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Article

Analysis of influential factors between personal innovation, word of mouth, using online pharmacy adoption

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Abstract: The rise of internet-based pharmacies has transformed the healthcare sector, giving patients access to medications, information, and direct interaction with pharmacists. While online pharmacies have become popular around the world, there are challenges hindering their widespread use in developing countries due to a limited understanding of the factors affecting their acceptance and usage. To bridge this knowledge gap, a study utilized a model combining the unified theory of acceptance and use of technology (UTAUT 2) with the technology acceptance model (TAM) to explore the drivers behind online pharmacy usage in Oman. Through this framework, twelve hypotheses were. A survey involving 378 individuals familiar with online pharmacies was conducted. Structural equation modeling (SEM) was applied to analyze the data and test these hypotheses. The results indicate that factors such as perceived expectancy effort expectancy and facilitating conditions hedonic motivation, habit perceived risk, technology trust, and technology awareness play roles in influencing the adoption of online pharmacies in Oman. The findings suggest that personal innovation plays a moderating role in the connection between perceived risk and behavioral intention, while it has a negative moderating influence on the relationship between technology trust and behavioral intention. Word of mouth was identified as a moderator in enhancing the correlation between behavioral intention and online pharmacy adoption. This research emphasizes the moderating relationship of personal innovation and word of mouth on shaping consumer attitudes towards online pharmacies and their acceptance. In summary, these results add to the existing knowledge on pharmacy adoption and in developed areas such as provide practical insights for online pharmacy providers to improve their offerings and attract a larger customer base.

Keywords: online pharmacy; technology adoption; UTAUT2; behavior intention; personal innovation

1. Introduction

Recent studies within Oman's pharmaceutical industry, such as the development of new drug formulations and public health initiatives, have significantly contributed to health innovation through the application of advanced scientific techniques (Rahimi et al., 2018). The increasing use of smartphones and the internet has boosted businesses that utilize marketing strategies such as M and F marketing, leading to their growth in space. However, Oman faces challenges related to e-commerce readiness, including issues with network infrastructure and government regulations (Al-Busaidi et al., 2023). In the healthcare sector, pharmacies encounter obstacles like regulatory stringency and limited consumer acceptance. Although Oman ranks highly in smartphone and internet accessibility, the adoption of e-commerce in the country remains relatively low (Tawafak et al., 2024). There is a lack of awareness about

online pharmacies among the population, with only a few people having purchased medications online. This indicates a knowledge gap and difficulty in discerning between legal and illegal online sources (Al Halbusi et al., 2024). On the contrary, online pharmacies have higher acceptance rates in East Asia and developed nations. Nevertheless, unregistered online pharmacies pose safety concerns, highlighting the importance of compliance with regulations (Al Sideiri et al., 2021). Access to medication plays a role in improving health outcomes and achieving coverage. While online pharmacies offer benefits such as convenience, accessibility, and cost-effectiveness, there are apprehensions regarding misuse and abuse. It is essential to establish a medicine delivery system supported by electronic pharmacy systems to enhance healthcare services (Al-Kfairy et al., 2024).

Despite the rise of online shopping and its impact on consumer behavior in the healthcare sector, there are notable gaps in understanding the adoption of online pharmacies in Oman (Al-Kfairy et al., 2024). First, there is limited research exploring the specific barriers to e-commerce adoption within the Omani healthcare sector, particularly in the context of online pharmacies. Second, there is a knowledge gap regarding the role of personal innovation and word of mouth in influencing online pharmacy adoption, especially in a developing country context (Ahmad et al., 2019). Third, while the UTAUT-2 and TAM frameworks have been applied to various settings, their application to online pharmacy adoption in Oman remains underexplored. This study aims to fill these gaps by examining the factors affecting online pharmacy adoption, including personal innovation and word of mouth, within the Omani context. By addressing these gaps, the research seeks to enhance healthcare accessibility, streamline delivery processes, guide policymaking, and create business opportunities (Al Sideiri et al., 2020). Academic advancements involve broadening the understanding of technology adoption in healthcare and contributing to the body of knowledge on healthcare advancements and online commerce (Karakose et al., 2022). Despite their benefits, adoption rates remain modest, influenced by factors like energy impact, personal innovation, and word of mouth. Hence, this research aims to decipher the drivers of online pharmacy adoption in Oman's healthcare sector, employing the UTAUT-2 and TAM frameworks. The research questions (RQ) are formulated as follows:

RQ 1: What are the relationships between various factors and the adoption of online pharmacies?

RQ 2: How do personal innovation and word of mouth relate to the adoption of online pharmacies?

The study's focus lies in unraveling the relationships of personal innovation and word of mouth on online pharmacy adoption, alongside other influencing factors. The paper is organized as follows: section 2 reviews the literature on online pharmacy and the theories used in the study. Section 3 discusses research hypotheses and model development. Section 4 explains the research methodology. The results of the study are presented in section 5, and the discussion of the findings is presented in section 6. Finally, section 7 concludes the study and suggests future research directions.

2. Literature review

2.1. Online pharmacy

During the 1990s, in the United States, the rise of pharmacies was a development that allowed people to buy both prescribed and over-the-counter medications through the Internet. Despite the convenience concerns about drugs, health regulations address consumer safety risks. While online pharmacies are famous for their convenience and potential health benefits, their environmental impact from energy use has not been thoroughly studied (Al-Kfairy et al., 2024). Previous research has highlighted advantages like medication adherence and lower healthcare costs. Few studies have investigated their environmental effects. Therefore, more research is needed to understand how much energy online pharmacies use and find ways to reduce their impact. This review aims to summarize existing literature on energy usage and online pharmacy adoption, pointing out areas for research (Al Farsi et al., 2024).

Online pharmacies can be classified into expert-guided and rogue categories with differing levels of legitimacy and risk. Traditional online pharmacies dispense medication based on prescriptions from professionals, while expert-guided platforms use assessments of patients' histories to provide medications (Alalwan et al., 2017). On the other hand, rogue pharmacies allow customers to buy prescription drugs without consultation, often operating illegally. Despite facing obstacles, the rise of drug services in developing countries highlights their convenience and accessibility in dealing with mental health concerns (Ahmad et al., 2019). Obtaining therapy or medication through these means can provide individuals with privacy and ease, although worries persist about the quality and safety of pharmaceutical products. To improve the standards of pharmacies, governments could enforce oversight and regulation of digital platforms, focusing on patient safety and adherence to correct protocols (Albertsen et al., 2020).

In developed areas such as the European Union and North America, digital pharmacies have seen progress compared to less developed regions (Alfarsi et al., 2021). While online vendors offer an array of medications and medical supplies, concerns linger about sales activities, mainly when wholesalers operate from abroad (Ammenwerth, 2019). In the past fifty years, countries in the developing world have experienced changes by blending modern technology with traditional values. However, striking a balance between embracing progress and preserving heritage has proven challenging (Baptista and Oliveira, 2015). The slow uptake is attributed to information and communications technology (ICT) infrastructure enhancements and social and cultural factors that impact the acceptance of e-government services (Al Halbusi et al., 2024; Al-Rahmi et al., 2022; Al Sideiri et al., 2021).

The clash between advancements and cultural beliefs often hinders the adoption of technologies, especially in the Arab region, where societal norms play a significant role in shaping attitudes towards innovation. This reluctance is not directed at the technology itself, but at the changes it brings about in society, creating hurdles for governments and organizations investing in technological advancements (Ahmad et al., 2019). In the Gulf countries, challenges persist in embracing e-commerce and e-banking initiatives, although there has been an increase in the use of e-services in

recent years. Despite trends, the utilization of solutions like virtual pharmacies remains limited in developing nations, like the Gulf, underscoring the importance of further research to comprehend factors influencing adoption rates and bridge gaps between existing models and consumer preferences (Chen et al., 2021).

2.2. The unified theory of acceptance and use of technology

The original UTAUT theory was based on perceptions like the TAM theory, including performance and effort expectancy, social influences, facilitating conditions, and several moderators (Dahri et al., 2023). To address criticisms of the original adoption theories, the UTAUT theory was further refined by incorporating additional contextual factors such as price value, habit, and hedonic motivation, resulting in the UTAUT-2 model 18. The UTAUT-2 model has become a comprehensive theoretical framework and task environments, enjoying high popularity (Ahmad et al., 2019). **Figure 1** depicts the UTAUT-2 framework.

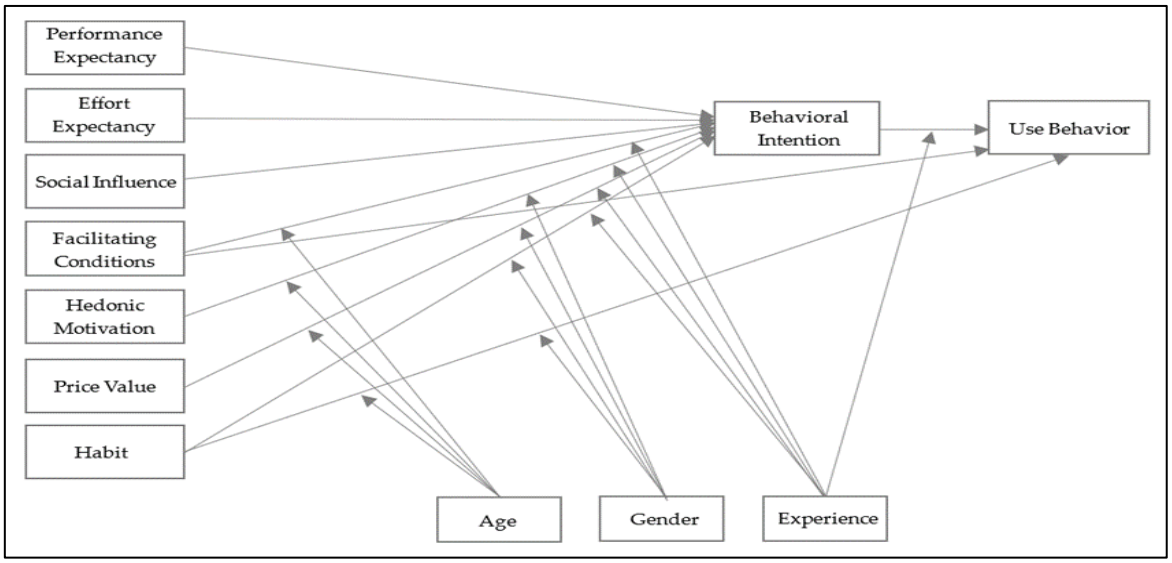

Figure 1. UTAUT-2 model (Dahri et al., 2023).

The UTAUT 2 theory is a framework for understanding how online pharmacies are adopted globally. This theory, widely used in various settings, sheds light on the factors influencing people's intentions and usage of online pharmacy platforms (Al Sideiri et al., 2021). By exploring concepts like performance expectations, ease of use, social influence, and supportive conditions, researchers can uncover what drives consumers to choose pharmacy services (Dash and Sahoo, 2021). In the changing landscape of online pharmacy adoption, the UTAUT 2 model provides a way to analyze the complexities of adoption behavior. Motivation, pricing value, and habit—introduced in the UTAUT 2 framework—shape consumer attitudes and behaviors toward online pharmacies (Al-Rahmi et al., 2022; Davis, 1989; Kalogiannakis et al., 2018).

Understanding these elements is crucial for healthcare industry stakeholders, regulators, and policymakers to develop strategies that promote pharmacy service adoption while addressing sales regulation issues. Despite the growth opportunities pharmacies offer, there is empirical research on individual adoption behavior in this

sector (Al Sideiri et al., 2020). Therefore, using the UTAUT 2 framework in studies can offer insights into the factors influencing consumers' intentions to adopt online pharmacy services. When researchers analyze these aspects against regulations and societal conventions, they can enhance their insights into the dynamics of pharmacy acceptance and develop practical approaches to encourage its usage (Karakose et al., 2022).

3. Research model and hypothesis

The purpose of this research is to test hypothesized relationships in the area of adoption and technology acceptance using a well-defined conceptual model that is developed and validated in theories and models. The proposed model for the adoption of online pharmacies, as depicted in **Figure 2**, is based on a synthesis of the UTUAT-2 theory and the TAM theory, with the addition of a moderator named personal innovation and word of mouth (Ahmad et al., 2019; Davis, 1989). This model was developed to provide empirical evidence for the role of each independent variable in influencing consumers' intentions to use and eventually adopt online pharmacies (Al Sideiri et al., 2021).

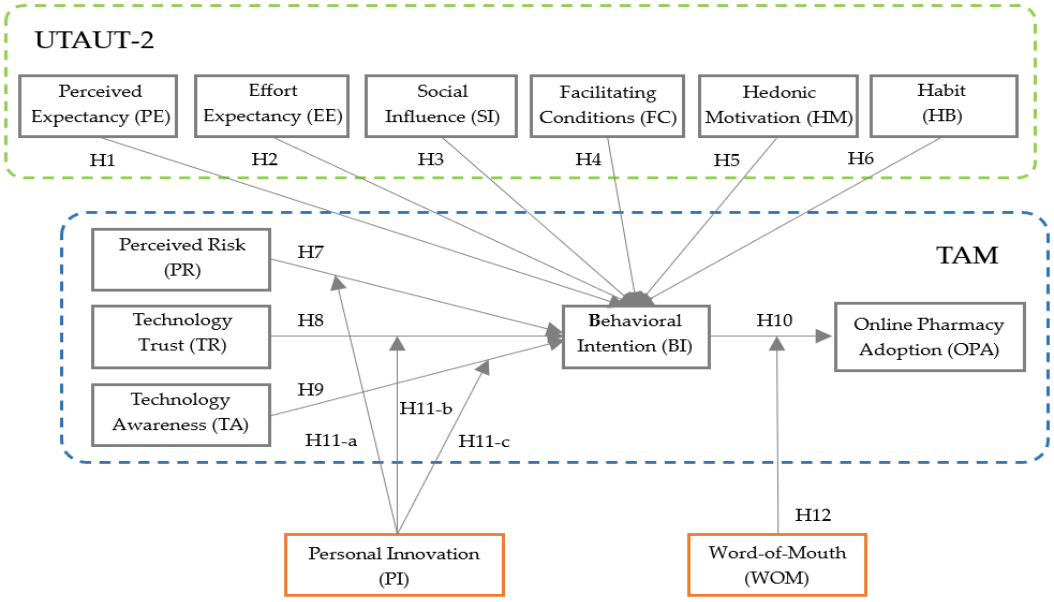

Figure 2. Research model.

3.1. Perceived expectancy and online pharmacy adaption

A recent research study highlighted the importance of considering social context when measuring incentives in the workforce effectively, based on equality theory, corporate fairness, and early developments in expectation philosophy (Rahimi et al., 2018). The study aimed to broaden the understanding of workplace motivation by examining the relationship between the social environment within and across organizations. The study proposed that the Vroom formula for the expectancy theory of motivation (motivation = instrumentality × expectancy × valence) should be amended to include a new social variable, social impact, which is measured by the sum of internal relationships and external environmental impact. Performance

expectancy, defined as an individual's perception of how information systems (IS) facilitate task completion more effectively, was identified as an important factor that enhances end-users' performance through system attributes such as efficiency, speed, and accuracy (Ammenwerth, 2019; Baptista and Oliveira, 2015). Another study investigated the determinants of policy and behavior related to social networking apps, including performance expectancy and effort expectancy, as part of the UTAUT-2 framework (Chang and Huang, 2019). The study proposed that exogenous latent constructs, such as expected performance, expected commitment, and social influence, serve as antecedents to predict the purpose and actions of social networking apps. The study also highlighted the moderating role of knowledge in shaping consumer behavioral expectations in social networking applications (Al-Rahmi et al., 2022). The findings indicated that success expectation, commitment expectation, and social impact significantly influence behavioral intention in social networking activity.

Performance expectancy has been consistently found to influence intentions to use IS systems, and it has been observed that the perceived benefits of online medicine purchase, such as protection of illness privacy, convenience, and lower prices, positively impact adoption intention (Al-Sideiri et al., 2024; El-Said and Al Tall, 2020). In Jordan, the acceptance of electronic health records (EHRs) systems was investigated based on the modified UTAUT-2 theory, with the aim of improving clinic quality, mitigating medical errors, and reducing health costs in the e-health sector (Chen et al., 2021). However, few studies have examined the historical factors influencing healthcare professionals' intentions to use EHR systems. A computational approach was introduced to explain medical professionals' engagement with an EHR framework, focusing on factors such as effort expectancy, hedonics, social impact, and trust of information and systems, which were all found to significantly influence EHR system acceptance. Overall, it is believed that users are more motivated to adopt new technology when they perceive it as advantageous and useful (Chen et al., 2021; El-Said and Al Tall, 2020). Therefore, the following hypothesis has been proposed for further investigation:

Hypothesis 1 (H1): Performance expectancy has a significant relationship on the behavioral intention to adopt the online pharmacy in Oman.

3.2. Effort expectancy and online pharmacy adoption

Effort expectancy, the second key component of UTAUT-2, refers to an individual's perception of the effort required to complete a task using an information system (IS). It has a significant relationship on consumers' use of technology in business settings and is rooted in the perceived ease of use (PEOU) construct from Davis' (1989) technology acceptance model (TAM). Effort expectancy has been validated as a significant predictor of intentions in numerous studies related to UTAUT-2 (Dash and Sahoo, 2021; Kalogiannakis et al., 2018). In the healthcare sector, effort expectancy has been examined as a predictor of the use of online health applications (Al Sideiri et al., 2021). The adoption of new information and communication systems, including online applications, has played a crucial role in advancing health services in developing countries by facilitating remote data collection and transmission to improve quality and availability. Understanding the

factors that contribute to the adoption of online technologies in healthcare is therefore important. A study conducted in Tanzania adopted a modified UTAUT model to investigate the factors influencing the acceptance and use of online health applications by health workers in health facilities (Chang and Huang, 2019). The study found that the level of effort expectancy and facilitating conditions significantly influenced consumers in urban areas to adopt and use online health devices.

Another study focused on the acceptance of the Electronic Occupational Mental Health System, which explored the adoption and barriers related to the potential use of this system for workers at high risk of early retirement due to labor hardship (Karakose et al., 2022). The study identified that UTAUT predictors, such as knowledge, attitudes towards efficacy, and accessibility, had significant positive effects on the acceptability of the system. This suggests that prioritizing education and strategies to improve these factors can enhance the adoption of the Occupational E-Mental Health System. In the context of this study, the inclusion of effort expectancy is to investigate consumers' beliefs about the ease of use of the online pharmacy system in Oman and how it predicts their behavioral intention to use the system. It is hypothesized that if customers perceive the system as easy to use, they are more likely to adopt and use it, and vice versa. However, the findings of a previous study indicated that the relationship of effort expectancy on consumers' adoption intentions of online pharmacies was not significant (El-Said and Al Tall, 2020). Therefore, the following hypothesis has been proposed for further observation:

Hypothesis 2 (H2): Effort expectancy has a significant relationship on the behavioral intention to adopt the online pharmacy in Oman.

3.3. Social influence and online pharmacy adoption

The social influence aspect of the UTAUT-2 model is the most prominent and divisive factor. It refers to the extent to which an individual believes that the opinions of social advocates (such as family and friends) regarding the importance of using technology are influential (Enaizan et al., 2020). People's awareness and intent towards technology can be significantly shaped by the information and encouragement they receive from those around them (Al Halbusi et al., 2024). Unlike the recommendation or word-of-mouth variable, which is a single instance of direct emphasis on the importance of using technology, social influence is a broader term that encompasses all types of external influences that impact a customer's perception. The concept of social influence was first introduced in and subsequent studies (El-Said and Al Tall, 2020). It is based on the idea that a person's ability to exert social influence depends on their control over others in terms of social norms, social identity, and social enjoyment, as outlined in the initial framework (Dahri et al., 2023). In the retail industry, social influence has been examined using the UTAUT-2 theory and the social influence theory to investigate whether price remains the dominant factor in influencing users' intentions towards new technology (Alalwan et al., 2017). In the tourism industry, while ticket prices and package prices are significant influencers in travel purchases, travelers' opinions have also become a major influencing factor (Dahri et al., 2023). Social theories and cognitive dissonance offer insights into consumer decision-making. The study explored the relationship of social factors on

pre- and post-decision dissonance in the context of traveler reviews and prices (Alalwan et al., 2017). The findings revealed that evaluations and post-decision dissonance strongly influence social impact, and the absence of price effects suggested that price may not always override decision-making. In conclusion, the study provided fresh insights into the impact of travel reviews on decision-making by examining social influence, the impact of price differences, and consumer involvement in dissonant decisions. Social influence was found to have a significant positive impact on consumers' intention to adopt online medicine (Tawafak et al., 2023). The article specifically highlighted the significant influence of recommendations from friends and relatives. This suggests that words of encouragement from close associates can influence consumers' adoption of online pharmacies. Based on this, the following hypothesis has been proposed for observation:

Hypothesis 3 (H3): Social influence has a significant relationship on behavioral intention to adopt online pharmacy in Oman.

3.4. Facilitating conditions and online pharmacy adoption

The existence of a business and its technical infrastructure to support an online system for service delivery or online pharmacy adoption is believed to be conducive to the adoption of the unified theory of acceptance and use of technology 2 (UTAUT-2) model (Venkatesh et al., 2016). The relationship of facilitating conditions on behavioral intentions may be influenced by the presence of performance and effort expectancy. Previous theories, such as the model of personal computer use (MPCU), innovation diffusion theory (IDT), and theory of planned behavior (TPB), have established that facilitating conditions directly determine behavioral intentions in technology adoption. This provides a foundation for further investigation into the underlying mechanisms contributing to the popularity of online pharmacies. However, conflicting conclusions have been presented in the literature, with some studies showing a stronger influence of facilitating conditions on behavioral intention for certain personality traits or contexts (Chen et al., 2021). For instance, research in Taiwanese corporations' upper management has shown that the prevalence of online stocking systems may influence behavioral intention, particularly for personality traits such as neuroticism, in conjunction with internet adoption or online experience. However, the moderating effect of facilitating conditions was a noteworthy finding. In contrast, studies conducted on American college students' views of course management systems using the UTAUT-2 model showed a direct causal relationship between facilitating conditions and behavioral intention. Correlation analysis between the variables in this study contradicts findings from other studies but supports claims made in other research (Srivastava and Raina, 2020). These differences in context, such as variations in online adoption and internet experience among different populations, may account for the discrepancy in results (Wedlock and Trahan, 2019).

Developed countries, unlike developing ones, may have less problematic facilitating conditions, such as infrastructure for online services, as indicated by previous research. Nonetheless, studies on Canadian college students' use of technology in classrooms and the adoption of interactive whiteboards by professors and students in an Australian university showed inconsistency in the results regarding

the connection between facilitating conditions and behavioral intention. Similarly, research conducted in Malaysia on online service adoption showed a significant impact of enabling conditions on behavioral intention, while a study in China on consumers' intent to use a virtual fitting room found no statistically significant correlation (Davis, 1989; Sütütemiz and Saygılı, 2020). On the other hand, a study on the adoption of e-learning in Jordan showed a significant correlation between various factors contributing to its success. It should be noted that China, Jordan, and Malaysia are considered developing nations with inadequate infrastructure compared to developed economies (de Oliveira, 2021). Based on these observations, it is hypothesized that facilitating conditions will have a significant relationship on the behavioral intention to adopt online pharmacy services in Oman (Hypothesis 4). Further research is needed to investigate the role of facilitating conditions in the context of Oman and online pharmacy adoption.

3.5. Hedonic motivation and online pharmacy adoption

The concept of "hedonic motivation" refers to the level of enthusiasm that consumers have towards a new technology system due to the fun and pleasure it brings (Wedlock and Trahan, 2019). This notion is similar to perceived enjoyment and playfulness, which were the focus of technology adoption when consumer information systems were initially designed to be task-oriented (International Telecommunication Union (ITU), 2021). Hedonic motivation has been found to be a significant predictor of intention towards technology adoption in previous studies (Sütütemiz and Saygılı, 2020). As information system creators realized that people use technology for both work and fun, the design process shifted to incorporate this aspect, and hedonic motivation was integrated as a new component into the well-established model for the diffusion of new technologies (Albertsen et al., 2020; Al Halbusi et al., 2024). Recently, as an integral part of the UTAUT-2 theory, researchers conducted a comprehensive literature review survey on hedonic motivation in the workplace (Venkatesh, et al., 2012). In the past, the extrinsic versus intrinsic motivation debate has dominated academic discussions. However, with the increasing use of technology by non-organizational individuals, a consumer-focused paradigm of science has emerged, leading to a more comprehensive and unified theory of technology adoption and use, such as UTAUT-2. The literature review aimed to re-establish a crucial dialogue between sellers and buyers, requiring a meta-analysis and comprehensive review of studies on UTAUT-2's hedonic motivation and affective structure (Alalwan et al., 2017). Out of the 79 empirical studies of UTAUT-2, only 46 (58%) successfully motivated participants to change their behavior, while the remaining 33 (42%) were unsuccessful. Extrinsic motivation was found to be the primary factor in both non-hedonic and insignificant hedonic motivation experiments involving computer use. Although UTAUT-2 associates moderators with hedonic motivation and their effects on consumers' intentions to use technology, this was not observed in this case. The results revealed a significant relationship between hedonic motivation and anticipatory initiative, providing valuable recommendations for future research and practice. Empirical evidence has also shown a strong connection between hedonic motivation and future IS use (Pesämaa et al., 2021; Sabbir et al., 2021). To account for both

intrinsic (fun, playfulness, entrainment, and enjoyment) and extrinsic (efficiency, usefulness, and performance) factors, UTAUT-2 incorporated this construct (Alalwan et al., 2017). In this investigation, we hypothesize that individuals would be more inclined to adopt and use an online pharmacy system if they perceived it as enjoyable. Therefore, the following hypothesis is proposed for investigation in Oman:

Hypothesis 5 (H5): Hedonic motivation has a significant relationship on the behavioral intention to adopt the online pharmacy in Oman.

3.6. Habit and online pharmacy adoption

The UTAUT-2 model, developed by Venkatesh, has gained momentum in recent years as it incorporates the idea that consumers' automatic behaviors outside of the task environment can influence their behavior (Venkatesh et al., 2012). Habit, defined as the extent to which learned behaviors become automatic for consumers, is one of these factors. While habit has been conceptualized separately from behavior in some models, it has been found to be a reliable predictor of future behavior in other contexts (Alismaiel et al., 2022; AlSideiri et al., 2022; Erjavec and Manfreda, 2022). In the context of mobile commerce, consumers often go through a routine sequence of actions, from identifying a need to consuming and evaluating a product, which could potentially lead to the development of a habit (Alismaiel et al., 2022). Based on this premise, the following hypothesis is proposed for observation:

Hypothesis 6 (H6): Habit has a significant relationship on the behavioral intention to adopt the online pharmacy in Oman.

3.7. Perceived risk and online pharmacy adoption

Perceived risk refers to the subjective feeling of uncertainty and harmfulness associated with using new technologies or services, and it is defined as the possibility of loss in the pursuit of a desired outcome of using an e-service (Nuryana et al., 2021). Perceived risk can be broken down into various component parts, with each part representing a different type of threat to an individual's sense of safety and security. Previous empirical studies have shown that perceived risk, particularly in terms of reputation and performance, significantly impacts behavioral intention (Erjavec and Manfreda, 2022). In the context of technology adoption, perceived risk has been studied in various fields, including e-payment and general financial dealings, but only a minority of online pharmacies utilize it (Yang and Wu, 2024). Empirical research has consistently shown that perceived risk is a significant predictor of behavioral intention, ranking as the second most influential factor. Studies have also demonstrated that perceived risk negatively influences behavioral intention in the adoption of information systems in general, including online pharmacy adoption (Ahmad et al., 2019; Xu et al., 2021). Additionally, the complexity of making transactions in a virtual environment, such as online pharmacies, can leave consumers feeling confused and increase their perceived risk of technology adoption (Baptista and Oliveira, 2015). Therefore, if users perceive buying medicine through an online pharmacy as highly risky, it is likely to negatively affect their intention to adopt the system, and vice versa. Based on these findings, the following hypothesis is proposed for observation:

Hypothesis 7 (H7): Perceived risk has a significant relationship on the behavioral intention to adopt the online pharmacy in Oman.

3.8. Technology trust and online pharmacy adoption

Trust in technology can be defined as "the acceptance of risk associated with an interpersonal relationship in which one party is dependent upon and potentially harmful consequences may flow from the actions of another" (Aydin and Ozer, 2022). Trust has been widely studied as a predictor of the spread of new technologies in various fields, such as mobile banking, e-learning, online information services, and online pharmacy, and has been included as an extension of the UTAUT-2 model (Aydin and Ozer, 2022; Karakose et al., 2022; Sütütemiz and Saygılı, 2020; Tawafak et al., 2023). Trust is particularly important in guiding user decisions due to concerns about safety and reliability in the use of the internet and new technologies, which are characterized by uncertainty, intangibility, heterogeneity, and vagueness (Karakose et al., 2022). Numerous literature reviews have demonstrated the positive impact of trust on consumers' adoption intentions of online pharmacies, with perceived reliability being influenced by assurances related to the online pharmaceutical e-commerce market, online pharmacies, and online medicine (Srivastava and Raina, 2020). Insufficient oversight in these areas could increase consumers' perceptions of risk. Therefore, incorporating trust as a construct in the UTAUT-2 model is a logical extension and is hypothesized to directly influence consumers' intentions to use online pharmacies. The findings of this study suggest that trust in the online system has a direct impact on consumers' behavioral intentions to use the system, and vice versa. Hence, the following hypothesis is proposed for observation:

Hypothesis 8 (H8): Technology trust has a significant relationship on the behavioral intention to adopt the online pharmacy in Oman.

3.9. Technology awareness and online pharmacy adoption

Experts in Oman specializing in technology awareness believe that potential users of online pharmacy adoption lack awareness of the system, which greatly impacts their behavioral intentions (Chen et al., 2021). It has been observed that higher levels of technology awareness led to greater diffusion of behavioral intention and online pharmacy adoption among online users, and vice versa (Onwezen et al., 2021). However, previous studies have yielded conflicting findings on the relationship between UTAUT-2 constructs, behavioral intention, and online service adoption (Alismaiel et al., 2022; Al Sideiri et al., 2021). Therefore, replicating the same study can help expand the literature and address these discrepancies (Popattia et al., 2018). Moreover, lack of awareness, especially in developing countries, has been identified as a major hindrance to the adoption of online pharmacies and other online services (Khan et al., 2018). For example, studies have suggested that the slow adoption of online services in merchandise in developing nations is due to a lack of technology awareness regarding the advantages of the system (Enaizan et al., 2020). Hence, technology awareness is considered a critical factor in facilitating the diffusion of online service adoption, including behavioral intention towards online pharmacy adoption (Kamal et al., 2020). The Economic Intelligence Unit (EIU) highlighted in

2006 that the introduction of e-commerce services is hindered by a lack of technology awareness on how to use the technologies, which limits behavioral intention (AlSideiri et al., 2022). Despite this, some studies have not empirically tested the beliefs related to technology awareness and its influence on the UTAUT-2 theoretical model constructs. However, it has been proposed that technology awareness significantly affects behavioral intention and online pharmacy adoption concurrently, suggesting a hypothetical relationship. Therefore, the following hypothesis is proposed for further investigation:

Hypothesis 9 (H9): Technology awareness has a significant relationship on the behavioral intention to adopt online pharmacy in Oman.

3.10. Behavioral intention and online pharmacy adoption

Studies on technology transfer behavior initially emerged in the fields of business, economics, and management. An example of technology transfer is when users continue to use one product while adopting another to fulfill different needs (AlSideiri et al., 2022). Previous research has mostly focused on how individuals adopt and utilize a single IT product, but recent studies have started to establish links between distribution routes and product acceptance. The technology acceptance model (TAM) was introduced by Fred Davis as an extension of the theory of reasoned action (TRA) (Alalwan et al., 2017). It has been found that an individual's behavioral intention (BI), or the level of effort they are willing to invest in a behavior, strongly predicts their actual behavior towards that activity. BI is determined by one's perspective on the behavior, which is commonly referred to as "attitude"—how s someone feels about a particular action or set of actions (Alalwan et al., 2017). Several studies have shown that attitude can also influence the perceived risk of BI. Based on these findings, the following hypothesis is proposed:

Hypothesis 10 (H10): Behavioral intention (BI) has a significant positive relationship on online pharmacy adoption (OPA).

3.11. Personal innovation and online pharmacy adoption

Younger individuals in the UK are more likely to exhibit innovativeness and be less affected by risk perceptions, as evidenced by the significant age gap in the adoption of communication technologies (Sütütemiz and Saygılı, 2020). Studies have shown that consumers' willingness to try new technologies is correlated with their level of innovative behavior (Sütütemiz and Saygılı, 2020). Innovativeness is often associated with traits such as being active, social, talkative, inquisitive, risk-taking, and having a constant need for mental challenge (Ezeudoka and Fan, 2024). The link between innovation and consumer adoption behavior has been supported by diffusion studies and other research. Innovation can be defined in various ways. For instance, an innovative firm may be defined as one that adopts innovation, or innovativeness may be measured in terms of the timing of adoption relative to other firms or the capacity and tendency of a firm to purchase new products and services (Ezeudoka and Fan, 2024). Some definitions also highlight the importance of welcoming and encouraging new ideas as part of daily operations (El-Said and Al Tall, 2020). Innovativeness can also be viewed in terms of enhancements to established products

and procedures (de Oliveira, 2021). In this study, personal inventiveness is defined as the propensity to experiment with any new information system (IS), which aligns with the study's objectives. Personal inventiveness has a positive impact on various types of e-commerce transactions, and creative thinkers are often characterized by being inquisitive, active, and sociable. Those who generate many creative ideas are usually eager to learn more. While not everyone may have prior experience with a new technological system, those who do should be adaptable and enthusiastic about using it. Based on the above, it can be inferred that individuals with a higher degree of innovativeness are likely to have a positive effect on their perceived ease of use (PEOU) of any new system, which in turn should lead to a stronger intention to use the system (AlSideiri et al., 2022). Therefore, the following hypotheses have been proposed for observation:

Hypothesis 11-a (H11-a): Personal innovation has a moderating role in the relationship between perceived risk and behavioral intention to adopt online pharmacy in Oman.

Hypothesis 11-b (H11-b): Personal innovation has a moderating role in the relationship between technology trust and behavioral intention to adopt online pharmacy in Oman.

Hypothesis 11-c (H11-c): Personal innovation has a moderating role in the relationship between technology awareness and behavioral intention to adopt online pharmacy in Oman.

3.12. Word-of-mouth and online pharmacy adoption

The significance of "word-of-mouth" recommendations, which can be amplified through interpersonal communication, has become crucial for consumers in forming their intentions. In the proposed model, one of the moderating constructs to be tested is the influence of word-of-mouth recommendations, which is intrinsic to the design of the model and will be used to investigate how the relationship between the independent variables, selected from the UTAUT-2 model, and the dependent variable of interest, online pharmacy adoption, can be strengthened. The impact of word-of-mouth recommendations on the adoption of online pharmacy will be assessed in this study, with a focus on behavioral intention as a viable independent variable and online pharmacy adoption as a viable dependent variable (Juhaidi et al., 2024). Word-of-mouth is a more restricted approach for expressing user satisfaction, but it is powerful and influential as it is a personal approach that can better define the intention to use online technology for health purposes, such as pharmacy (AlSideiri et al., 2022). However, to distinguish the word-of-mouth recommendation variable as a moderator, it is important to clearly show the impact of social influence, which is a common term used to describe all types of external influences that affect customers' perceptions of using technology for their purchasing needs in Oman. Therefore, the following hypothesis has been proposed for observation:

Hypothesis 12 (H12): Word of mouth has a moderating role in the relationship between behavioral intention and online pharmacy adoption in Oman.

4. Research methodology

In order to achieve the research objectives outlined in the research questions and hypotheses, a positivist quantitative survey methodology is considered appropriate. This section provides a detailed discussion on the development of instruments, data collection, and data analysis. The research design for this study is grounded in the positivist philosophical paradigm, relying on the collection and analysis of quantitative data. This approach was chosen for its cost-effectiveness and efficiency in conducting research. Additionally, a quantitative survey was deemed the most suitable method for addressing the research questions and testing the hypotheses, as it allows for direct comparison of independent and dependent variables. As stated by Kamal et al. (2020), the use of non-experimental correlation research designs with quantitative data is necessary for establishing causal relationships between variables. Given that this study is based on the theoretical foundation of continuance, it is crucial to employ a quantitative research approach that provides empirical evidence for the variables that influence continuance behaviors. The questionnaire used nominal, ordinal, and interval Likert scales in its development. The five-point Likert scale was chosen over a seven-point Likert scale to minimize respondent frustration and increase the quality of responses (Alalwan et al., 2017). This decision was made since a five-point scale is easier to administer, construct, and establish, thereby increasing the overall reliability of the study (Albertsen et al., 2020). The primary data for this research was collected through structured questionnaires that were randomly distributed to users in different areas. A criterion for selecting respondents was set, which required them to be familiar with using mobile apps.

Table 1. List of constructs and measurement items.

Constructs	Items (67)
Perceived Expectancy (PE)	5
Effort Expectancy (EE)	5
Social Influence (SI)	5
Facilitating Conditions (FC)	5
Hedonic Motivation (HM)	5
Habit (HB)	5
Perceived Risk (PR)	5
Technology Trust (TR)	5
Technology Awareness (TA)	5
Behavioral Intention (BI)	5
Personal Innovation (PI)	5
Word-of-Mouth (WOM)	5
Online Pharmacy Adoption (OPA)	7

The sample size for the study was determined based on a table provided by Krejcie and Morgan's (1970), which suggests that a sample size of 384 is suitable for any large population in order to achieve confidence and precision in descriptive studies. For the study, 384 samples have been determined based on Krejcie and

Morgan's (1970) table to generalize the study findings to more than 100,000 populations. Data for this study was collected between November 2021 and March 2022. The analysis of the data was conducted using Smart-PLS 2.0, and a common method bias test was performed to check for the presence of common method variance. The results of the measurement models, including the uni-dimensionality, reliability, and validity of the constructs, were assessed through confirmatory factor analysis (CFA). The measurement items for the principal constructs were based on existing instruments, and a summary of the latent constructs and their respective measurement items can be found in **Table 1**.

To analyze the data, descriptive statistics were used to examine the information collected from both the first and second sections of the questionnaire. The survey was distributed through online and offline channels to increase participant reach. An invitation email was sent to 50 individuals affiliated with the institution, resulting in 34 completed and submitted questionnaires. Unit non-response was minimized by sending follow-up reminders to participants who did not complete the survey within the initial timeframe. The final response rate was 86%. In contrast, only four out of the 12 paper-based surveys that were handed out face-to-face were completed and returned, resulting in a response rate of 33.3%. These findings suggest that the online approach is more efficient and less time-consuming compared to the face-to-face approach. Following academic conventions, a pilot study sample size of 20–40 is considered reasonable, and thus, the reliability of our pilot study's data was based on the responses of 38 completed questionnaires. In this study, the partial least squares (PLS) technique was applied to analyze the causal relationships between constructs using Smart-PLS 2.0, given the exploratory nature of the research. The two-step approach, as suggested by Albertsen et al. (2020), Dahri et al. (2023), was utilized in data analysis. The first step involved the analysis of the measurement model to establish the reliability and validity of the measures, while the second step tested the structural relationships among the latent constructs to assess the overall model.

Informed consent was obtained from all participants prior to data collection. Participants were provided detailed information about the study's purpose, procedures, and rights. The data collected has not been previously used or published. The survey data is available for replication upon request by contacting the corresponding author. The study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Board at University of Tenaga National, Malaysia, and all procedures involving human participants were carried out with the highest ethical standards.

The partial least squares (PLS) technique as a part of structural equation modeling (SEM) was applied to analyze the casual relationships between constructs using the software application Smart-PLS 2.0. The PLS approach was selected due to the exploratory nature of the research. The first step involves the analysis of the measurement model, while the second step tests the structural relationships among the latent constructs. The two-step approach aims at establishing the reliability and validity of the measures before assessing the structural relationship of the model. In SEM analyses, construct validity is assessed by two main components: convergence validity and discriminant validity. Convergent validity refers to the similarity in degree of variance between the items, which are the indicators of a specific construct. The

convergent validity could be measured by considering the size of factor loading (standardized regression weights), average variance extracted (AVE), and construct reliability (CR) among sets of items in the construct. The factor loading estimates with values of 0.5 or greater and an extracted average variance of 0.5 or higher show adequate convergence among the items in the construct. The average variance extracted can be calculated by dividing the sum squared of the standardized factor loading by the factor loading number. The construct reliability (CR) should be 0.6 or higher to show adequate internal consistency. The CR is computed from the square sum of factor loading and the sum of error variance terms for a construct. CR can be calculated using the following formula:

The measurement items that represent each variable should also be verified through internal reliability analysis. Reliability is the degree to which a measure is error-free. To ensure that the items produce a reliable scale, Cronbach's alpha coefficient of internal consistency should be examined. The higher value of Cronbach's alpha refers to higher reliability, with a range from 0 to 1. Nunnally and Bernstein suggest that for a reliable scale, Cronbach's alpha should not be lower than 0.7. Discriminant validity refers to the issue of how truly distinct a construct is from other constructs. Discriminant validity can be assessed by comparing the square root of the AVE for two constructs and their correlations. Evidence of discriminant validity is when the correlation between the two constructs is smaller than the square root of the AVE for each construct. Further, correlations between the factors should not exceed 0.85. To confirm the accuracy of the structural model, the value of *R*-squared (R^2), which represents the portion of the variance in the dependent variable explained by its predictors, should be above 0.10, as recommended. For hypothesis testing purposes, parameter estimates, and coefficient values were examined through bootstrapping with 1000 replications. Parameter estimates are used to generate the estimated population covariance matrix for the model. Coefficients' values are derived by dividing the variance estimate by its standard error (S.E.). When the critical value (C.R.) or *z*-value is greater than 1.96 for a regression weight (standardized estimates), the parameter is statistically significant at the 0.05 level.

5. Results and analysis

5.1. Demographic characteristics

The characteristics that were examined in this study included gender, age, work experience, and level of education. Descriptive analysis was conducted using SPSS version 23 to provide an overview of the respondents' profiles. **Table 2** presents the frequencies and percentages of gender and educational level as the demographic variables.

With 61.6% (n = 145) coming from males and 38.4% (n = 88) from females. This means that the sample for this study is predominantly male. Respondents were also asked to provide information about their ages, with 0.3% stating they are below 20 years old, 15.6% falling in the age range of 21 to 30 years old, 36.8% in the range of 31 to 40 years old, 38.9% in the range of 41 to 50 years old, and 8.5% above 51 years old. When it comes to the experience of the respondents, 13% reported having less than 5 years of experience, 16.9% had 6–10 years of experience, 28.8% had 11–15

years of experience, 15.6% had 16–20 years of experience, 19.3% had 21–25 years of experience, 6.1% had 26–30 years of experience, and only 0.3% had more than 31 years of experience. In terms of educational qualification, 6.1% of the respondents had a high school degree, 15.1% had a 2-year diploma, 60.8% had a bachelor's degree, 15.9% had a master's degree, and 2.1% had a Ph.D.

Table 2. Sample profile, frequency analysis.

Group	Percentage
Gender	
Male	61.6
Female	38.4
Age	
under 20 years	0.7
21–30 years	15.6
31–40 years	36.8
41–50 years	46.9
Experience	
Under five years	13.1
6–10 years	16.9
11–15 years	28.8
16–20 years	15.6
21–30 years	25.3
31 years and above	0.3
Education	
High School	6.1
2 Years Diploma	15.1
Bachelor Degree	60.8
Master Degree	15.9
PhD	2.1

5.2. Common method bias (Harman's single-factor test)

Common method bias introduces bias in the dataset due to external factors that impact the responses given by participants. In this study, data was collected using a single method, specifically a manual questionnaire survey, which may introduce systematic response bias that could affect or deflate responses. To assess the potential impact of common method bias, Harman's single-factor test was employed in this study. This test is used to examine whether common method variance is a significant concern, especially in studies where data is collected using a one-wave self-reported design where all variables are measured at the same time point. The findings of Harman's single-factor test revealed that the one-factor model explained only 14.911% of the total variance, suggesting that common method variance was not a significant issue in this study.

5.3. Measurement model assessment

The measurement model defines how latent variables are operationalized in terms of the observed variables, ensuring accuracy in the research process. In this study, the CFA models were used to assess the reliability and validity of each construct. Reliability was evaluated using measures such as Cronbach's alpha, construct reliability (CR), and average variance extracted (AVE), while validity was assessed through convergent and discriminant validity. The uni-dimensionality of each construct was tested using Smart-PLS 2.0 in the overall measurement model, and the results are presented in this study.

5.4. Validity and reliability analysis

As observed in **Table 3**, the initial standardized factor loading of OPA7 was below the recommended cut-off of 0.6, with a value of 0.274. Consequently, these items were removed from the model, in line with the recommendations of (Popattia et al., 2018). The standardized factor loadings of the remaining items ranged from 0.750 to 0.947, all exceeding the recommended cut-off. Additionally, the average variance extracted (AVE) values, reflecting the proportion of variance accounted for by the latent constructs, ranged from 0.635 to 0.881, surpassing the recommended threshold of 0.6. Composite reliability (CR) values, indicating the internal consistency of the constructs, ranged from 0.904 to 0.974, well above the 0.6 threshold. Cronbach's alpha values, assessing internal consistency, ranged from 0.868 to 0.966, meeting the recommended threshold of 0.7 (Pesämaa et al., 2021). The inter-correlations among the constructs were between 0.057 and 0.577, all below the recommended threshold of 0.85 (Yang and Wu, 2024). Moreover, the correlations were lower than the square root of the AVE for each construct, indicating good discriminant validity (Al-Kfairy et al., 2024).

Table 3. Results of Cronbach alpha and convergent validity for overall CFA model.

Construct	Item	Factor Loading	Average Variance Extracted (AVE) a	Composite Reliability (CR) b	Internal Reliability Cronbach Alpha
Perceived Expectancy (PE)	PE1	0.869	0.743	0.935	0.914
	PE2	0.853			
	PE3	0.875			
	PE4	0.847			
	PE5	0.866			
Effort Expectancy (EE)	EE1	0.847	0.693	0.919	0.890
	EE2	0.812			
	EE3	0.817			
	EE4	0.844			
	EE5	0.843			

Table 3. (*Continued*).

Construct	Item	Factor Loading	Average Variance Extracted (AVE) a	Composite Reliability (CR) b	Internal Reliability Cronbach Alpha
Social Influence (SI)	SI1	0.827	0.709	0.924	0.898
	SI2	0.853			
	SI3	0.849			
	SI4	0.846			
	SI5	0.834			
Facilitating Conditions (FC)	FC1	0.837	0.715	0.926	0.901
	FC2	0.856			
	FC3	0.853			
	FC4	0.827			
	FC5	0.855			
Hedonic Motivation (HM)	HM1	0.841	0.662	0.907	0.873
	HM2	0.760			
	HM3	0.821			
	HM4	0.834			
	HM5	0.809			
Habit (HB)	HB1	0.822	0.654	0.904	0.868
	HB2	0.790			
	HB3	0.793			
	HB4	0.824			
	HB5	0.815			
Perceived Risk (PR)	PR1	0.828	0.712	0.925	0.899
	PR2	0.836			
	PR3	0.873			
	PR4	0.821			
	PR5	0.861			
Technology Trust (TR)	TR1	0.790	0.749	00.937	0.916
	TR2	0.878			
	TR3	0.883			
	TR4	0.891			
	TR5	0.881			
Technology Awareness (TA)	TA1	0.823	0.727	0.930	0.906
	TA2	0.882			
	TA3	0.874			
	TA4	0.867			
	TA5	0.816			

Table 3. (*Continued*).

Construct	Item	Factor Loading	Average Variance Extracted (AVE) a	Composite Reliability (CR) b	Internal Reliability Cronbach Alpha
Behavioural Intention (BI)	BI1	0.881	0.728	0.930	0.906
	BI2	0.871			
	BI3	0.893			
	BI4	0.830			
	BI5	0.788			
Personal Innovation (PI)	PI1	0.937	0.881	0.974	0.966
	PI2	0.946			
	PI3	0.947			
	PI4	0.947			
	PI5	0.916			
Word-of-Mouth (WOM)	WOM1	0.871	0.790	0.949	0.934
	WOM2	0.886			
	WOM3	0.876			
	WOM4	0.894			
	WOM5	0.914			
Online Pharmacy Adoption (OPA)	OPA1	0.750	0.635	0.912	0.885
	OPA2	0.799			
	OPA3	0.774			
	OPA4	0.817			
	OPA5	0.803			
	OPA6	0.834			
	OPA7	0.274			

5.5. Discriminant validity

In addition to these tests, we conducted further validity and reliability checks to ensure the robustness of the measurement model. The Heterotrait-Monotrait (HTMT) ratio was used to assess discriminant validity, with all HTMT values being below the recommended threshold of 0.85, confirming that constructs are distinct from each other. Collinearity checks were performed by examining the variance inflation factor (VIF) for each predictor variable, ensuring that VIF values were below the recommended threshold of 5.0, indicating no severe multi-collinearity issues. Based on the comprehensive examination of goodness of fit, convergent validity, discriminant validity, HTMT ratios, and collinearity checks, the modified measurement scale used for assessing the constructs and their items was confirmed to be both reliable and valid (**Table 4**).

Table 4. Discriminant validity of modified overall CFA model.

	BI	EE	FC	HB	HM	OPA	PE	PI	PR	SI	TA	TR	WOM
BI	0.939												
EE	367	0.920											
FC	0.390	0.325	0.915										
HB	0.364	0.368	0.404	0.907									
HM	0.373	0.233	0.370	0.251	0.917								
OPA	0.452	0.385	0.335	0.320	0.396	0.866							
PE	0.364	0.206	0.252	0.221	0.253	0.260	0.932						
PI	0.285	0.005	0.103	0.075	0.067	0.085	0.153	0.968					
PR	0.577	0.236	0.290	0.217	0.199	0.263	0.236	0.363	0.910				
SI	0.294	0.352	0.419	0.296	0.234	0.336	0.205	0.086	0.201	0.909			
TA	0.530	0.216	0.175	0.149	0.238	0.250	0.184	0.339	0.383	0.217	0.907		
TR	0.519	0.157	0.155	0.202	0.209	0.222	0.170	0.274	0.393	0.220	0.461	0.889	
WOM	−0.010	0.086	−0.053	−0.020	0.068	0.353	0.027	−0.047	−0.057	0.057	0.013	0.020	0.933

The following section discusses the results of the path analysis of the causal effect hypotheses:

Table 5. Examining results of hypothesized path analysis of the causal effect hypotheses.

Path Shape	Path Coefficient	Standard Error	*T*-value	*P*-value	Hypothesis Result
PE → BI	0.106	0.032	3.339	0.001	H1) Supported
EE → BI	0.090	0.036	2.496	0.013	H2) Supported
SI → BI	0.000	0.036	0.003	0.998	H3) Not Supported
FC → BI	0.083	0.038	2.192	0.029	H4) Supported
HM → BI	0.116	0.039	2.992	0.003	H5) Supported
HB → BI	0.093	0.038	2.463	0.014	H6) Supported
PR → BI	0.333	0.046	7.295	0.000	H7) Supported
TR → BI	0.179	0.035	5.077	0.000	H8) Supported
TA → BI	0.239	0.044	5.484	0.000	H9) Supported
BI → OPA	0.456	0.041	11.222	0.000	H10) Supported
(PI*PR) → BI	0.152	0.064	2.376	0.018	H11-a) Supported
(PI*TR) → BI	−0.246	0.049	5.027	0.000	H11-b) Supported
(PI*TA) → BI	0.101	0.062	1.622	0.106	H11-c) Not Supported
(PI*BI) → OPA	0.165	0.049	3.375	0.001	H12) Supported

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

The mean was used as a measure of central tendency, revealing that the mean values of all constructs were above the midpoint level of 3, indicating that the respondents' consensus perception towards these constructs was above average. Among the constructs, behavioral intention (BI) had the highest mean rating of 3.738, followed by technology awareness (TA) with a mean value of 3.677. On the other hand, social influence (SI) had the lowest mean rating of 3.229. To assess the degree

of variability among individuals within each variable, the standard deviation was used as a dispersion index. Personal innovation (PI) showed the highest individual deviation from its mean (SD = 1.124), indicating reasonably high variability in respondents' perceptions of this variable. In other words, participants' perceptions of personal innovation (PI) varied greatly from each other. On the contrary, technology awareness (TA) had the lowest deviation from the mean, with a standard deviation of 0.602.

5.6. Structural model assessment

The second step in SEM analysis involves constructing the structural equation model, which represents the interrelationships between constructs after confirming the measurement model. In this study, a structural model was estimated using the PLS technique and bootstrapping with 1000 replications to test the research hypotheses. The subsequent sections discuss the development of structural models to examine the research hypotheses. The structural model for testing the causal and moderation effects of the hypothesized variables is summarized in **Figure 3**.

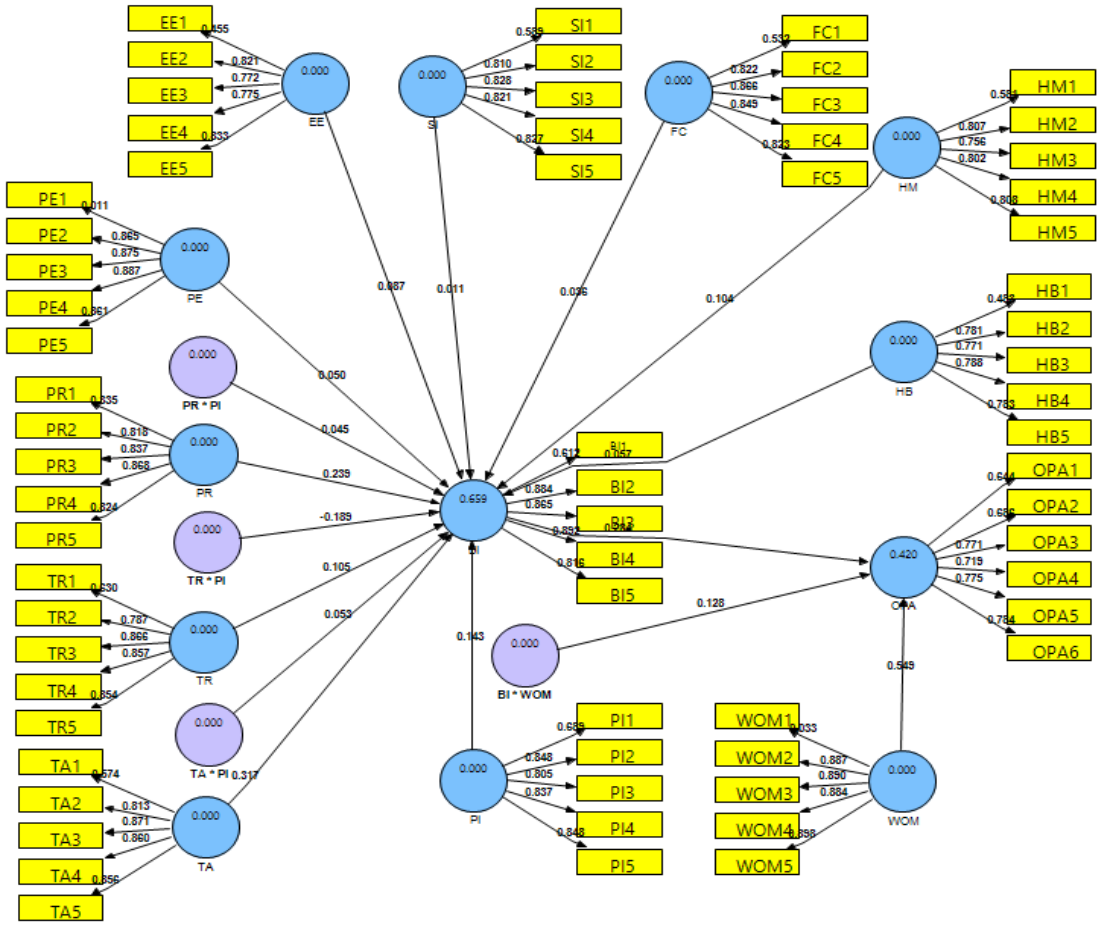

Figure 3. Results of structural model that examine the effects of causal and moderation hypotheses.

The R^2 values for behavioral intention (BI) and online pharmacy adoption (OPA) were 0.659 and 0.420, respectively. This means that approximately 58.7 percent of the variation in behavioral intention (BI) can be explained by its nine predictors. These R^2 values meet the recommended cutoff value of 0.10, as suggested by Pesämaa et al. (2021), indicating a satisfactory model fit. The Q2 values for behavioral intention (BI)

and online pharmacy adoption (OPA) were 0.415 and 0.095, respectively, both of which were significantly greater than zero, indicating the high predictive relevance of the model as suggested by Chin (2010). In conclusion, the model demonstrates acceptable fit and strong predictive relevance.

6. Discussion

The following section discusses the results of the path analysis of the causal effect hypotheses:

H1) Perceived expectancy (PE) significantly and positively affects behavioral intention (BI). Based on the results shown in **Table 5**, the *t*-value and *p*-value of perceived expectancy (PE) in predicting behavioral intention (BI) were 3.339 and 0.001, respectively. This indicates that the regression weight for perceived expectancy (PE) in the prediction of behavioral intention (BI) is significantly different from zero at the 0.01 level, supporting H1. The path coefficient was 0.106, indicating a positive relationship. This means that when perceived expectancy (PE) increases by 1 standard deviation, behavioral intention (BI) increases by 0.106 standard deviations.

H2) Effort expectancy (EE) significantly and positively affects behavioral intention (BI). As per the results shown in **Table 5**, the regression weight for effort expectancy (EE) in predicting behavioral intention (BI) is significantly different from zero at the 0.05 level, supporting H2. The path coefficient was 0.090, indicating a positive relationship. This means that when effort expectancy (EE) increases by 1 standard deviation, behavioral intention (BI) increases by 0.090 standard deviations.

H3) Social influence (SI) does not have a significant effect on behavioral intention (BI). The results indicate that there is no significant causal relationship between social influence (SI) and behavioral intention (BI), as the path coefficient is 0.000, the *t*-value is 0.00, and the *p*-value is greater than 0.5. Therefore, H3 is rejected.

H4) Facilitating conditions (FC) significantly and positively affect behavioral intention (BI). As shown in **Table 5**, the regression weight for facilitating conditions (FC) in the prediction of behavioral intention (BI) is significantly different from zero at the 0.05 level, supporting H4. The path coefficient was 0.083, indicating a positive relationship. This means that when facilitating conditions (FC) increase by 1 standard deviation, behavioral intention (BI) increases by 0.083 standard deviations.

H5) Hedonic motivation (HM) significantly and positively affects behavioral intention (BI). Based on the results shown in **Table 5**, the regression weight for hedonic motivation (HM) in the prediction of behavioral intention (BI) is significantly different from zero at the 0.01 level, supporting H5. The path coefficient was 0.116, indicating a positive relationship. This means that when hedonic motivation (HM) increases by 1 standard deviation, behavioral intention (BI) increases by 0.116 standard deviations.

H6) Habit (HB) significantly predicts behavioral intention (BI) with a positive effect. Based on the results in **Table 5**, the regression weight for habit (HB) in predicting behavioral intention (BI) is statistically significant at the 0.05 level. Therefore, H6 is supported. The path coefficient is 0.093, indicating a positive relationship. This means that when habit (HB) increases by 1 standard deviation, behavioral intention (BI) also increases by 0.093 standard deviations.

H7) Perceived risk (PR) significantly predicts behavioral intention (BI) with a positive effect. As shown in **Table 5**, the regression weight for perceived risk (PR) in predicting behavioral intention (BI) is statistically significant at the 0.001 level. Therefore, H7 is supported. The path coefficient is 0.333, indicating a positive relationship. This means that when perceived risk (PR) increases by 1 standard deviation, behavioral intention (BI) also increases by 0.333 standard deviations.

H8) Technology trust (TR) significantly predicts behavioral intention (BI) with a positive effect. According to the results in **Table 5**, the regression weight for technology trust (TR) in predicting behavioral intention (BI) is statistically significant at the 0.001 level. Therefore, H8 is supported. The path coefficient is 0.179, indicating a positive relationship. This means that when technology trust (TR) increases by 1 standard deviation, behavioral intention (BI) also increases by 0.179 standard deviations.

H9) Technology awareness (TA) significantly predicts behavioral intention (BI) with a positive effect. Based on the results in **Table 5**, the regression weight for technology awareness (TA) in predicting behavioral intention (BI) is statistically significant at the 0.001 level. Therefore, H9 is supported. The path coefficient is 0.239, indicating a positive relationship. This means that when technology awareness (TA) increases by 1 standard deviation, behavioral intention (BI) also increases by 0.239 standard deviations.

H10) Behavioral intention (BI) significantly predicts online pharmacy adoption (OPA) with a positive effect as shown in **Table 5**, the regression weight for behavioral intention (BI) in predicting online pharmacy adoption (OPA) is statistically significant at the 0.001 level. Therefore, H10 is supported. The path coefficient is 0.456, indicating a positive relationship. This means that when behavioral intention (BI) increases by 1 standard deviation, online pharmacy adoption (OPA) also increases by 0.456 standard deviations.

Examining moderation effect hypotheses

To investigate the presence of a moderation effect by a third variable on the relationship between the independent variable (IV) and dependent variable (DV), it is necessary to assess whether the nature of this relationship changes as the values of the moderating variable change. This can be achieved by including an interaction effect in the model and examining its significance. To facilitate interpretation and avoid multicollinearity issues, all predictors should be standardized or centered. This involves subtracting the mean of the measured variable from its respective value and dividing the result by the standard deviation of that measured variable. The product of the centered indicator can then be calculated and used as an indicator of the latent interaction term. To determine the significance of the moderator effect, the effect of the interaction term on the DVs should be examined. If a significant moderating effect is present, a technique proposed by Alalwan et al. (2017) can be applied to generate plots for visualizing the effect of the moderator on the relationship between the predictor and outcome variable. Following the suggestions of Pesämaa et al. (2021), 4-cell means are needed for graphing the interaction between the variables. This involves dichotomizing both the independent variables (low and high) and the

moderating variable (low and high) and crossing these levels to obtain 4-cell means. "Low" is defined as one standard deviation below the mean, and "high" is one standard deviation above the mean. The results of the path analysis for the moderation effect hypotheses are discussed below:

H11-a) Personal innovation (PI) significantly moderates the relationship between perceived risk (PR) and behavioral intention (BI). As shown in **Table 5**, the effect of personal innovation (PI) interaction with perceived risk (PR) on behavioral intention (BI) was statistically significant at the 0.05 level, with a coefficient path of 0.152, a *T*-value of 2.376, and a *p*-value of 0.018. This indicates that personal innovation (PI) moderates the relationship between perceived risk (PR) and behavioral intention (BI). Therefore, hypothesis H11-a) was supported. **Figure 4** illustrates the graph of the moderating effect of personal innovation (PI) on the relationship between perceived risk (PR) as an independent variable and behavioral intention (BI) as a dependent variable.

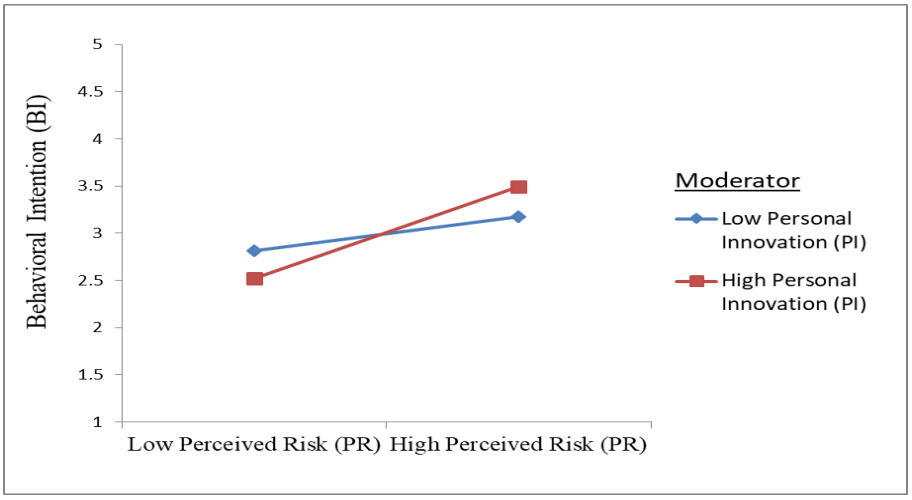

Figure 4. Moderation effect of personal innovation (PI) on the relationship between perceived risk (PR) and behavioral intention (BI).

The standard deviation values for the constructs in this study were notably low, indicating that respondents' perceptions were closely aligned with the mean values. For example, technology awareness (TA) had a standard deviation of 0.602, and personal innovation (PI) exhibited a higher standard deviation of 1.124, reflecting variability in responses. A low standard deviation suggests that respondents' answers were relatively consistent, which may indicate that the constructs measured, such as technology awareness, are uniformly experienced or well understood among the sample. However, this low variability could also point to a homogeneous sample or limitations in the measurement tools used.

To address these concerns, we reviewed the survey instruments and data collection processes to ensure clarity and minimize bias. The questions were designed to capture a range of responses accurately, and efforts were made to achieve a representative sample. Despite the low standard deviation, which reflects high consistency among respondents, it is crucial to interpret the results with this uniformity in mind. Future research might consider using a more diverse sample or refined

measurement tools to explore a broader range of perceptions and enhance the sensitivity of the findings.

As depicted in **Figure 4**, the relationship between perceived risk (PR) and behavioral intention (BI) was positive, with the lines showing a non-parallel pattern, indicating the presence of moderation. The steeper line for the high level of personal innovation (PI) compared to the low level suggests that personal innovation (PI) acts as a positive moderator, strengthening the positive relationship between perceived risks (PR) and behavioral intention (BI). In other words, with an increase in the level of personal innovation (PI) as a moderator, the effect of perceived risk (PR) as an independent variable on behavioral intention (BI) as a dependent variable will increase. Furthermore, in support of hypothesis H11-b, as shown in **Table 5**, the effect of personal innovation (PI) interaction with technology trust (TR) on behavioral intention (BI) was statistically significant at the 0.05 level, with a coefficient path of −0.246, a *T*-value of 5.027, and a *p*-value of 0.000. This indicates that personal innovation (PI) moderates the relationship between technology trust (TR) and behavioral intention (BI). The moderating effect of personal innovation (PI) on the relationship between technology trust (TR) as an independent variable and behavioral intention (BI) as a dependent variable is illustrated in **Figure 5**.

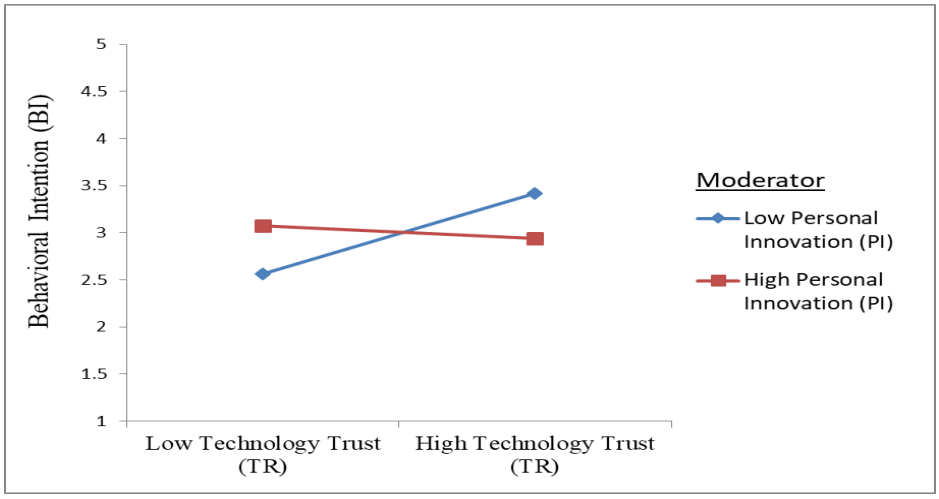

Figure 5. Moderation effect of personal innovation (PI) on the relationship between technology trust (TR) and behavioral intention (BI).

As depicted in **Figure 5**, the relationship between technology trust (TR) and behavioral intention (BI) was found to be positive for a low level of personal innovation (PI) but negative for a high level of personal innovation (PI). This suggests that personal innovation (PI) acts as a negative moderator, dampening the positive relationship between technology trust (TR) and behavioral intention (BI). In other words, with an increase in the level of personal innovation (PI) as a moderator, the effect of perceived risk (PR) as an independent variable on behavioral intention (BI) as a dependent variable will decrease. According to **Table 5**, the interaction effect of personal innovation (PI) with technology awareness (TA) on behavioral intention (BI) was not statistically significant, with a coefficient path of 0.101, a *T*-value of 1.622, and a *p*-value > 0.05. This indicates that personal innovation (PI) does not moderate the relationship between technology awareness (TA) and behavioral intention (BI). As

a result, hypothesis H11-c was rejected. On the other hand, as shown in **Table 5**, the interaction effect of word-of-mouth (WOM) with behavioral intention (BI) on online pharmacy adoption (OPA) was statistically significant at the 0.01 level, with a coefficient path of 0.165, a *T*-value of 3.375, and a *p*-value of 0.001. This suggests that word-of-mouth (WOM) does moderate the relationship between behavioral intention (BI) and online pharmacy adoption (OPA). Therefore, hypothesis H12 was supported. **Figure 6** illustrates the graph of the moderating effect of word-of-mouth (WOM) on the relationship between behavioral intention (BI) as an independent variable and online pharmacy adoption (OPA) as a dependent variable.

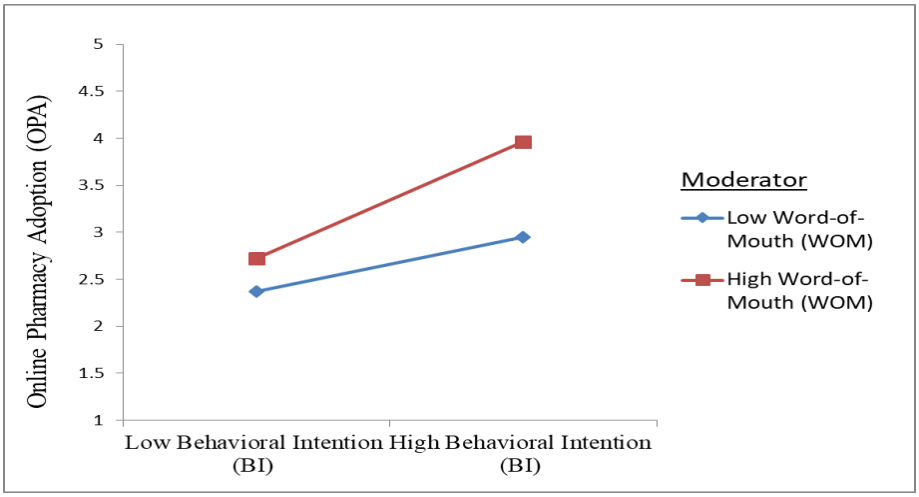

Figure 6. Moderation effect of word-of-mouth (WOM) on the relationship between behavioral intention (BI) and online pharmacy adoption (OPA).

As depicted in **Figure 6**, the two lines representing behavioral intention (BI) and online pharmacy adoption (OPA) show a positive relationship. However, the lines are not parallel, indicating the presence of moderation. Specifically, the line is steeper, indicating a stronger relationship for a high level of word-of-mouth (WOM) compared to a low level. This suggests that word-of-mouth (WOM) positively moderates (strengthens) the positive relationship between behavioral intention (BI) and online pharmacy adoption (OPA). In other words, with an increase in the level of word-of-mouth (WOM) as a moderator, the effect of behavioral intention (BI) as an independent variable on online pharmacy adoption (OPA) as a dependent variable will also increase. The research model, as shown in **Figure 7**, illustrates this relationship.

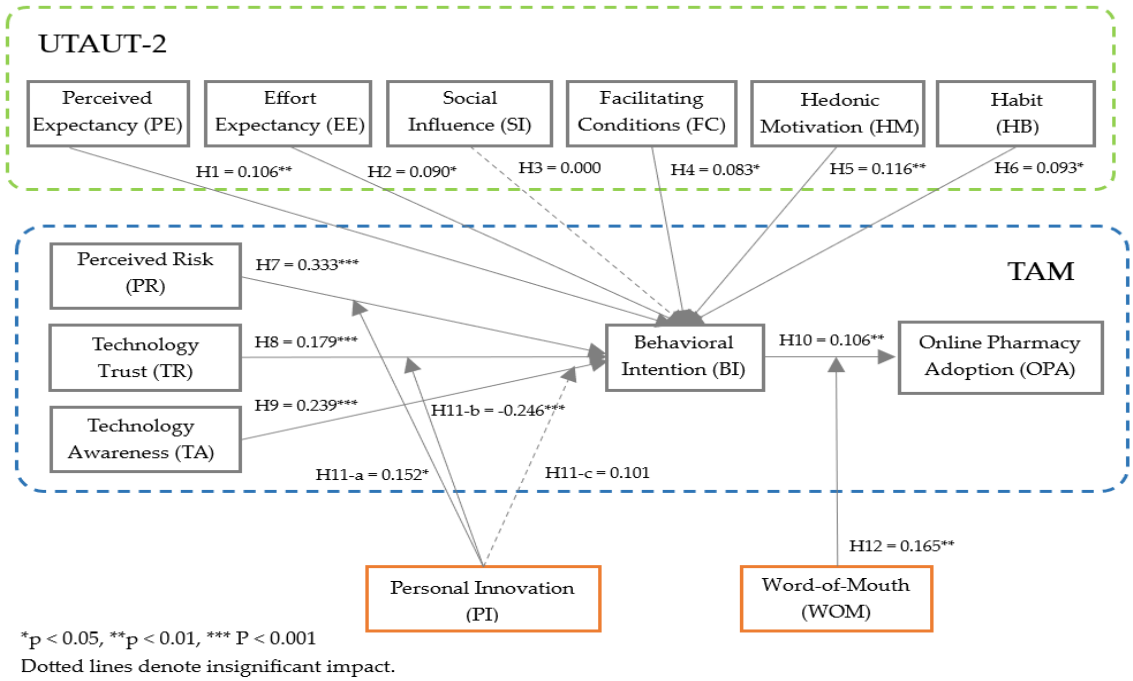

Figure 7. Research model.

The primary objective of this research is to investigate the factors that influence the adoption of online pharmacies in Oman, as stated in the introduction chapter. The research question (RQ 1) aims to identify these factors based on the proposed conceptual model, which was tested and validated using the SEM technique. Nine hypotheses were formulated to examine the causal effect of behavioral intention on online pharmacy adoption, and eight of them were supported, while one was rejected. The significant variables that positively affect behavioral intention include perceived expectancy (PE), effort expectancy (EE), facilitating conditions (FC), hedonic motivation (HM), habit (HB), perceived risk (PR), technology trust (TR), and technology awareness (TA). Additionally, the hypothesis regarding the effect of behavioral intention on the adoption of online pharmacy in Oman was also found to be significantly positive. The results highlight the importance of perceived and effort expectancy in influencing consumers' behavioral intention to adopt online pharmacy, indicating that consumers already have a strong belief and intention to use online pharmacy to satisfy their unique needs. This finding is consistent with previous studies (Boon-Liat et al., 2023; Elvira et al., 2020; Yulist et al., 2024). Therefore, perception and effort expectancy are crucial factors that influence consumers' behavioral intentions to use internet technology for pharmacy procurement in Oman.

In addition, the facilitating condition was also significantly positive. The facilitating condition determines the use and acceptance of online pharmacies in Oman. Moreover, both technology trust and perceived hazards are linked to the facilitating condition construct. It, therefore, means that when required, external assistance boosts an individual's morale, their belief grows, and their acceptability increases. The hedonic motivation, which expresses the level of enjoyment of the consumers, was also positively significant. It means that customers' contentment and willingness to use an online pharmacy increase when they find it convenient and easy to use, and they contemplate how it might help them improve their health. The result

is consistent with the study of (Boon-Liat et al., 2023; Yulist et al., 2024). Another significant factor that influences the predictive validity of consumer behavior in this study is habit, which has a positive and significant effect on behavioral intention, consistent with the findings of (Li et al.,2023). Additionally, perceived risk (PR), technology trust (TR), and technology awareness (TA) are important determinants of behavioral intention to use online pharmacies in Oman, and managing these variables properly can increase the acceptance rate of online education (Ciftci et al., 2021; He, 2024). To ensure the successful adoption of online pharmacies in Oman, it is crucial to consider factors such as perceived expectancy (PE), effort expectancy (EE), facilitating conditions (FC), hedonic motivation (HM), habit (HB), perceived risk (PR), technology trust (TR), and technology awareness (TA). As for the research question on how personal innovation and word of mouth affect the adoption of online pharmacy, the model was constructed based on rationalizing the role of each explanatory variable in influencing consumers' intentions to adopt online education and actually use it (Gharaibeh et al., 2023; Limbu et al., 2024). One innovative aspect of this research is the combination of UTUAT-2 and TAM theories, which allows for the introduction of two distinct moderating variables, personal innovation and word-of-mouth, into the adoption model for online pharmacies in Oman, as depicted in **Figure 7**.

This study provides valuable insights into the adoption of online pharmacies in Oman, with several significant practical implications for stakeholders in both the public and corporate sectors. The findings underscore the necessity of addressing crucial factors such as the security of online payment channels, the establishment of trust in digital environments, and the comprehension of international trade laws. Decision-makers should prioritize enhancing the security of online transactions to build consumer confidence and foster growth in the e-commerce sector. Additionally, educating the public about the benefits of e-commerce and online pharmacies can drive adoption and improve market penetration.

The study also highlights the need for strategic investments to overcome challenges unique to Oman, such as the lack of postal addresses and uneven internet infrastructure. Investing in information technology, expanding infrastructure, and attracting skilled professionals are essential for developing a robust e-commerce ecosystem. The research suggests that while Oman's traditional retail sector is well-established, leveraging government support and strategic investments in e-commerce can further stimulate growth. Future research could explore the direct impacts of these factors on e-commerce adoption in Oman to refine strategies and policies aimed at enhancing online pharmacy use.

Theoretically, this research advances the understanding of technology adoption in the context of online pharmacies by integrating the UTAUT-2 and TAM frameworks. By combining these models, the study offers a comprehensive theoretical framework that captures both technological and social aspects influencing adoption behavior. This integrated approach provides a nuanced understanding of the determinants of online pharmacy adoption, incorporating variables such as perceived expectancy, effort expectancy, facilitating conditions, hedonic motivation, habit, perceived risk, technology trust, and technology awareness.

The research contributes to the theoretical discourse by confirming that personal innovation plays a significant moderating role in the relationship between perceived risk and behavioral intention. Specifically, personal innovation positively influences this relationship and negatively moderates the association between technology trust and behavioral intention. This finding suggests that individuals who are more innovative are likely to have a stronger behavioral intention to adopt online pharmacies, even in the presence of perceived risks. The study's theoretical contribution lies in its ability to integrate and apply these models to a novel context, thus enhancing the predictive potential and understanding of online pharmacy adoption.

7. Conclusion

The recent study greatly enhances the knowledge of technology acceptance in the Arab world and Oman through an analysis of the rise of online pharmacies. These platforms offer a range of benefits, such as increased accessibility, reduced transaction costs, flexibility, and improved privacy for users, potentially transforming the sector in Oman. This study has implications both in theory and practice in countries like Oman, where online pharmacy usage is still at an early stage. A key result of this research is the creation of a framework for predicting online pharmacy adoption in Oman. By combining UTUAT 2 and TAM frameworks, this model considers social factors to provide an understanding of adoption patterns. It explores elements like perceived expectancy, effort expectancy, and technology trust to evaluate their influence on adopting pharmacies. Furthermore, this study delves into the roles played by personal innovation and word of mouth as moderating factors between intention and actual adoption of pharmacies. According to the results of investigating moderation hypotheses, personal innovation (PI) positively moderates the link between perceived risk (PR) and behavioral intention (BI). In addition, word-of-mouth (WOM), which is another moderating variable, was also found to positively modify the association between behavioral intention (BI) and online pharmacy adoption (OPA). The analysis primarily examined the role and impact of word-of-mouth (WOM) recommendations. The results of our study have confirmed our hypothesis that WOM plays a crucial role in influencing the relationship between behavioral intention and the adoption of online pharmacies. This highlights the significant impact of WOM communication, supporting the claims made by researchers in the literature that a consumer's willingness to recommend a firm can accurately predict their level of involvement in WOM communication. Therefore, WOM becomes a significant factor that firms should carefully examine, considering its ability to influence consumer behavior. This study offers valuable insights into the factors that affect the uptake of online pharmacies. The findings, particularly concerning the crucial moderating role of word-of-mouth (WOM), might provide practical guidance to organizations aiming to enhance their online presence.

This study adds to the existing body of literature as one of the studies on the adoption of online pharmacies in Oman. Moreover, this research holds importance in assessing how awareness influences consumer decisions to use pharmacy services globally, especially in overcoming the challenge of low awareness among Omani

citizens. It offers insights for authorities and healthcare professionals on how to maximize the advantages of pharmacy adoption while minimizing associated risks. Suggestions include enhancing health literacy, increasing consumer awareness, and seizing opportunities in the realm of medicine. The study underscores the importance of energy impact, personal innovation, and word of mouth as factors influencing pharmacy adoption. Therefore, it is proposed that providers of pharmacies concentrate on delivering a user experience, fostering individual creativity among users, and encouraging favorable word of mouth to boost adoption rates and overall success. Furthermore, highlighting energy impact in marketing efforts, offering convenient services, and cultivating customer experiences are crucial for online pharmacies to gain a competitive edge in the market.

The limitation of this research is that it is only focused on in-person word-of-mouth communication, disregarding the influence of word-of-mouth (e-WOM) on the acceptance of online pharmacies. By incorporating an analysis of e-WOM alongside face-to-face interactions, a comprehensive view of the relationship of word of mouth on online pharmacy adoption could be achieved, leading to an understanding of consumer behavior in the digital age. Additionally, although the study addresses factors that affect pharmacy adoption, it might not consider other important variables like socioeconomic status, cultural values, and past experiences with online pharmacies. Future investigations could explore these aspects further to enhance the research findings and gain insights into consumer behavior. Engaging in interviews or focus groups could uncover perspectives on these factors, thereby contributing to a nuanced comprehension of online pharmacy adoption in Oman.

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