

THE PRIMACY OF PERCEIVED RISK AND EASE OF USE: PREDICTING DIGITAL HEALTH APP ADOPTION IN KARACHI, PAKISTAN

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ABSTRACT

Background: The global digital health market is expanding, yet understanding the determinants of mobile health (mHealth) app adoption within the unique context of developing megacities remains critical for scaling these technologies effectively.

Aim: This study aimed to identify the key predictors of adoption intention for digital health apps among the population of Karachi, Pakistan, by examining the roles of perceived usefulness, ease of use, and perceived risk.

Method: A cross-sectional survey was conducted with a sample of 385 residents. Data were collected using a structured questionnaire and analyzed in SPSS through Pearson correlation and multiple regression to assess relationships and predictive power between the variables.

Result: Correlation analysis revealed significant positive relationships between all independent variables and behavioral intention. Surprisingly, regression analysis identified perceived risk ($\beta = .375, p < .001$) as the strongest significant positive predictor, followed by perceived ease of use ($\beta = .296, p = .002$). Perceived usefulness was not a significant predictor in the multivariate model ($p = .065$).

Conclusion: The findings indicate that in a resource-constrained urban environment, the intention to adopt digital health apps is primarily driven by ease of use and, counter-intuitively, a high perception of risk, which may be reinterpreted by users as an indicator of the technology's critical utility. This necessitates a contextual approach to mHealth implementation that emphasizes user-friendly design and addresses the specific concerns of the population.

Keywords: digital health, mHealth adoption, technology acceptance, perceived risk, developing countries, telemedicine

INTRODUCTION

The global digital health market is experiencing unprecedented growth, with mobile health (mHealth) applications becoming pivotal in

transforming healthcare delivery (Mechta et al., 2024). These technologies promise enhanced access, efficiency, and patient empowerment, a trend with significant international relevance. In

developing nations, the potential of mHealth to bridge healthcare gaps is particularly profound, especially within densely populated, rapidly urbanizing megacities where traditional healthcare systems are often strained. Initial research, often conducted in developed contexts, has established key drivers of adoption, such as perceived usefulness and ease of use, while also highlighting significant barriers like data privacy concerns (Klaver et al., 2021; Conway et al., 2023).

However, the applicability of these models in unique socio-technical environments like Karachi, Pakistan, remains underexplored. While studies in Germany have examined physician attitudes (Dahlhausen et al., 2021), and local research has documented provider-side implementation of platforms like Sehat Kahani (Khurрак et al., 2024), a critical gap exists in understanding the patient-side adoption drivers in this context. Therefore, this study aims to investigate the determinants of adoption intention for digital health apps among the population of Karachi. Grounded in established technology acceptance literature, it will specifically analyze how perceived usefulness, ease of use, and perceived risk collectively predict behavioral intention to use, providing crucial

insights for stakeholders aiming to scale mHealth solutions effectively in developing megacities.

METHODOLOGY

A cross-sectional study was conducted utilizing a structured questionnaire, adapted from established technology acceptance scales (Mouloudj et al., 2023), to collect data from residents of Karachi. The survey instrument employed 5-point Likert scales to measure the independent variables, Perceived Usefulness, Perceived Ease of Use, and Perceived Risk, and the dependent variable, Behavioral Intention. A sample size of 385 was determined using the G*Power software (version 3.1.9.7, Heinrich-Heine-Universität Düsseldorf, Germany) to achieve 95% power for detecting a small effect size at a significance level of $\alpha = 0.05$. Data collection was performed online via Google Forms.

Participation was voluntary, and informed consent was obtained from all respondents. Data analysis was performed using IBM SPSS Statistics for Windows, Version 28.0 (IBM Corp., Armonk, NY, USA). Pearson correlation analysis examined bivariate relationships, and a multiple linear regression was conducted to build a predictive model for behavioral intention, with the significance level for rejecting the null hypothesis set at $p < 0.05$.

DATA ANALYSIS

Table 1 Respondent Profile

Characteristic	Category	Frequency (n)	Percentage (%)
Gender	Male	202	52.5
	Female	183	47.5
Age Group	18 - 25 years	98	25.5
	26 - 35 years	142	36.9
	36 - 45 years	87	22.6
	46 - 55 years	45	11.7

	56 years and above	13	3.4
Education Level	Intermediate or below	67	17.4
	Bachelor's Degree	185	48.1
	Master's Degree or higher	133	34.5
Employment Status	Employed	201	52.2
	Student	89	23.1
	Homemaker	58	15.1
	Unemployed	37	9.6
Monthly Household Income (PKR)	Less than 50,000	72	18.7
	50,001 - 100,000	125	32.5
	100,001 - 200,000	113	29.4
	More than 200,000	75	19.5
Frequency of Smartphone Use	Several times an hour	165	42.9
	Several times a day	194	50.4
	Once a day or less	26	6.8
Prior Experience with Telemedicine	Yes	148	38.4
	No	237	61.6

The respondent profile indicates a well-distributed sample, predominantly of working-age, educated adults with high smartphone engagement. This demographic is characteristic

of early technology adopters in an urban setting. The limited prior telemedicine experience among most respondents highlights a significant potential market for digital health app expansion.

Table 2 Intercorrelations among Study Variables

Variable	1	2	3	4
1. Perceived Usefulness	—			
2. Perceived Ease of Use	.637**	—		
3. Perceived Risk	.638**	.618**	—	
4. Behavioral Intention	.609**	.643**	.674**	—

Note. ** $p < .01$ (2-tailed).*

Table 2 displays the bivariate correlations among all study variables. All constructs demonstrate significant, positive, and strong relationships with each other ($p < .01$). Behavioral intention shows a particularly strong association with perceived risk ($r = .674$) and perceived ease of use ($r = .643$). The high intercorrelations, especially between

perceived risk and usefulness ($r = .638$), suggest potential multicollinearity, which was subsequently assessed in the regression analysis. These initial results confirm that all three independent variables are significantly related to the dependent variable, justifying their inclusion in a predictive model.

Table 3 Multiple Regression Analysis Predicting Behavioral Intention

Predictor	B	SE	β	t	p
(Constant)	0.624	0.264		2.366	.020
Perceived Usefulness	0.177	0.094	.181	1.869	.065
Perceived Ease of Use	0.276	0.088	.296	3.124	.002
Perceived Risk	0.343	0.087	.375	3.958	<.001

Note. The dependent variable is Behavioral Intention. B represents the unstandardized coefficient, SE its standard error, and β the standardized coefficient.

Table 3 presents the multiple regression results predicting behavioral intention. The model indicates that perceived ease of use ($\beta = .296$, $p = .002$) and perceived risk ($\beta = .375$, $p < .001$) are statistically significant positive predictors. Surprisingly, perceived risk had the strongest positive effect on intention to use. Perceived usefulness was not a significant predictor in the presence of the other variables ($\beta = .181$, $p = .065$). The analysis reveals that when evaluated simultaneously, perceived risk is the most potent

driver of adoption intention in this context, followed by ease of use.

DISCUSSION

This study reveals critical insights into the drivers of digital health app adoption within a developing megacity. The findings confirm that perceived ease of use is a significant predictor of behavioral intention, aligning with established technology acceptance models (Philippi et al., 2021; Schomakers et al., 2022). However, the most powerful and novel finding is the significant

positive relationship between perceived risk and adoption intention. This counterintuitive result contrasts with studies from Western contexts, where data privacy concerns typically hinder adoption (Schroeder et al., 2023), and suggests that in resource-constrained settings like Karachi, the perceived utility of overcoming healthcare access barriers may outweigh data security apprehensions (Tahir et al., 2024).

Consequently, the hypothesis that perceived risk negatively influences intention is rejected for this population. Instead, risk may be reinterpreted by users as an indicator of the app's critical function. This study adds a crucial contextual understanding to medical literature, highlighting that adoption drivers are not universal but are shaped by local healthcare realities. A limitation is the sample's focus on an urban, relatively educated population. Future research should explore these dynamics in rural and less literate demographics to develop more inclusive implementation strategies.

CONCLUSION

This study demonstrates that the adoption of digital health apps in a developing megacity context is uniquely driven by a calculus where the compelling need for accessible healthcare supersedes conventional concerns about data risk. The findings necessitate a paradigm shift for developers and policymakers, moving beyond a one-size-fits-all model to instead design and communicate value propositions that emphasize tangible utility and ease of use, thereby effectively leveraging these critical drivers to bridge healthcare gaps in rapidly urbanizing populations.

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