Health literacy and online pharmacy adoption by Saudi population using UTAUT

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A B S T R A C T

The field of online pharmacies is expanding rapidly and has become a crucial component in delivering pharmaceutical services across Saudi Arabia. This study aims to explore the factors influencing the adoption of online pharmacies by the Saudi population, utilizing an enhanced version of the Unified Theory of Acceptance and Use of Technology (UTAUT) framework. This study employed a cross-sectional design, utilizing an online questionnaire that was pre-validated and shared via social media channels between August 2024 and October 2024. The study focused on Arabic-speaking individuals aged >18 years. The gathered data were examined through structural equation modeling (SEM) using AMOS software (v.22.0). The study found that the UTAUT model demonstrates strong applicability in explaining the adoption of online pharmacies, accounting for 62.4% ($R^2 = 0.624$) of the variance in behavioral intention. Among the key factors, effort expectancy ($p < 0.001$) emerges as the most influential predictor of behavioral intention, followed by facilitating conditions ($p < 0.001$) and health literacy ($p < 0.001$). However, the analysis reveals that perceived risk ($p > 0.05$) and personal innovativeness ($p > 0.05$) do not have a statistically significant impact on behavioral intention. The study results would help formulate more effective strategies for establishing online pharmacy operations in developing nations like Saudi Arabia. This study contributes to enhancing the traditional UTAUT model through the integration of additional factors such as health literacy, personal innovativeness, perceived risk, and perceived trust. These variables introduce new dimensions to the existing literature on online pharmacies.

1. Introduction

The pharmaceutical sector is among the most significant industries worldwide. In Saudi Arabia, the pharmacy market is experiencing rapid expansion, with an anticipated growth rate of 6.8% between 2024 and 2030 (Halwani et al., 2024). This growth is driven by factors like a larger population and more spending on healthcare. Saudi Arabia's pharmacy sector is likely to experience substantial growth in the near future. It is suggested that this market's revenue will reach approximately $7.38 billion in 2024 (Statista, 2024), which highlights its important role in Saudi Arabia's economy. Saudi Arabia is experiencing rapid growth in the development of modern and innovative pharmacies with increased demands for healthcare services. Among these advancements is the emergence of e-pharmacies, or online pharmacies. Initially, online platforms were used specifically for items like clothing, accessories, and durable goods, however, recently the pharmaceutical industry has also gained popularity in this digital shift. An online pharmacy serves as a digital platform where a wide range of medications is offered which includes both generic and branded products, through web-based portals and with home delivery services. These platforms provide convenient access to various types of medicines, such as over-the-counter (OTC) drugs, prescription-only medications, and complementary therapies. These offers are often referred to as e-pharmacies, internet pharmacies, or cyber pharmacies that aim to ensure that medicines are delivered directly to customers' doorstep (Desai & Desai, 2018; Sabbir et al., 2021). The practice of selling medications online was initiated in the United States during the 1990s (Orizio et al., 2011), it has gained widespread acceptance and continues to grow globally. By the end of 2023, the worldwide online pharmacy

market was valued at an estimated $32 billion, which is likely to grow to around $5.7 billion and get recognized as the leading market in the industry. China is leading the global pharma e-commerce market, with revenue of approximately $8.5 billion. However, this is not surprising that online pharmacies have become the most rapidly expanding segment within the Asian digital health sector, considering the dominance of China. Fig. 1 shows the worldwide revenue in the "Online Pharmacy" which is expected to grow steadily from 2024 to 2029, with a total increase of $48 billion. By the end of 2029, the revenue is expected to hit a record high of $130.46 billion (Statista, 2024).
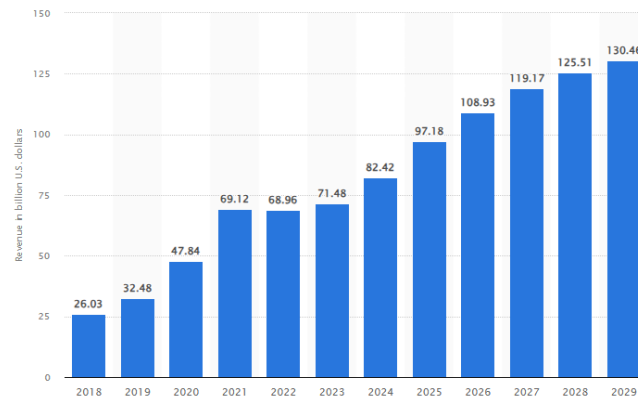

Fig. 1. Revenue of the online pharmacy market (global) from 2018 to 2029 (in billion U.S. dollars)

Source: (Statista, 2024)

Wiedmann et al. (2010) explored the perceptions of consumers regarding the benefits and risks of using e-pharmacies and revealed that consumers may have positive attitudes toward online shopping; however, this is not a regular behavior due to the high-risk associated with online pharmacy shopping. Similarly, Svorc (2012) found that the intention to buy medications online is strongly influenced by consumers' views on the risks involved and the perceived usefulness of the service. Su et al. (2011) examined the business strategies and management approaches of online pharmacies in China, while Yin et al. (2016) discovered that factors such as social influence, trust, performance expectancy, and perceived risk significantly affect consumers' willingness to adopt online pharmacy services. Additionally, a study by Sabbir et al. (2021) explored various aspects of e-pharmacy, including consumer readiness to purchase medications online in Bangladesh Ignjatovic and Stanic (2019) focused on the application of modern marketing strategies within e-pharmacy. Previous studies in Saudi Arabia have investigated the public awareness of online pharmacies, and satisfaction with online pharmacy services (Almohammed et al., 2023, Suleiman & Albarq, 2024). There are several gaps in the literature on online pharmacies, despite some significant contributions. This agrees with Orizio et al. (2011) that most of the previous studies conducted until 2011 focused on regions including Europe and the USA. These studies are not completely applicable to Saudi Arabia due to cultural differences affecting consumer intentions (Karakaya et al., 2014). Secondly, there is a limited exploration of factors influencing consumer intention to adopt online pharmacies; as most of the studies are qualitative. Thirdly, previous studies have particularly focused on health literacy as a determinant of online pharmacy adoption, with no studies directly measuring it (Orizio et al., 2011). Moreover, some studies have employed advanced modeling techniques like SEM and neural networks (Chong, 2013; Liébana-Cabanillas et al., 2018), but their application in the context of online pharmacies remains limited, despite recent calls for such approaches in the literature (Soh et al., 2020; Brusch & Rappel, 2020).

This study aims to fill the existing research gaps and make significant contributions to the online pharmacy literature in four key areas. Initially, the study applied the Unified Theory of Acceptance and Use of Technology (UTAUT) as the theoretical framework to explore factors influencing consumers' intention to adopt online pharmacies. The study's focus is on how individual, organizational, and social factors (Isaac et al., 2019) affect adoption, considering the importance of consumer acceptance for technological success (Rogers, 2003). Secondly, the study considers additional factors such as perceived risk, trust, personal innovativeness, and health literacy into the UTAUT model for a better understanding of consumer behavior. Thirdly, the study uses a sequential multi-method design (a combination of SEM and neural network analysis) to strengthen the validity and reliability of the results (Chong, 2013). Based on this, the study significantly contributes to existing body of literature by providing ill provide insights into the adoption of online pharmacies in developing countries, expanding the understanding of consumer behavior in this context.

2. Literature Review

In the Saudi pharmacy market, there is a surge in the integration of technology. Digital tools are being used by pharmacies to improve their customer service and optimize their operations. In this aspect, they offer online ordering and delivery options, along with mobile applications for medication reminders and health monitoring. Additionally, pharmacies are investing in electronic health records to enable more efficient communication between patients and healthcare professionals and enhance overall patient safety. In Saudi Arabia, consumers prefer pharmacies offering a comprehensive online selection of products

and services. The priority of consumers is convenience and ease of access. Individuals are moving towards adopting products that can meet all their healthcare needs in one place including over-the-counter drugs, personal care items, prescription medications, and wellness products. In addition, consumers are becoming highly health-conscious with increased activity seeking online pharmacies in Saudi Arabia offering specialized services such as nutrition counseling and disease management programs.

2.1 Performance Expectancy (PE)

Performance expectancy (PE) refers to an individual's belief that using a specific technology will enhance their ability to perform tasks effectively (Venkatesh et al., 2003). The perceived advantages and usefulness of a technological tool play a significant role in shaping user interest and willingness to adopt it. Individuals are more motivated to accept and integrate technology into their daily lives, as it increasingly demonstrates its practicality and value (Alalwan et al., 2017).

H₁: *The behavioral intention of consumers in online pharmacy adoption is significantly and positively influenced by PE.*

2.2 Effort expectancy (EE)

Effort expectancy (EE) represents the degree to which individuals perceive a system as user-friendly and simplified navigation. According to Venkatesh et al. (2003), the ease of use significantly influences the adoption of new systems by individuals. This concept shows relevancy in the context of emerging technologies, as consumers are more likely to adopt innovations that require minimal effort to use and are readily accessible (Alalwan et al., 2017). Considering online pharmacies, EE has been identified as an important factor in predicting consumer acceptance of e-health services, which helps facilitate the adoption of digital healthcare platforms (Venkatesh et al., 2003).

H₂: *The behavioral intention of consumers in online pharmacy adoption is significantly and positively influenced by EE.*

2.3 Social influence (SI)

Social influence (SI) is defined as the extent to which individuals feel that other people in their surroundings, whose opinions they value, encourage them to adopt a new system or technology (Venkatesh et al., 2003). Considering the aspect of technology acceptance, social influence helps in shaping individual decisions. For instance, family members, friends, colleagues, or even children can significantly influence a person's willingness to engage with emerging technologies (Porter & Ganong, 2002). Previous studies have demonstrated that there is a significant positive effect of SI on people's intentions to embrace innovations that include online shopping platforms (Soh et al., 2020) and e-health systems (Sabbir et al., 2021). This highlights the significance of social dynamics in facilitating technological adoption.

H₃: *The behavioral intention of consumers in online pharmacy adoption is significantly and positively influenced by SI.*

2.4 Facilitating conditions (FCs)
Facilitating conditions (FCs) encompass the availability of organizational and technical resources that enable individuals to effectively use a system or technology (Venkatesh et al., 2003). There are increased chances that individuals adopt and engage with new systems or technologies when organizations provide support structures, such as technical assistance, training, and accessible tools. In the context of health information technology, strong organizational backing significantly enhances the willingness of users to accept and integrate technologies into their workflows (Soh et al., 2020).

H₄: *The behavioral intention of consumers in online pharmacy adoption is significantly and positively influenced by FCs.*

2.5 Perceived risk (PR)

Perceived risk (PR) describes an individual's sense of uncertainty when engaging with new services or technologies (Yin et al., 2016). This might act as a barrier, which further discourages consumers from fully trusting and then adopting such innovations. In the case of online purchases, PR significantly reduces consumers' willingness to proceed with transactions, as concerns about product reliability, security, and privacy prevail (Sabbir et al., 2021).

H₅: *The behavioral intention of consumers in online pharmacy adoption is significantly and positively influenced by PR.*

2.6 Perceived trust (PT)

In online shopping, perceived trust (PT) encompasses an individual's confidence in different aspects of the online experience including the online platform's reliability, seller's credibility, product quality, secure payment process, and the delivery system's dependability (Yin et al., 2016). Trust in these factors has a powerful influence on consumers' decisions to engage in online transactions. Previous studies have shown that a strong sense of trust significantly encourages consumers to make

purchases from online platforms (Sabbir et al., 2021) and even purchase medications through different e-commerce platforms (Yin et al., 2016).

H6: *The behavioral intention of consumers in online pharmacy adoption is significantly and positively influenced by PT.*

2.7 Personal innovativeness (PI)

Personal innovativeness (PI) is described as the degree to which an individual is among the first to adopt new technologies (Rogers, 2003). This characteristic is a key determinant in shaping a consumer's willingness to adopt novel technologies. In particular, PI significantly influences the willingness of individuals to adopt new technologies, with those showing increased levels of innovativeness more readily accepting and integrating new advancements (Sabbir et al., 2021).

H7: *The behavioral intention of consumers in online pharmacy adoption is significantly and positively influenced by PI.*

2.8 Health literacy (HL)

Health literacy (HL) refers to the combination of personal, cognitive, and social skills that empower individuals to access, comprehend, and apply information to sustain and promote an individual's well-being (Nutbeam, 2000). A higher level of health literacy motivates individuals to take proactive steps toward improving their health, such as reducing healthcare expenses and seeking better healthcare options (Sabbir et al., 2021). Health literacy plays a crucial role in the adoption of online pharmacy, as individuals with greater health literacy are more likely to effectively utilize online health services (Orizio et al., 2011).

H8: *The behavioral intention of consumers in online pharmacy adoption is significantly and positively influenced by HL.*

Online pharmacies provide several benefits, including reduced costs and better accessibility for individuals in remote areas, along with the facilitation of greater privacy for consumers. Additionally, these pharmacies often offer promotional deals and prompt home delivery services (Desai & Desai, 2018). These advantages have resulted in the increased global popularity of online pharmacies. In Saudi Arabia, the COVID-19 pandemic has led to the adoption of a new lifestyle focused on social distancing and self-isolation, which has resulted in a significant surge in online shopping (Alwhaibi et al., 2021; Sabbir et al., 2021). In a post-pandemic era, the healthcare industry has rapidly embraced digital advancements in its service delivery leading to online alternatives in the replacement of traditional pharmacies (Nicola et al., 2020). The consumer's openness to adopting and making full use of these technological advancements determines the effective use of Information and Communication Technology (ICT) in various sectors (Sivathanu, 2019). In this context, it is important to understand various factors influencing consumers' decisions to adopt online pharmacies. However, previous studies have failed to explore the contributing factors and much remains to be explored in this area (Sabbir et al., 2021; Al Mohammed et al. 2023). Therefore, it is essential to conduct comprehensive studies investigating the specific factors that significantly influence consumers' behavioral intentions and predict the adoption process. Figure 2 presents the proposed research model for this study based on the hypotheses.
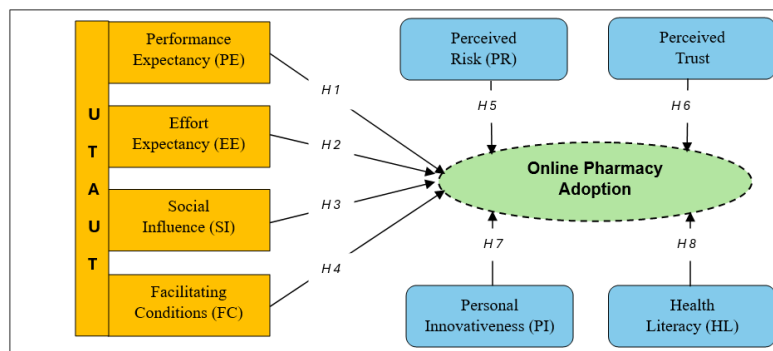

Fig. 2. Study Research Model

3. Methods

3.1 Study design

A cross-sectional study was carried out using a specially designed online survey that was sent via various social media channels, including WhatsApp, Facebook, Twitter, and LinkedIn, over the period from August to October 2024.

3.2 Study Population and Sampling

The population for the study included Arabic-speaking adults, aged >18 years, residing in Saudi Arabia, and who purchase products from online community pharmacies either for their use or on behalf of their family/friends. It was not appropriate to employ a probability sampling method due to the absence of official records containing the population's names and contact

details so a non-probability convenience sampling approach was adopted in this study. Using a 95% confidence level and a 5% margin of error, Sekaran and Bougie (2019) recommended a sample size of 384 participants. Moreover, Baruch and Holtom (2008) indicated that the response rate should range from 33% to 39%, considering that the survey was distributed electronically. A total of 1,000 copies of the questionnaire were distributed in digital format to ensure they achieved the desired sample size. Out of the 1,000 questionnaires distributed, 488 complete questionnaires were returned with a response rate of 48.8%.

3.3 Ethical Consideration

Participation in the study was voluntary and it had obtained approval from the relevant local authorities. The Deanship of Scientific Research and the Ethical Committee at KFU University approved to conduct the study, under approval number KFU-2024-ETHCS2724. All the participants had to give written informed consent to ensure the confidentiality and privacy of their personal information before commencing the online survey. Before completing the questionnaire, participants were informed about the study's objectives through an introductory letter, which also reassured them of the confidentiality of their responses and clarified that the data would be used exclusively for research purposes.

3.4 Study Tool

A thorough review of existing literature was conducted, which resulted in the identification of seven key constructs. The survey instrument was created using established items from previous studies to assess those constructs. The questionnaire's validity was evaluated by four specialists in the field of social pharmacy and pharmacy practice a desired revision was made to the questionnaire based on their recommendations. The survey was initially created in Arabic, then translated into English by two researchers, and subsequently reviewed by two additional researchers to ensure it met publication standards. Table 1 presents the validity of the study tools by listing the total number of items considered for each variable, their sources, and the most recent studies that have validated them.

Table 1
Validity of the study tools adopted

Variable	No. of Items	Items Source	Recent Validation
Performance Expectancy	3		
Effort Expectancy	3	Venkatesh et al. (2003)	
Social Influence	4	Venkatesh et al. (2012)	Sabbir et al. (2021)
Facilitating Conditions	3		
Perceived Risk	3	Koufaris and Hampton Sosa (2004)	
Perceived Trust	3	Featherman and Pavlou (2003)	
Personal Innovativeness	3	Agarwal and Prasad (1998),	Sabbir et al. (2021), Yietal (2006)
Health Literacy	3	Osborne et al. (2013)	Sabbir et al. (2021)
Behavioral Intention	3	Venkatesh et al. (2003)	

3.5 Pilot Study

A pilot study was conducted with a small group of 14 participants to ensure the final version of the questionnaire was suitable for broader distribution. This pilot test was conducted to review the online survey's structure and content; however, it showed that no additional modifications were required. The Cronbach's alpha was calculated to assess the reliability of the survey. The value came out to be 0.78, which indicates acceptable internal consistency.

3.6 Data Collection

The data collection for this study starts with a screening of the question that was designed to identify whether participants were involved in online purchases from community pharmacies. The individuals who answered "yes" were eligible to proceed with the survey. Participants were required to answer with the level of agreement or disagreement with various statements on a five-point Likert scale ranging from strongly disagree to strongly agree.

3.7 Data Analysis

The data gathered from online questionnaires were analyzed using structural equation modeling (SEM) on AMOS 22.0 software. A two-step procedure was adopted for the analysis as recommended by Hair et al. (2010). In the first step, confirmatory factor analysis (CFA) was performed to assess the measurement model, and then the structural model and research hypotheses were tested.

4. Results

Table 2 presents the demographic characteristics of the respondents (n=488). The majority of respondents were female (68.4%) and under 40 years old (59.8%). Most of the participants lived in the Central Region (66.2%), and were single (43.2%) with graduation-level education (71.5%). Regarding making purchases from online pharmacies, 81.6% reported that they purchase more than 10 times per year.

Table 2

Demographic profile of study participants

Demographic Group	Demographic Category	Count	Percentage
Gender	Male	154	31.6%
	Female	334	68.4%
Age	< 40 years	292	59.8%
	≥ 40 years	196	40.2%
Region of Residence	Central Region	324	66.2%
	Western Region	83	17.0%
	Eastern Region	55	11.2%
	Southern Region	19	4.0%
	Northern Region	7	1.6%
Marital Status	Married	195	39.9%
	Single	211	43.2%
	Other	82	16.9%
Education Level	Schooling	31	6.3%
	Graduation	349	71.5%
	Post-graduation & above	108	22.2%
Online Purchase Frequency from Pharmacy	Less than 1 time	4	0.8%
	1-5 times	11	2.3%
	6-10 times	75	15.6%
	More than 10 times	398	81.6%

Table 3 presents the results of the Confirmatory Factor Analysis (CFA) for the measurement model. All factors show good reliability, with Construct Reliability (CR) and Cronbach's Alpha (α) values above acceptable thresholds, indicating strong internal consistency for each construct. The Average Variance Extracted (AVE) values are also satisfactory and suggest adequate convergent validity. The goodness-of-fit indices indicate a good fit of the model to the data that further supports the robustness of the measurement model (CFI = 0.932, RMSEA = 0.063).

Table 3

Measurement Model (CFA)

Factor and Items	Factor Loading	CR	α	AVE	Construct Reliability
Performance Expectancy			0.81	0.70	0.84
PE - 1	0.824	13.247			
PE - 2	0.812	12.845			
PE - 3	0.863	13.112			
Effort Expectancy			0.83	0.68	0.87
EE - 1	0.831	12.982			
EE - 2	0.811	13.982			
EE - 3	0.709	11.312			
Social Influence			0.86	0.64	0.81
SI - 1	0.892	12.456			
SI - 2	0.880	10.446			
SI - 3	0.758	11.274			
SI - 4	0.758	10.998			
Facilitating Conditions			0.82	0.61	0.82
FC - 1	0.714	10.965			
FC -2	0.698	11.328			
FC - 3	0.793	10.997			
Perceived Risk			0.68	0.59	0.79
PR - 1	0.711	11.963			
PR - 2	0.801	10.745			
PR - 3	0.671	9.654			
Perceived Trust			0.84	0.68	089.
PT - 1	0.881	12.854			
PT - 2	0.831	13.854			
PT - 3	0.901	14.325			
Personal Innovativeness			0.81	0.71	0.81
PI - 1	0.888	12.978			
PI - 2	0.796	10.428			
PI - 3	0.798	14.011			
Health Literacy			0.84	0.68	0.83
HL - 1	0.698	10.964			
HL - 2	0.702	12.147			
HL - 3	0.693	10.741			
Behavioral Intention			0.88	0.63	0.81
BI - 1	0.744	12.314			
BI - 2	0.717	12.017			
BI - 3	0.709	10.983			

Goodness of fit indices: CMIN/df = 2.439; CFI = 0.932; GFI = 0.889; AGFI = 0.901; NFI = 0.92; IFI = 0.933; TLI = 0.921; RMSEA = 0.063

Table 4 shows the discriminant validity of the measurement model. According to Farrell (2010), for discriminant validity, the square root of the AVE for each construct should be greater than the correlation between that construct and any other construct

in the model. Table 4 clearly shows that all diagonal values (square roots of AVE) exceed the corresponding off-diagonal correlations, confirming that each construct is distinct and not highly correlated with the others.

Table 4
Discriminant Validity for the Measurement Model

Construct	PE	EE	SI	FC	PR	PT	PI	HL	BI
Performance Expectancy – PE	**0.831**								
Effort Expectancy – EE	0.198	**0.838**							
Social Influence – SI	0.414	0.398	**0.809**						
Facilitating Conditions – FC	0.509	0.199	0.327	**0.822**					
Perceived Risk – PR	0.228	0.122	0.234	0.154	**0.827**				
Perceived Trust – PT	-0.037	-0.024	-0.36	0.054	0.498	**0.861**			
Personal Innovativeness – PI	0.349	0.526	0.511	0.422	0.474	0.420	**0.798**		
Health Literacy – HL	0.459	0.361	0.460	00457	0.175	0.339	0.146	**0.811**	
Behavioral Intention – BI	0.489	0.368	0.535	0.476	0.413	0.504	0.103	0.463	**0.869**

Notes: * values are the square root of AVE; others are correlation coefficients.

Table 5 shows the regression analysis results for the model hypothesized in this study. Significant positive relationships were found between BI and several constructs. Specifically, PE ($\beta = 0.226$, $p < 0.01$), EE ($\beta = 0.818$, $p < 0.001$), SI ($\beta = 0.515$, $p < 0.001$), FC ($\beta = 0.811$, $p < 0.001$), PT ($\beta = 0.221$, $p < 0.01$), and HL ($\beta = 0.679$, $p < 0.001$), supporting hypotheses; H_1, H_2, H_3, H_4, H_6, and H_8. However, PR ($\beta = 0.050$, $p = 0.436$) and PI ($\beta = 0.109$, $p = 0.097$) were not significant and led to the rejection of Hypotheses, H_5 and H_8. Overall, the goodness of fit indices suggests that the model fits the data well (CMIN/df = 3.38, CFI = 0.976, GFI = 0.965, RMSEA = 0.08, and SRMR = 0.05).

Table 5
Regression Wight for Hypothesized Model Testing Result

Hypothesis		Standard estimate (β)	SE	*t*-value	*p*-value	Results
H_1	PE → BI	0.226	0.042	5.337	**	**Accepted**
H_2	EE → BI	0.818	0.053	15.396	***	**Accepted**
H_3	SI → BI	0.515	0.069	7.503	***	**Accepted**
H_4	FC → BI	0.811	0.054	15.011	***	**Accepted**
H_5	PR → BI	0.050	0.074	0.681	0.436	**Rejected**
H_6	PT → BI	0.221	0.051	4.317	**	**Accepted**
H_7	PI → BI	0.109	0.045	1.824	0.097	**Rejected**
H_8	HL → BI	0.679	0.048	14.086	***	**Accepted**

Goodness of fit indices: CMIN/df = 3.38; CFI = 0.976; GFI = 0.965; AGFI = 0.901; NFI = 0.945; IFI = 0.964; TLI = 0.953; RMSEA = 0.08; SRMR = 0.05
*** $p < 0.001$ and ** $p < 0.01$.

5. Discussion

The present study aimed to test the UTAUT model with the inclusion of four new variables that include PT, PR, PI, and HL) to explore the factors affecting the adoption of online pharmacy among young Saudi individuals. The findings of the study indicate that PE plays a significant role in the adoption of online pharmacies among the Saudi population. In particular, Alalwan et al. (2017) also reported that positive experiences with technology result in greater comfort and ease in using it. This suggests that the younger population is more likely to use online pharmacies if they are perceived as beneficial and enhance the efficiency of purchasing medications. The results from hypothesis H_2 show that EE has a significant and positive influence on BI, suggesting that younger individuals are more likely to adopt online pharmacies if they perceive it as reasonable and user-friendly. Additionally, SI plays a key role in deciding to use online pharmacies, as encouragement from family or friends significantly affects the acceptance of new technologies. The present study revealed that FCs have a significant positive influence on the intention of young Saudi individuals to make purchases from online pharmacies. These results are consistent with a recent study by Alam et al. (2020), reporting that FC positively affects the adoption of online pharmacies.

The adoption of online pharmacies in Saudi Arabia would significantly gain from technical and organizational support, such as enhanced technological platforms similar to other technology-driven services like digital payments (Sivathanu, 2019) and e-commerce (Soh et al., 2020). Unexpectedly, PR does not play a significant role in influencing the intention to use online pharmacies, which contradicts prior studies (Yin et al., 2016; Aref & Okasha, 2020). However, this outcome aligns with the findings of Ofori and Appiah-Nimo (2019) and Wei et al. (2018), as these studies aimed to explore the intention to adopt online shopping. For instance, Wei et al. (2018) reported that individuals, who are primary users of online shopping platforms and possess HL, may not consider PR as a critical factor affecting their decision to adopt online pharmacies (Wei et al., 2018).

PR might become a crucial consideration during its actual usage, while the participants currently view PR as unimportant when expressing their intention to adopt it. Similarly, in the context of this study, PI does not appear to influence the decision to adopt online pharmacy services significantly. These results differ from those presented by Natarajan et al. (2017). The discrepancy could be attributed to younger individuals frequently relying on the internet for various purposes, such as

accessing information, engaging in social interactions, and completing tasks, which has made online usage an integral aspect of their daily routines (Sabbir et al., 2021).

The study results also showed that PT has a significant and positive effect on BI, which is consistent with the findings of a few of the previous studies (Yin et al., 2016; Sabbir et al., 2021). This finding suggests that there is an increased chance that consumers adopt online pharmacy services if they view them as secure. Additionally, the study highlighted a new finding in the context of online pharmacy adoption stating that there is a positive relationship between HL and BI. This finding suggests that an individual's health-related knowledge plays a significant role in deciding to adopt online pharmacies.

However, there are certain limitations of this study. Firstly, the study was conducted within a specific cultural and economic context, which may limit its generalizability. Secondly, these findings may not account for ongoing changes in technology and online behavior, considering the ever-evolving nature of the internet as a medium. Therefore, longitudinal studies collecting data at multiple time points are necessary to capture these dynamics and provide a more accurate representation of trends over time.

5.1 Study Implications

The study results provide valuable insights for improving online pharmacy platforms, which decision-makers, such as developers, should carefully consider to accelerate consumer adoption. The findings reported PE and EE as the key factors affecting the acceptance of online pharmacies. Therefore, marketing efforts should highlight the benefits and simplicity of these services to demonstrate how they enable users to manage their health needs more effectively. Additionally, policymakers and service providers should work to build online pharmacies as a user-friendly and innovative solution to obtain essential medications quickly. The study's findings also highlighted that PT positively influences BI so online pharmacy providers must guarantee a flawless delivery system with assurance of delivering accurate medication in the correct dosage to foster trust among consumers. Additionally, the research revealed that HL significantly affects the adoption of online pharmacies so providers should enhance their websites with educational resources, such as proper guidelines for medication usage and instructions for verifying expiration dates. This is likely to result in improved customers' HL and address health-related concerns.

6. Conclusions

The study investigated the factors influencing BI to use online pharmacies by testing a unified model that included additional constructs within the widely recognized UTAUT model. This study's results offer implications for both practitioners and researchers by highlighting the factors shaping behavioral intention to use online pharmacies. By examining a wide range of predictors, the study highlighted the importance of PE, PT, and HL as key drivers of the adoption of online pharmacies. This highlighted the significance of creating user-friendly, reliable platforms that prioritize customer trust and transparency to enhance accessibility and user engagement. Overall, the findings emphasized the need for interventions addressing an individual's expectations and experiences while building trust and helping them make well-informed decisions about using online pharmacies. The study directs future studies to explore longitudinal effects and explore how these effects vary in different cultures to make global e-health strategies.

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