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Consumer Acceptance of E-Pharmacy Services: Examining the Mediating Effect of Consumer Trust

Farhan Raza [a] Hafiz Muhammad Wasif Rasheed [b]

Abstract: *The study examines how brand credibility and perceived risk affect e-pharmacy acceptance among consumers. The study specifically investigates how consumer trust functions as a mediator between these two variables. A quantitative cross-sectional research design was adapted using validated measurement scales to create a structured questionnaire. Data were collected from 385 respondents who had previous e-pharmacy experience in Pakistan through purposive and snowball sampling methods. Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed to assess both direct effects and mediation effects. The results indicate that brand credibility positively influences consumer trust, while perceived risk significantly affects trust formation. Consumer trust functions as the main predictor of e-pharmacy acceptance, while it operates as the essential link between brand credibility and perceived risk and consumer acceptance. The findings demonstrate that trust functions as the bridge between cognitive evaluations and behavioral intention in high-risk digital healthcare environments. The research creates a trust-based mediation framework that expands current healthcare technology adoption models through its implementation. The study reveals how consumers make decisions through psychological mechanisms that exist beyond direct effects.*

Keywords: E-Pharmacy, Consumer Acceptance, Brand Credibility, Perceived Risk, Consumer Trust, Digital Healthcare, PLS-SEM

Introduction

The healthcare digitalization dynamism has experienced a rise in global e-pharmacy services in order to transform the current pharmaceutical distribution patterns. The online pharmacy is more accessible, cost-effective, and convenient, primarily in the emerging markets where the level of infrastructure of the healthcare system is uneven (Mahesh et al., 2020; Srivastava & Raina, 2020; Yang et al., 2021). The development of internet penetration and the adoption of mobile commerce have also led to the adoption of digital channels in the pharmaceutical retail, creating new trends of how consumers access healthcare services (Klimanov et al., 2021; Zeadally & Bello, 2021). Nevertheless, within the context of this growth curve, the uptake of consumers remains uneven as it is still considered in the context of legitimacy, regulation, and authenticity of products (Miller et al., 2021; Sabbir et al., 2020). The strategic relevance of digital pharmaceutical channels also increases due to the situation of the post-pandemic healthcare system, yet the psychological processes of consumer acceptance are an area that is less researched in the context of the study of digital health marketing.

Adoption of e-pharmacy services by consumers is not comparable to adoption of e-commerce because buying pharmaceuticals is a high-involvement, high-risk purchase. The acquisition of drugs is an implication of health; however, unlike clothes or devices, it has a regulatory implication and safety concern (Singh et al., 2020; Yang et al., 2021; Miller et al., 2021). Recent reports mention that the healthcare sector consumers have become more critical in their choice to adopt online pharmaceutical transactions (Srivastava & Raina, 2020). One of the most significant obstacles to online pharmacies is perceived risk. Consumers have to struggle with such multidimensional risks as the risks associated with financial risk, the risks associated with performance risk, the risks associated with privacy risk, and the risks associated with health (Sabbir et al., 2020; Yang et al., 2021; Miller et al., 2021). The possibility of fake drugs aggravates these issues, and the

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unlawful vendors of health care products on the Internet marketplace. They found out that the purchase intention in the online health environment has been significantly lower when the risk perception is high (Miller et al., 2021; Sabbir et al., 2020).

Research Objectives

- To confirm the implications of brand credibility in establishing customer trust regarding e-pharmacy services.
- To examine the potential impact of the risk perception on the customer trust in the e-pharmacy platform.
- To examine the impact of customer trust on the degree of market acceptance of e-pharmaceutical services to consumers.

Research Questions

RQ1: How does brand credibility affect customer trust in e-pharmacy services?
RQ2: How is there a correlation between perceived risk and customer trust in the e-pharmacy platform?
RQ3: Mediation of brand credibility and risk perception of e-pharmacy services and consumer acceptance, is customer trust a mediator of the relationship?

Literature Review

Theoretical Framework

Signaling Theory and Brand Credibility

Signaling theory is a critical theoretical perspective that can be applied to understand how brand credibility plays a role in the perception of consumers in an information-asymmetric environment. Online pharmaceutical stores do not allow their customers to do physical checks of the products they are selling, so reputable brands are indicators of trustworthiness, competence, and ethical standards (Gupta, 2020; Srivastava & Raina, 2020; Yang et al., 2021). Based on the new results, signaling mechanics is increasingly becoming a prominent topic in the online healthcare ecosystems where the regulatory clarity varies across places (Miller et al., 2021; Klimanov et al., 2021). The significance of brand-related cues in reducing the degree of uncertainty and raising the degree of confidence in the digital medical exchange was supported by previous research in 2020-22 (Dhagarra et al., 2020; Gani et al., 2022). The theoretical basis of research is the signaling theory, which presupposes that the credibility of a brand is not a factor of direct influence in the context of acceptance; it operates via the psychological condition of trust in a customer.

Perceived Risk Theory

Consumer stopping during a high involvement and uncertain situation during selling is explained using the Perceived Risk Theory. The aspects of risks, such as monetary, privacy, performance, and health-related (Dhagarra et al., 2020; Gupta, 2020; Yang et al., 2021), are always involved in e-pharmacy services as well. According to the recent data on digital health, consumers are making efforts to minimize the threat prior to any online acquisition within the sphere of medicine (Gani et al., 2022). According to the studies carried out in 2020–22, perceived risk is an important factor in reducing the not-moderated, not-mediated behavioral intention, which is enhanced by trust (Dhagarra et al., 2020; Honein-Abouhaidar et al., 2020). Consequently, in the hypothetical model, perceived risk is described as a negative predictor of customer trust, which agrees with the risk-based adoption theory and forms part of a more elaborate explanation of the e-pharmacy adoption behavior.

Empirical Study

Numerous current-day studies offer the rationale that the credibility of a brand can also create customer confidence in a digital healthcare environment to a significant degree. One of the efficient market cues that e-pharmacy services would have in a high-risk environment to minimize the information asymmetry and

negligence among consumers is a credible brand (Gupta, 2020; Srivastava & Raina, 2020). The newest study on digital health correlates that regulatory compliance, expertise, and reliability of services are credibility cues that positively influence the development of trust on online medical platforms (Yang et al., 2021; Cheng et al., 2022). According to the signalling theory perspective, brand credibility is an alternative to institutional assurance in situations where consumers cannot establish the authenticity of the pharmaceuticals physically, and hence, it is easier to build trust. Past post-pandemic research studies also pre-empted that beliefs of integrity and competence, essential dimensions of believing in online healthcare ecosystems, are reinforced by the credibility of platforms (Miller et al., 2021; Dhagarra et al., 2020).

Customer trust and perceived risk in the online pharmaceutical environment have a high degree of correlation, with an inverse correlation reflected in the literature. This is because multidimensional risks, financial, privacy, performance, and health-related, that are inherent to e-pharmacy services, add significantly to the consumer vulnerability perception (Gupta, 2020; Yang et al., 2021). According to the recent empirical studies, the perception of high risk is a direct threat to the trust in the digital healthcare services, particularly when there are ambiguities in the regulations (Gani et al., 2022; Cheng et al., 2022). Theoretical backgrounds of digital commerce in the past suggested that perceived risk provides a negative predictor of trust in high uncertainty internet buying (Dhagarra et al., 2020; Honein-Abouhaidar et al., 2020). According to the perception risk theory, the uncertainty will result in the mobilization of protective cognitive processes that will reduce confidence in the service providers and consequently, reduce the creation of trust. However, perceived risk is not necessarily associated with a negative impact on trust in the presence of a strong set of institutional protection mechanisms or regulatory transparency (Miller et al., 2021; Gani et al., 2022). In digitally mature markets, the consumers might be ready to take some kind of risk in place of the cost of doing business on an online healthcare platform and trust signals, e.g., insecure payment gateways and verified prescription (Gupta, 2020; Yang et al., 2021).

Trust as a concept is usually referred to as an aspect of consumer acceptance in online healthcare systems. It has also been demonstrated in contemporary literature that trust is a promising predictor of behavioral intention and adoption of online pharmacies (Gani et al., 2022; Srivastava & Raina, 2020). Trust alleviates the high-risk services and builds trust in the security of the transactions and the genuineness of the product (Yang et al., 2021; Cheng et al., 2022). Past literature on digital commerce formulated the notion of trust as a predictor of online purchase intention and more so in digital commerce pertaining to healthcare-associated services (Dhagarra et al., 2020; Honein-Abouhaidar et al., 2020).

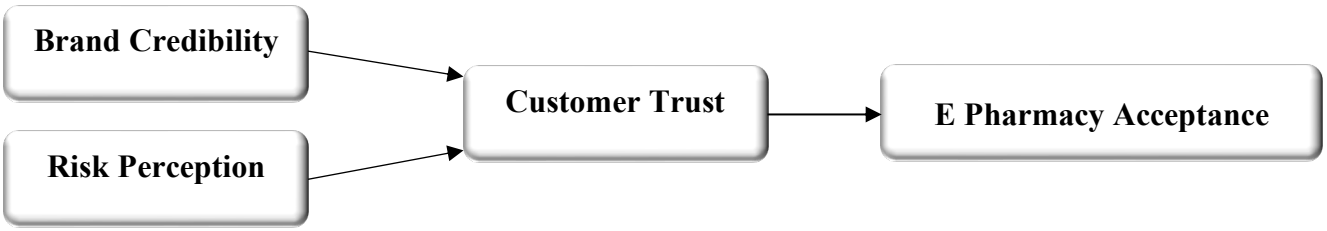
Recent mechanism-based research favours highly making trust a mediating construct and not a direct predictor. On the basis of the research, it turns out that brand credibility may be applied to boost acceptance, not by direct influence but by instilling trust (Gupta, 2020; Yang et al., 2021). Similarly, the theorization of perceived risk on the intention to behave is also mediated by the undermining of trust in the former (Gani et al., 2022; Cheng et al., 2022). Past available sources also indicated that mediation models are more appropriate to describe adoption processes of high-risk digital services (Dhagarra et al., 2020; Honein-Abouhaidar et al., 2020). Trust transforms cognitions (credibility signal and risk appraisals) into behavioural performance that is consistent with trust theory and assimilation of signalling theory. Conversely, brand credibility and perceived risk were also found to directly affect acceptance regardless of the presence of trust because some empirical studies show that the effect is substantial (Miller et al., 2021; Gani et al., 2022). It is the sign of semi-mediation and not full mediation. Recent paradigms of digital adoption caution that total mediation does not necessarily have to be assumed as an unchallenged fact without empirical validation due to the potential of alternating cognitive evaluations and intention (Gupta, 2020; Yang et al., 2021).

Regulatory transparency, online healthcare experience, or digital literacy prior should be considered a contextual factor that can mediate the relationships within trust-based adoption frameworks as proposed by the recent literature (Miller et al., 2021; Gani et al., 2022). One such fact is that how perceived risk adversely affects trust can be alleviated by high digital literacy (Yang et al., 2021; Cheng et al., 2022). The earlier

digital health research further implied that the credibility as trust pathways might be enhanced by institutional trust or government regulation (Dhagarra et al., 2020; Honein-Abouhaidar et al., 2020). However, other researchers believe that the inclusion of moderators can complicate and obscure parsimonious models based on trust in the explanation (Gani et al., 2022; Joa & Magsamen-Conrad, 2022). Some empirical studies have demonstrated that core constructs, such as trust, are steady-level predictors that do not depend on the demographic and contextual variations (Gupta, 2020; Yang et al., 2021). The existing body of literature also reported that the trust mechanisms might also be functioning in the high-stakes healthcare scenarios (universally, not conditionally) everywhere (Dhagarra et al., 2020; Miller et al., 2021).

Figure 1

Conceptual Framework



Hypothesis Development

H1: Brand credibility has a positive and significant effect on customer trust in e-pharmacy services.

The signaling theory argues that brand credibility is a signal that shows the trustworthiness of a company and professional knowledge and moral conduct in circumstances where individuals do not have all the information (Gupta, 2020; Srivastava & Raina, 2020; Yang et al., 2021). One of the advantages of credible brands in the e-pharmacy industry is that it assists customers who cannot physically see the products to build trust in their brands (Miller et al., 2021). Positive brand credibility will determine the relationship between brand credibility and consumer trust, which will enhance consumer trust.

H2: Risk perception negatively and significantly impacts customer trust in e-pharmacy services.

Perceived risk theory states that consumers evaluate their potential financial, privacy, and health-related losses prior to making online purchases (Dhagarra et al., 2020; Yang et al., 2021; Gani et al., 2022). The greater perceived risk in high-risk settings such as e-pharmacy, the greater the perceived uncertainty and vulnerability, and consequently, that adversely impacts the creation of trust (Cheng et al., 2022).

H3: There is a positive and significant impact of customer trust on e-pharmacy acceptance.

According to the trust theory, individuals rely on trust to reduce their sense of vulnerability to enable them to make decisions when confronted with uncertain situations (Dhagarra et al., 2020; Yang et al., 2021). The trust in digital health systems results in more frequent use of e-pharmacy services by consumers.

H4: Customer trust is a mediator between brand credibility and e-pharmacy acceptance.

The credibility of brands is not the only factor that determines the customer acceptance of products. Brand credibility creates customer trust, which consequently results in product acceptance. Trust is a cognitive process that converts the signals of credibility into real patterns of behavior that individuals exhibit in online domains with a high-security risk (Miller et al., 2021; Gupta, 2020; Gani et al., 2022).

H5: The relationship between risk perception and e-pharmacy acceptance is mediated by customer trust.

Perceived risk has an influence on trust, which determines consumer acceptance. The greater the level of perceived risks, the lower the level of trust, and this leaves people with less opportunity to use e-pharmacy services (Cheng et al., 2022). Trust is the medium that binds the risk perception and acceptance of products.

Research Methodology

Research Design

This study employs a quantitative cross-sectional study design to examine how the relationship between brand credibility, perceived risk, and customer trust affects each other to determine impacts on e-pharmacy adoption. The study adopted a survey-based approach to collect original data from the respondents at a single point in time. The research is cross-sectional in nature in the sense that it examines constructs of perception and hypothesizes mediation relationships among various variables by use of statistical analysis. The research aims to investigate individual consumers who have used e-pharmacy services before.

Research Population and Sampling Procedure

The sampling of this research is those who have previous experience of using e-pharmacy in Pakistan. The analysis was done on those users who had earlier used e-pharmacy platforms since their answers had to be in line with the objectives of the study. In this way, participants will require a minimum level of understanding of online pharmacy services to be able to evaluate the trust, perceived risk, and brand credibility. Sample responders are only analyzed who had a positive experience with an online pharmacy in the past.

Data Collection

In their study, the researchers gathered information using a structured self-administered questionnaire that they developed in order to capture the critical aspects of their research model. The questionnaire developed by the researchers was based on developed measurement scales that they identified in the existing digital commerce and healthcare research literature (Marikyan & Papagiannidis, 2023; Gani et al., 2022; Fan & Ukaegbu, 2024). The current study in the area of digital trade and medical services emphasizes the significance of the multi-item scales to gain detailed consumer perceptions of the high-risk service setting (Adebo et al., 2024; Khan et al., 2023). Previous empirical studies on online pharmacy adoption have similarly done so by using Likert scales in measuring trust and risk perception (Thusi, 2022; Rajput & Seetharaman, 2022). This will increase internal consistency, construct validity, and statistical forcefulness.

Data Analysis Techniques

Measurement and structural models were analyzed using a partial Least Squares Structural Equation Modeling (PLS-SEM) approach, with SmartPLS software. Internal consistency reliability (Cronbach Alpha and composite reliability), convergent (Average Variance Extracted), and discriminant validity (HTMT criterion) were measured within the measurement model (Marikyan & Papagiannidis, 2023; Batucan et al., 2022; Gani et al., 2022). Bootstrap tests were employed in testing both direct and indirect effects in testing the hypothesis. The research needs PLS-SEM in that it allows the researchers to examine a variety of latent variables that comprise brand credibility, perceived risk, consumer trust, and e-pharmacy acceptance. The technique is most effective in testing mediation models where consumer trust is the relationship between the independent and dependent variables. Past research conducted in the context of pharmaceutical adoption online also indicated that the SEM-based strategies might be precise in the assessment of the indirect trust connection (Adebo et al., 2024; Fan & Ukaegbu, 2024).

Result and Discussion

Table 1

Reliability and Validity Analysis

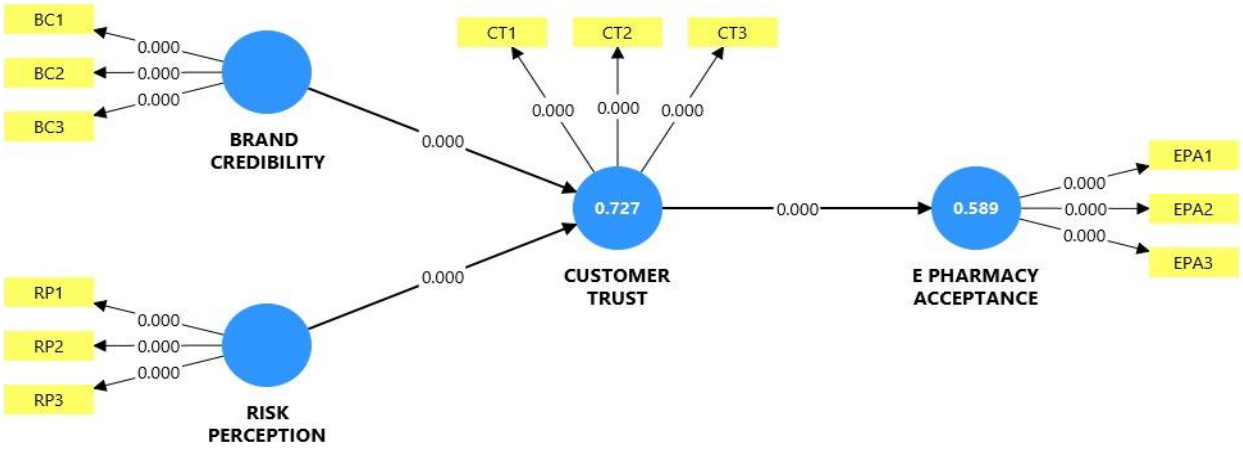
Construct reliability and validity				
Overview				
	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
BRAND _CREDIBILITY	0.887	0.888	0.930	0.815
CUSTOMER_TRUST	0.908	0.909	0.942	0.844
E PHARMACY_ACCEPTANCE	0.862	0.871	0.916	0.784
RISK_PERCEPTION	0.832	0.832	0.899	0.748

Based on construct reliability and validity results, all the latent variables in the model have a high internal consistency and convergent validity. The alpha values of Cronbach range between 0.832 (Risk Perception) and 0.908 (Customer Trust), more than the suggested alpha of 0.70, thus the acceptable to excellent reliability factor is met. All these results show that the measurement model is statistical with strong constructs and sufficient common variance amongst the measures and the latent variables behind the measures to support the presence of the model in further structural analysis.

PLS SEM Bootstrapping

Figure 2

PLS SEM Bootstrapping



The findings of the structural model indicate that the explanatory power is greater and that all the relationships among the constructs are statistically significant. The customer trust has an R2 value of 0.727, which means 72.7 per cent of the customer trust variation is predicted by the two variables, the Brand Credibility and the risk perception, which means it is highly predictive. Similarly, E-Pharmacy Acceptance shares an equivalent R2 value of 0.589, meaning that Customer Trust explains 58.9 percent of the fluctuation in the acceptance intention, which is a moderate to strong power of explanation. The bootstrapping outcomes all suggest that the p-value of the structural paths is 0.000, which means that the relationship is statistically significant at the level of 0.05. This indicates that Customer Trust is highly influenced by Brand Credibility and risk perception, and strongly predicted by Customer Trust on E-Pharmacy Acceptance.

Hypothesis Testing (Direct Effect)

Table 2

Hypothesis Testing (Direct Effect)

Path coefficients				
Mean, STDEV, T values, p values				
	Original sample (O)	**Sample mean (M)**	**Standard deviation (STDEV)**	**T statistics (|O/STDEV|)**	**P values**
BRAND _CREDIBILITY -> CUSTOMER_TRUST	0.408	0.410	0.078	5.209	0.000
CUSTOMER_TRUST -> E PHARMACY_ACCEPTANCE	0.768	0.768	0.045	17.136	0.000
RISK_PERCEPTION -> CUSTOMER_TRUST	0.482	0.480	0.075	6.449	0.000

The findings of the structural path indicate that all the hypothesized relationships reported are positive and statistically significant. The evidence of strong statistical significance is the large t-values (all larger than 1.96), and the evidence of consistent estimates with bootstrap samples is the small standard deviations.

Overall, the findings are extremely robust in supporting the mediating importance of customer trust among brand credibility and risk perceptions to e-pharmacy acceptance.

Specific Indirect Effects

Table 3

Specific Indirect Effects

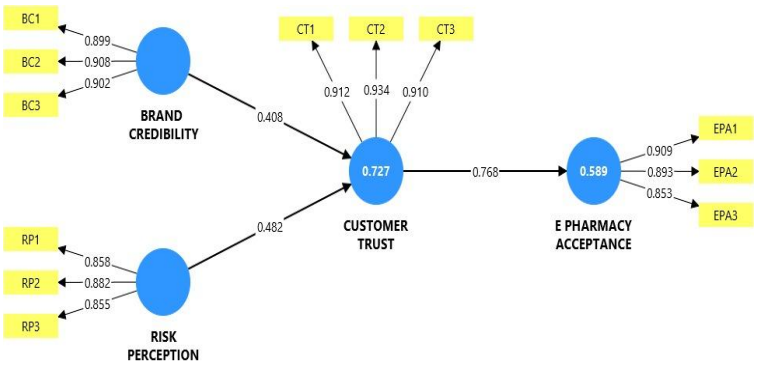
Specific indirect effects					
Mean, STDEV, T values, p values					
	Original sample (O)	Sample mean (M)	Standard deviatior (STDEV)	T statistics (|O/STDEV|)	P values
BRAND _CREDIBILITY -> CUSTOMER_TRUST -> E PHARMACY_ACCEPTANCE	0.313	0.317	0.069	4.515	0.000
RISK_PERCEPTION -> CUSTOMER_TRUST -> E PHARMACY_ACCEPTANCE	0.370	0.368	0.057	6.454	0.000

These are statistically significant mediation paths as indicated by the large t-values (over 1.96) and p-values less than 0.001. Overall, these findings indicate that Customer Trust is a significant mediating factor because it transmits the effects of both brand credibility and risk perception onto the consumers in the form of their requirements to adopt e-pharmacy services.

PLS SEM

Figure 3

PLS SEM



The measurement model has a high indicator reliability and convergent validity among all constructs. Each of the outer loadings is greater than the recommended value of 0.70, suggesting that every indicator is a strong indicator of its latent construct.

Model Fitness

Table 4

Model Fitness

Model fit		
Fit summary		
	Saturated model	Estimated model
SRMR	0.058	0.092
d_ULS	0.261	0.660
d_G	0.260	0.358
Chi-square	565.500	694.592
NFI	0.861	0.829

The measures of model fits indicate that the model fit is moderate and good in general. The saturated model SRMR (0.058) value is lower than the recommended value of 0.08, which presents a good fit, and the estimated model SRMR (0.092) is somewhat bigger than the ideal cut-off that implies a poor fit in PLS-SEM, but of tolerable levels. This growth in the Chi-square value between the saturated and the estimated model has been due to structural constraints of the estimated model. Besides, the NFI (0.861 saturated and 0.829 estimated model) values are close to the recommended 0.90 value of a fair but not excellent fit of the model. Overall, the results suggest that the structural model is reasonably well-fitted and adequate to explain the relationships between the constructs, although there is still a chance of a slight improvement of the model.

Discussion

The existing findings reveal that Customer Trust is a significant implication of Brand Credibility (0.408), which is also in line with the recent findings, which credibility is among the primary antecedents of trust in the case of using digital health platforms (Dhagarra et al., 2020; Alam et al., 2020; Honein-Abouhaidar et al., 2020). Still, despite the existing studies which demonstrate even more significant influence of brand credibility on behavioral intention directly, the current findings demonstrate that credibility works with the assistance of trust, and the mediation processes are crucial components of technology adoption models.

Furthermore, Customer Trust is directly related to E-Pharmacy Acceptance (0.768) as the existing studies on digital health adoption confirm that trust is the motivation of behavioral intention (Dhagarra et al., 2020; Honein-Abouhaidar et al., 2020; Alam et al., 2020). The most recent multi-model studies also show that trust exhibits high variance in the acceptance of online services and tends to be more effective than classical TAM constructs (Fan & Ukaegbu, 2024; Adebo et al., 2024). The significance of trust as a point of focus in intention and actual use was also emphasized in previous research on online trade (Sabbir et al., 2020; Srivastava & Raina, 2020).

Finally, the results of the mediation (Brand Credibility x trust acceptance; Risk Perception x trust acceptance) support the points of discussion that the multiple-model structures are more explanatory than single-path models. Mediation-based frameworks are more favored in the recent literature to describe the psychological technology adoption processes (Cheng et al., 2022; Marikyan & Papagiannidis, 2023; Gani et al., 2022). The existing multiple structural model gives a more elaborate explanation of how intention is studied as compared to the previous methods, which did not explore how the intention was directly affected, since the current study statistically established the transmission of trust as the mechanism. This enhances the degree of predictability and theoretical perfection in the context of embracing the e-pharmacies.

Conclusion

The conclusion of this paper is that Customer Trust is the most important determinant of E-Pharmacy Acceptance, which is the main channel through which Brand Credibility and Risk Perception influence the consumer adoption intention. The structural correlation of trust and acceptance is high (= 0.768), which justifies that consumers need to be psychologically assured in a high-risk digital healthcare environment before they can exploit online pharmaceutical services. These findings align with the recent research on the adoption of digital health that suggests trust is the predictor of behavior in most instances (Fan & Ukaegbu, 2024; Adebo et al., 2024; Cheng et al., 2022). Trust has also been identified as an important factor in reducing uncertainty in online transactions by previous literature reviews (Dhagarra et al., 2020; Kamal et al., 2024).

The results also reveal that the Customer Trust is more influenced by the Risk Perception in comparison to Brand Credibility, and the customers are more sensitive to the concern of privacy, authenticity, and security of the information transactions made online in pharmacies. This contribution can be applied particularly in the area of digital healthcare markets, where fake products and misinformation remain the central concerns. Recent studies have also emphasized the applicability of risk alleviation to the digital trade and health platforms (Gani et al., 2022; Fan & Ukaegbu, 2024; Yang & He, 2023). Perceived risk and the formation of

trust have an inverse relationship, which has been supported in previous works (Dhagarra et al., 2020; Thusi, 2022).

Limitations and Future Research

The addition of the additional technological and psychological constructs to the current model, such as perceived usefulness, perceived ease of use, privacy concerns, quality of service, and regulatory assurance mechanisms, can further improve the current model in future research.

The authors also indicate that multi-theoretical frameworks such as UTAUT2, Protection Motivation Theory (PMT), and Information Privacy Calculus must be integrated to make sure that more complex consumer attitudes are captured in health care platforms (Marikyan & Papagiannidis, 2023; Batucan et al., 2022). The methodological limitations used in the study, longitudinal or experimental designs, may be used in future research to examine the change in trust and adoption behavior over time, in particular when the digital healthcare ecosystem is maturing (Khan et al., 2023; Adebo et al., 2024; Yang & He, 2023).

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