

عنوان البحث

Barriers Associated with the Use of the “Sehhaty” Mobile Health Application Among the
General Population in Saudi Arabia: A Cross-Sectional Study

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العام الدراسي

2026

Introduction

Over the past two decades, healthcare systems worldwide have experienced rapid digital transformation driven by advances in information and communication technologies.

Among the most significant developments has been the emergence of mobile health (mHealth), defined as the use of mobile devices and wireless technologies to support medical and public health practices [1].

mHealth applications are increasingly integrated into national health systems to improve accessibility, enhance patient engagement, optimize resource allocation, and reduce operational costs. These applications allow users to schedule appointments, access medical records, receive teleconsultations, monitor chronic conditions, and manage prescriptions remotely [1].

In Saudi Arabia, digital health transformation is a central pillar of Vision 2030, which emphasizes modernization, efficiency, and sustainability in public services [2]. The Ministry of Health has launched several digital platforms to enhance service delivery, among which the “Sehhaty” mobile application represents a core component. Sehhaty provides users with access to primary healthcare appointment booking, virtual medical consultations, laboratory results, vaccination records, prescription management, and health monitoring tools. During the COVID-19 pandemic, Sehhaty played a critical role in managing testing and vaccination appointments, accelerating public familiarity with digital health platforms [3].

Despite their widespread adoption and strategic importance, the effective and sustained use of mHealth applications depends on multiple factors beyond simple availability. International research suggests that technological innovation alone does not guarantee successful implementation. User experience, perceived usefulness, ease of use,

technical reliability, data security, and system integration significantly influence adoption and continued engagement [4]. Therefore, identifying and understanding the barriers associated with mHealth applications, including Sehhaty, usage among the general population is essential for improving digital health sustainability and maximizing public health impact.

Problem statement

Although Sehhaty is widely promoted as a national digital health platform and has achieved substantial user registration numbers, actual sustained usage and user satisfaction may be constrained by various barriers. Previous studies in digital health contexts indicate that users often encounter technical difficulties such as system crashes, slow response times, and compatibility problems. In addition, concerns regarding data privacy and cybersecurity may reduce trust in health applications. Usability issues, including complex navigation and unclear instructions, may particularly affect older adults and individuals with limited digital literacy [4].

Within the Saudi context, research examining Sehhaty has identified performance-related issues and concerns about integration with other healthcare systems. However, most available studies focus either on healthcare providers, specific age groups such as young adults, or isolated dimensions such as usability [5–9]. There remains a lack of a comprehensive, multidimensional analytical framework that simultaneously evaluates technical, behavioral, psychological, and organizational factors influencing usage among the general population. Accordingly, the central problem addressed in this study is the absence of an integrated model explaining how various perceived barriers influence user satisfaction and behavioral intention to continue using Sehhaty. Without such evidence, policymakers and system developers may lack the empirical basis required to optimize platform design and enhance public trust.

Significance of the study

This study is significant at multiple levels.

- Academically, it contributes to the growing literature on digital health adoption in the Middle East by developing and empirically testing a multidimensional explanatory model within the Saudi context.
- Practically, the study provides actionable insights for healthcare policymakers, system developers, and digital transformation leaders. Understanding the relative impact of technical barriers, perceived usefulness, trust, and interoperability can guide resource allocation and improvement strategies.
- Strategically, the study supports Saudi Arabia's Vision 2030 objectives by strengthening evidence-based digital transformation. Sustainable digital health systems require not only technological infrastructure but also public confidence and satisfaction. By identifying modifiable barriers, the research supports long-term digital health sustainability.

Study objectives

The primary objective of this study is to examine the barriers associated with the use of the Sehhaty mHealth application among the general population in Saudi Arabia.

More specifically, the study aims to:

1. Identify technical barriers affecting Sehhaty usage.
2. Assess perceived ease of use and perceived usefulness of the application.
3. Measure levels of trust and privacy concerns.
4. Evaluate the role of system interoperability.
5. Examine the relationship between these factors and user satisfaction.
6. Determine predictors of behavioral intention to continue using Sehhaty.

Research questions

This study seeks to answer the following research questions:

1. What technical barriers are most commonly experienced by Sehhaty users?
2. How does perceived ease of use influence perceived usefulness?
3. To what extent does trust affect behavioral intention?
4. Does user satisfaction mediate the relationship between perceived usefulness and behavioral intention?
5. Are there significant differences in perceived barriers based on demographic characteristics?

Hypotheses

Based on established theoretical frameworks and previous empirical findings, the following hypotheses are proposed:

H1: Technical barriers negatively influence behavioral intention to use Sehhaty.

H2: Perceived ease of use positively influences perceived usefulness.

H3: Perceived usefulness positively influences user satisfaction.

H4: User satisfaction positively influences behavioral intention.

H5: Trust positively influences behavioral intention.

H6: System interoperability positively influences user satisfaction.

Previous studies

Several studies have examined barriers and determinants of the adoption of mHealth applications in general. A foundational perspective is provided by the systematic review by Zakerabasali et al. [4], which synthesized provider-reported barriers to mHealth adoption. The review identified 18 barriers grouped into three broad domains: technical barriers, individual barriers, and healthcare system barriers. Among technical barriers, security and privacy concerns were consistently emphasized as a major adoption challenge. Individual-level barriers included knowledge gaps and limited digital literacy, while system-level barriers included economic/financial constraints and structural readiness. The authors argue that mHealth adoption is inherently multi-dimensional and that successful deployment requires simultaneously addressing technical readiness, user competencies, and system-level integration and incentives.

In Saudi Arabia, Alzghaibi [5] conducted a cross-sectional study focusing on non-healthcare users of the Sehhaty app ($n = 403$) and applied a comprehensive measurement approach covering ten categories of barriers (operationalized through multiple items). The study found that technical issues, notably frequent crashes and slow response times, were the most prominent barriers and were strongly linked to reduced satisfaction. Usability barriers (e.g., unintuitive navigation) were also widely reported. Importantly, privacy and security concerns, particularly concerns about transparency and data protection, emerged as major deterrents to continued use. The study also noted that accessibility constraints were more pronounced among older adults and individuals with disabilities, and that limited support/training compounded these barriers. Cost-related barriers were minimal, suggesting that in this setting, the problem is not “pricing” but rather performance, usability, trust, and accessibility. Correlation analysis indicated that technical barriers are strongly associated

with usability and functionality constraints, implying that improving system stability may have cascading benefits for perceived ease-of-use and time efficiency.

A complementary viewpoint comes from Alzghaibi's second cross-sectional study [6] among secondary healthcare practitioners ($n = 574$), examining perceptions of mHealth and adoption barriers with a specific focus on Sehhaty. The most significant barriers reported by practitioners included technical barriers (e.g., glitches, slow performance, compatibility concerns), integration and workflow challenges (including lack of interoperability with EHRs and clinical systems), and privacy/security concerns affecting trust. Usability issues, such as complex navigation and excessive steps, were also highlighted. Correlation patterns again suggested interdependence among technical, usability, and integration barriers (e.g., technical barriers correlated strongly with usability and integration/workflow challenges). The practitioner perspective is critical because it emphasizes that adoption is not only a "patient/user" issue; clinicians and staff also experience barriers that shape the overall digital health ecosystem, including how strongly the platform is embedded in routine care processes.

Focusing on younger users, Al-Edresee et al. [7] assessed factors affecting usage of Sehhaty telehealth services among young adults in Riyadh (age 18–35) using a Technology Acceptance Model (TAM)-based framework. In a cross-sectional online survey ($n = 314$), perceived usefulness was the strongest predictor of behavioral intention ($\beta = 0.75$, $p < 0.001$), followed by ease of use and trust. Interoperability showed a moderate correlation with satisfaction ($r = 0.40$), and qualitative feedback highlighted a lack of integration with other public/private hospital systems as a recurring concern. This study is particularly valuable because it demonstrates (i) TAM constructs perform well in the Saudi telehealth context, (ii) trust adds explanatory value beyond classic TAM, and (iii) interoperability affects user satisfaction even among digitally literate young adults.

Ali et al. [8] examined the usage patterns and usability of two Saudi health apps (Tawakkalna and Sehhaty) during COVID-19 using a cross-sectional online survey (n = 147). While adoption levels were high (Sehhaty was installed by 89.4% of participants), actual usage frequency differed. Sehhaty was used more intermittently (often monthly), reflecting its service pattern (appointments, immunization scheduling). The study reported moderate usability acceptance for Sehhaty (57.0%) and noted issues in perceived usefulness and system recovery from errors. These findings are important because they illustrate that wide installation/adoption does not automatically translate into high usability ratings or frequent engagement; rather, usability and error recovery can shape perceived service quality and willingness to use the platform.

An additional important contribution to the Sehhaty literature is the study by Dawood and Alkadi [9], which evaluated the usability and user satisfaction of the Sehhaty telehealth application during the COVID-19 pandemic. Using the Telehealth Usability Questionnaire, the authors conducted an online cross-sectional survey among 106 users in the Riyadh region between July and November 2021. The study assessed multiple dimensions of telehealth usability, including usefulness, ease of use, learnability, interface quality, interaction quality, reliability, satisfaction, and future use intention. While the application demonstrated relatively high overall acceptance in certain usability domains, particularly interface quality and interaction quality, the findings revealed notable concerns regarding perceived usefulness. Specifically, 67.92% of participants disagreed that the application was useful, and a substantial proportion reported that Sehhaty did not adequately meet their healthcare needs or save time compared to in-person visits. Although many respondents described the platform as pleasant and easy to understand, preference for traditional face-to-face consultations remained high. Age and educational level significantly influenced perceptions of usefulness and interface quality, suggesting

demographic disparities in telehealth acceptance. Importantly, qualitative responses highlighted structural limitations such as limited clinic availability, appointment delays, and restricted service access. This study underscores that usability alone does not guarantee perceived usefulness or sustained engagement. It further supports the need to examine technical performance, perceived usefulness, satisfaction, and intention within a broader explanatory framework, particularly beyond the pandemic context.

Theoretical foundations of the study

Understanding the adoption and continued use of mobile health applications requires a structured theoretical framework that explains how individuals evaluate digital technologies and decide whether to engage with them. This study is grounded in three complementary theoretical perspectives: TAM, digital trust theory, and multidimensional barrier frameworks in health informatics research.

1. TAM

The primary theoretical foundation of this study is the TAM, originally developed to explain user acceptance of information systems [10, 11]. It posits that two core cognitive beliefs determine an individual's intention to use technology:

- Perceived usefulness: the degree to which a person believes that using a system enhances their performance.
- Perceived ease of use: the degree to which a person believes that using the system requires minimal effort.

According to TAM, perceived ease of use positively influences perceived usefulness, and both constructs directly affect behavioral intention. In digital health contexts, perceived usefulness often reflects whether the application saves time, improves access to healthcare services, or enhances health management efficiency. Perceived ease of use reflects clarity of interface, navigation simplicity, and user-friendliness [10, 11].

2. Digital trust theory

Health-related digital platforms involve the collection, storage, and transmission of sensitive personal information. Therefore, user trust plays a central role in adoption decisions. Digital trust theory emphasizes that individuals evaluate technology not only based on functionality but also on their confidence in data security, privacy protection, and institutional reliability [12].

In mHealth research, privacy concerns and perceived data vulnerability are consistently reported as major barriers to sustained use. Users may hesitate to engage fully with a health application if they believe their personal medical information could be misused or inadequately protected [4].

Within the context of *Sehhaty*, trust extends beyond technical encryption mechanisms; it includes confidence in the Ministry of Health's governance, regulatory oversight, and transparency. Accordingly, this study incorporates trust as an independent construct directly influencing behavioral intention, consistent with findings from prior Saudi-based studies.

3. Multidimensional barrier frameworks

While TAM focuses primarily on cognitive acceptance mechanisms, broader mHealth literature highlights that adoption is influenced by overlapping technical, individual, and system-level barriers. Systematic reviews categorize barriers into:

- Technical barriers such as application instability, slow response time, compatibility issues, and functional limitations.
- Individual barriers, including limited digital literacy and resistance to change.
- System or integration barriers such as poor interoperability with other healthcare systems and a lack of coordination across providers.

Research methods

Study design

This study will employ a cross-sectional analytical design to investigate barriers associated with the use of the Sehhaty mobile health application among adults in Saudi Arabia.

Study setting

The study will be conducted across Saudi Arabia using a fully online recruitment strategy. Data will be collected through a structured electronic questionnaire distributed via digital platforms, including social media networks (e.g., Facebook, Twitter/X, WhatsApp, Telegram, Instagram), community groups, university mailing lists, and professional networks.

Study population

The study population consists of adults residing in Saudi Arabia who have used the Sehhaty mobile application at least once. The unit of analysis is the individual user of the application.

Eligibility criteria

Inclusion criteria

Participants must meet all of the following criteria:

1. Aged 18 years or older.
2. Currently residing in Saudi Arabia.
3. Have used the Sehhaty application at least once.
4. Able to read and understand Arabic or English.
5. Provide electronic informed consent.

Exclusion criteria

Participants will be excluded if:

1. They have never used Sehhaty.
2. They submit incomplete questionnaires, missing primary outcome variables.
3. They provide clearly inconsistent or duplicate responses.

Healthcare professionals will not be excluded, but occupation will be measured and adjusted for in the analysis.

Sampling procedures

A non-probability sampling strategy will be used, specifically convenience sampling supplemented with controlled online dissemination to improve diversity.

Recruitment will follow these steps:

1. The survey link will be created using a secure online platform (e.g., Qualtrics, Google Forms).
2. The link will be disseminated across multiple regions using region-specific social groups.
3. Participants will be encouraged to share the survey within their networks (controlled snowball effect).
4. Screening questions at the beginning of the survey will confirm eligibility.

To reduce duplication:

- Only one response per device/IP will be allowed when technically feasible.
- A validation question regarding the type of Sehhaty service used will ensure actual prior use.

Sample size

Sample size is calculated using Cochran's formula for cross-sectional studies:

$$n = (Z^2 \times p \times (1 - p)) / e^2$$

Assuming:

- $Z = 1.96$ (95% confidence level)

- $p = 0.50$ (maximum variability)
- $e = 0.05$ (margin of error)

The minimum required sample size is 384 participants.

To account for incomplete responses and improve analytical stability in multivariable modeling, the study will target at least 400 completed responses.

This sample size is sufficient for:

1. Multiple linear regression modeling.
2. Adjusted association testing.
3. Subgroup comparisons.

Data collection instrument

Data will be collected using a structured self-administered online questionnaire consisting of the following sections:

1. Sociodemographic characteristics

Age, gender, nationality, education level, employment status, region of residence, and urban/rural location.

2. Health and usage profile

Self-rated health, presence of chronic disease, frequency of Sehhaty use, most frequently used services, and duration of app usage.

3. Technical barriers

Items assessing:

- App crashes or instability
- Slow loading or response time
- Technical errors
- Compatibility issues

4. Usability and ease of use

Items assessing:

- Clarity of interface
- Ease of navigation
- Simplicity of completing tasks
- Clarity of instructions

5. Perceived usefulness

Items assessing:

- Whether Sehhaty saves time
- Whether it improves access to care
- Whether it enhances healthcare management

6. Trust and privacy concerns

Items assessing:

- Confidence in data security
- Concern about personal information misuse
- Trust in the Ministry of Health digital systems

7. Interoperability

Items assessing:

- Integration with other hospitals
- Integration with private providers
- Continuity of records

8. Satisfaction

Overall experience and satisfaction with the application.

9. Behavioral intention

Likelihood of continued use and recommendation to others.

All perception-based items will be measured using a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree).

Instrument validity and reliability

1. Content validity will be assessed by expert review (at least 3 specialists in digital health and epidemiology).
2. A pilot test (30–50 participants) will be conducted to assess clarity and completion time.
3. Internal consistency will be evaluated using Cronbach's alpha (acceptable threshold ≥ 0.70).
4. Construct validity will be assessed using exploratory factor analysis if needed.

Statistical analysis

Data will be analyzed using SPSS.

1. Data cleaning

- Removal of duplicate responses.
- Assessment of missing data.
- Logical consistency checks.

2. Descriptive analysis

- Means and standard deviations for continuous variables.
- Frequencies and percentages for categorical variables.
- Ranking of most commonly reported barriers.

3. Bivariate analysis

- Independent t-tests or ANOVA for comparison of mean barrier scores across demographic groups.
- Pearson correlation coefficients to examine relationships between continuous constructs.

4. Multivariable analysis

Multiple linear regression will be used to examine predictors of behavioral intention. The behavioral intention score will be treated as a continuous dependent variable.

Independent variables will include:

- Technical barriers score
- Ease of use score
- Perceived usefulness score
- Trust score
- Interoperability score
- Satisfaction score

Demographic variables (age, gender, education, and region) will be entered as covariates.

Model assumptions will be assessed:

1. Normality of residuals
2. Linearity
3. Homoscedasticity
4. Multicollinearity (Variance Inflation Factor < 5)

Adjusted beta coefficients with 95% confidence intervals will be reported. A p-value < 0.05 will be considered statistically significant.

Ethical considerations

Ethical approval will be obtained from a recognized Institutional Review Board in Saudi Arabia before data collection.

The online survey will begin with an informed consent page explaining:

1. Study purpose
2. Voluntary participation
3. Confidentiality

4. Right to withdraw

5. Estimated completion time

No identifying information (e.g., name, ID number) will be collected. Data will be stored in password-protected files accessible only to the research team. Results will be reported in aggregate form. Participation will not affect access to healthcare services.

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