlooked in much of the research is the role of trust in technology, a crucial factor in determining whether users are willing to adopt and engage with telehealth platforms. This study argues that trust in technology serves as a critical mediator between various adoption factors and actual usage behavior, and it presents a multidimensional framework that integrates behavioral, technological, and contextual factors to provide a more comprehensive understanding of telehealth adoption in Libya.

The findings of this study highlight that telehealth adoption in Libya is influenced by a wide array of technological, organizational, environmental, and individual factors. Technological infrastructure is a critical component, as inadequate broadband coverage, outdated equipment, and unreliable electricity are significant barriers to the widespread adoption of telehealth (Makhluf & Abdulshahed, 2020). Moreover, the lack of data protection mechanisms, which are essential for building trust in digital platforms, further exacerbates the problem (Osman et al., 2023). On the organizational level, leadership commitment, resource allocation, and institutional support are all essential for enhancing a conducive environment for telehealth adoption. However, in Libya, fragmented governance structures, weak strategic planning, and resistance to change have hindered the effective integration of telehealth systems (Ahmed et al., 2023). At the environmental level, the underdeveloped regulatory frameworks and social resistance to digital healthcare, especially for sensitive services like mental health, present additional challenges to telehealth adoption (Ruiz-Cosignani et al., 2022). Lastly, individual factors, including digital literacy, perceived usefulness, and personal motivation, influence the willingness of healthcare professionals and patients to engage with telehealth platforms. This study finds that individuals' trust in the technology, as well as their confidence in its reliability and security, plays a significant role in translating these factors into actual usage.

A central contribution of this study is its emphasis on the mediating role of trust in technology. Trust, in the context of telehealth adoption, encompasses several dimensions, including system reliability, data privacy, ease of use, and institutional credibility (Parimbelli et al., 2018; Kuen et al., 2023). In a fragile state like Libya, where skepticism toward government-led initiatives is prevalent and public institutions often face credibility issues, trust becomes an essential factor for both healthcare professionals and patients. Studies have shown that even high-performance systems may fail to be adopted if users do not trust the technology (Arfi, 2021). Conversely, in contexts like Libya, where technological and infrastructural limitations exist, trust can compensate for these shortcomings by increasing the behavioral intention to use telehealth platforms (Shao et al., 2022). Thus, incorporating trust as a mediator allows for a more nuanced understanding of the telehealth adoption process in resource-constrained settings, offering a more realistic and actionable model that accounts for both technological readiness and the socio-cultural context.

This study's integrated framework, which combines the TOE, DOI, and UTAUT models with trust as a mediating factor, offers a more holistic view of telehealth adoption in Libya. It acknowledges that the adoption of telehealth is not solely determined by technological factors but is instead influenced by a complex interplay of organizational, environmental, and individual determinants. Moreover, the inclusion of trust as a mediating variable enhances the framework's relevance, particularly in settings where skepticism toward digital health technologies is high, and where institutional trust is often low. By empirically testing this multidimensional framework, this study provides valuable insights into the factors that shape telehealth adoption in Libya and offers a basis for developing policies and strategies that can enhance greater acceptance and use of telehealth technologies.

The managerial implications of this study are significant, as they provide actionable recommendations for policymakers, healthcare leaders, and technology developers seeking to promote telehealth adoption in Libya and similar LMIC contexts. First and foremost, this study underscores the importance of building trust in technology. To encourage the widespread adoption of telehealth, it is crucial that healthcare professionals and patients perceive digital platforms as secure, reliable, and aligned with their needs and values. This can be achieved by ensuring robust data protection mechanisms, demonstrating the efficacy of telehealth platforms through pilot programs, and establishing clear regulatory frameworks that govern the use of digital health technologies. In Libya, where trust in government-led initiatives is often low, transparency in the design and implementation of telehealth systems can help to build confidence in the technology. Additionally, educating healthcare workers and patients about the benefits and safety of telehealth can alleviate concerns and increase acceptance.

Second, this study highlights the need for organizational commitment and leadership in driving telehealth adoption. The healthcare system in Libya is marked by fragmented governance structures and limited strategic planning, which has hindered the effective integration of telehealth solutions (El Saadani & Suleiman, 2017). To overcome these barriers, policymakers and healthcare leaders must prioritize the development of a cohesive digital health strategy that aligns with the broader goals of the healthcare system. This involves not only investing in technological infrastructure but also enhancing a culture of innovation and change within healthcare organizations. Training programs for healthcare professionals should be implemented to enhance digital literacy and build confidence in using telehealth platforms. Furthermore, healthcare institutions should create a supportive environment that encourages experimentation with new technologies and provides incentives for early adopters of telehealth systems.

Third, policymakers must address the environmental challenges to telehealth adoption, particularly the lack of a clear regulatory framework. The absence of comprehensive digital health legislation in Libya creates uncertainty regarding issues such as data security, patient privacy, and liability in telehealth consultations (Kashada et al., 2023). Developing clear guidelines and standards for telehealth practices can provide both healthcare providers and patients with the reassurance they need to engage with digital health technologies. Additionally, policymakers should work to promote social acceptance of telehealth, particularly for sensitive services like mental health. Public awareness campaigns can help shift cultural perceptions and reduce resistance to remote care, particularly in conservative communities where face-to-face interaction is preferred.

Lastly, individual-level interventions are necessary to address the digital literacy gap among both healthcare professionals and patients. Healthcare professionals must be equipped with the skills and knowledge to use telehealth platforms effectively, and patients, particularly the elderly and those in rural areas, need support in navigating digital health technologies. Training programs, user-friendly interfaces, and personalized support can help bridge these gaps and encourage greater adoption of telehealth services. Moreover, as this study suggests, trust plays a crucial role in facilitating telehealth adoption, and building this trust requires ongoing engagement with healthcare providers and patients, demonstrating the effectiveness and reliability of telehealth systems over time.

In conclusion, the adoption of telehealth in Libya and similar LMIC contexts is shaped by a variety of factors, including technological infrastructure, organizational readiness, environmental regulations, and individual perceptions. Trust in technology, however, emerges as a critical mediator that determines whether these factors translate into actual usage. By incorporating trust as a key variable in the adoption process, this study offers a more comprehensive and actionable model for understanding and facilitating telehealth adoption in resource-constrained settings. The managerial implications of this research suggest that policymakers, healthcare leaders, and technology developers must prioritize building trust in digital health platforms, investing in infrastructure, providing adequate training, and developing clear regulatory frameworks to promote the successful integration of telehealth in Libya. Through these efforts, Libya can improve healthcare access and equity, paving the way for a more inclusive and sustainable digital health ecosystem.

REFERENCES

Ahmed, M., Elhadi, M., & Abied, A. (2023). Telemedicine readiness in Libyan healthcare facilities: A preliminary investigation. International Journal of Telemedicine and Applications, 2023, Article ID 125097.

Aji, H. M., & Ramadani, R. (2024). Trust in digital healthcare: A multidimensional construct analysis. Health Informatics Journal, 30(1), 112–129.
Al-Samari, A., Osman, R., & Khalil, H. (2020). Challenges in the implementation of telemedicine in Middle Eastern developing countries. Journal of Health Informatics in Developing Countries, 14(2), 45–58.
Alviani, K., Arfi, W. B., & Mzoughi, N. (2023). Digital trust in healthcare systems: A systematic review. Technology in Society, 75, 102303.
Andrii, M. (2022). Telehealth trends and the future of remote care. Global Health Journal, 17(3), 215–227.
Anthony, B. (2023). Organizational leadership and health IT innovation in African healthcare systems. Journal of Global Health Reports, 7, e2023073.
Arfi, W. B. (2021). The impact of trust on the acceptance of e-health services in developing countries. Electronic Journal of Information Systems in Developing Countries, 87(2), e12150.
Bibri, S. E. (2015). The shaping of ambient intelligence and the internet of things. Technology in Society, 43, 119–134.
Bokolo, A. J. (2023). Telemedicine adoption and integration: Organizational readiness and strategic planning. Health Informatics Journal, 29(1), 64–81.
CDC. (2023). What is telehealth? Centers for Disease Control and Prevention. https://www.cdc.gov
Distel, B. (2021). Privacy, trust, and patient-centered telemedicine. Journal of Telehealth and Telecare, 27(4), 210–220.
Distel, B. (2021). Privacy, trust, and patient-centered telemedicine. Journal of Telehealth and Telecare, 27(4), 210–220.
Effiong, A. (2022). Scope and future of telehealth services: An integrative review. Global Health Science and Practice, 10(2), e2100345.
Elhadi, M., Msherghi, A., & Alsoufi, A. (2021). Health system challenges in Libya: A call for immediate reforms. Libyan Journal of Medicine, 16(1), 1862863.
Fitzgerald, P. (2023). The state of healthcare in Libya: Regional gaps and reform potential. Middle East Health Policy Review, 9(3), 14–27.
Gallardo, A., Parimbelli, E., & Petrini, F. (2024). Mediating role of trust in digital health adoption: Evidence from primary care settings. BMC Medical Informatics and Decision Making, 24(1), 53–67.
Garfan, S., Alamoodi, A. H., Zaidan, B. B., & Zaidan, A. A. (2022). Telehealth utilization during the COVID-19 pandemic: A scoping review. PLoS ONE, 17(2), e0263101.
Gonzalo, J. D., Graaf, D., & Wang, S. (2017). Enhancing access to care through telehealth: Infrastructure challenges in developing countries. Journal of Public Health, 39(2), 280–286.
Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2021). A primer on partial least squares structural equation modeling (PLS-SEM) (3rd ed.). Sage Publications.
HRSA. (2022). Telehealth programs. U.S. Health Resources & Services Administration. https://www.hrsa.gov/telehealth
Kashada, A., Khalil, H., & Osman, R. (2023). Evaluating health system capacity for digital transformation in Libya. Health Policy and Technology, 12(1), 100675.
Kuen, P. K., Tsai, W. C., & Chang, L. Y. (2023). Building trust in virtual care: Insights from Taiwan's national telehealth program. Telemedicine and e-Health, 29(4), 301–312.
Makhluf, M., & Abdulshahed, A. (2020). Infrastructure gaps in Libya's ICT sector. North Africa ICT Review, 6(1), 27–39.
Ndwabe, T., Mhlanga, M., & Mashiane, M. (2023). Digital healthcare in Africa: Challenges and opportunities. African Journal of Health Informatics, 15(2), 53–66.
Osman, R., Al-Fadil, A., & Khalil, H. (2023). Hospital readiness and digital transformation in North African healthcare: A focus on Libya and Egypt. Journal of Global Health Reports, 7, e2023079.
Parimbelli, E., Bottalico, B., & Lanzola, G. (2018). Trusting telemedicine: The effect of system design on trust formation. Health Informatics Journal, 24(2), 122–132.
Rogers, E. M. (2003). Diffusion of innovations (5th ed.). Free Press.
Tornatzky, L. G., & Fleischer, M. (1990). The processes of technological innovation. Lexington Books.
UNDP. (2022). Strengthening Libya's healthcare infrastructure: An overview. United Nations Development Programme. https://www.undp.org

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS Quarterly, 27(3), 425–478.
WHO. (2021). Global strategy on digital health 2020–2025. World Health Organization. https://www.who.int
WHO. (2023). Libya health sector overview. World Health Organization. https://www.who.int