

**Customer's Adoption, Acceptance and Usage of E-Pharmacy  
in National Capital Region, India**

Thesis Submitted for the Award of the Degree of

**DOCTOR OF PHILOSOPHY**

**in**

**Management**

**By**

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### **DECLARATION**

I, Kushal Pal Singh, declare that the proposed work in the thesis entitled “Customer’s Adoption, Acceptance and Usage of E-Pharmacy in National Capital Region, India” in fulfilment of degree of Doctor of Philosophy (Ph. D.) carried out by me under the supervision of Prof. (Dr.) Pawan Kumar, Professor, Mittal School of Business, Lovely Professional University, Punjab, India, is my original work and has not been submitted, in part or full, elsewhere for the award of any degree. This work follows the general practice of reporting the scientific observations and all sources have been duly acknowledged for their contributions.

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### **CERTIFICATE**

I certify that the work reported in the Ph. D. thesis entitled “Customer’s Adoption, Acceptance and Usage of E-Pharmacy in National Capital Region, India” submitted in fulfillment of the requirements for the award of degree of Doctor of Philosophy (Ph.D.) in the department of Marketing, Mittal School of Business, Lovely Professional University, Punjab, India, is a research work carried out by Mr. Kushal Pal Singh, with registration number 41900498, is authentic record of his original work carried out under my supervision and that no part of thesis has been submitted for award of any other degree elsewhere.

Mr. Kushal Pal Singh has carried out the work with complete and utmost dedication at the Mittal School of Business, Lovely Professional University.

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## **ABSTRACT**

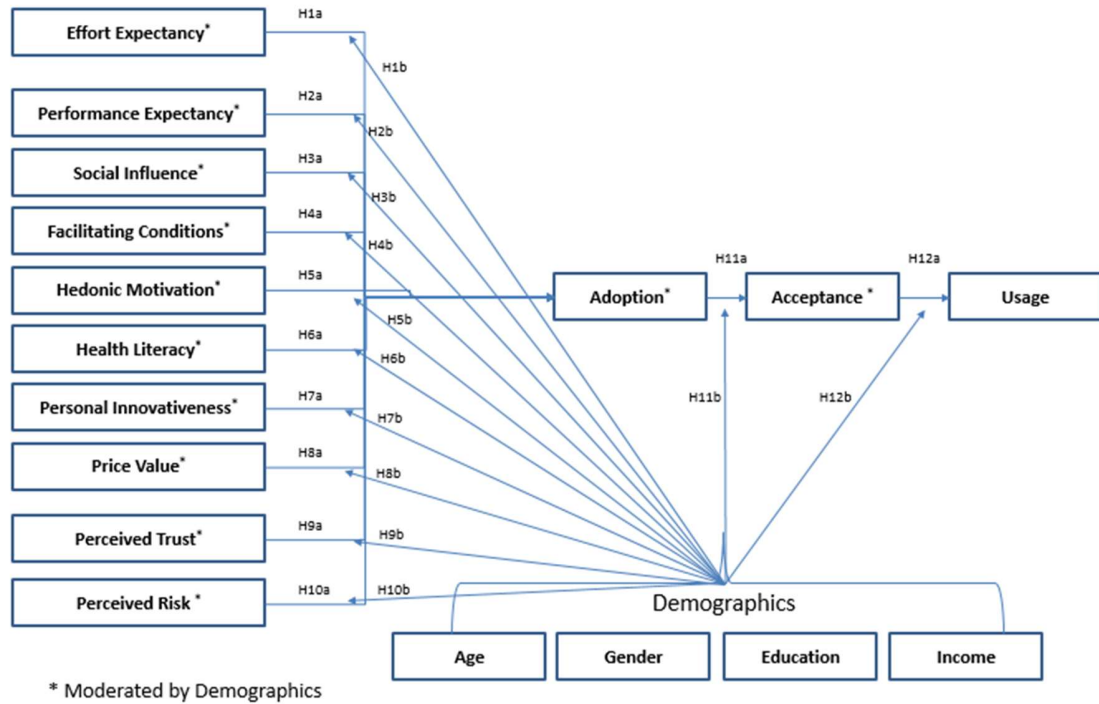
**Introduction-** Developing countries like India are undergoing large-scale digital health transformation to address the issue of health access through various government initiatives and market push. The rapid expansion of digital health services has positioned e-pharmacy platforms as a critical alternative to traditional medicine access. Despite increasing adoption of e-commerce, sustained engagement with e-pharmacy platforms remains inconsistent. This highlighting gaps between initial adoption, psychological acceptance, and continued usage. Existing technology-adoption models often stop at initial adoption intention and fails to capture the deeper behavioral transition from initial adoption to sustained usage. Hence, this study introduces and empirically validates a comprehensive Adoption–Acceptance–Usage behavioral continuum while integrating digital health-specific determinants such as health literacy, trust, risk, and personal innovativeness, offering a more complete understanding of e-pharmacy usage behavior.

**Purpose-** The primary aim of this thesis was to examine the psychological, technological and contextual determinants influencing customers’ adoption of e-pharmacy and progression from initial adoption to acceptance and sustained usage of e-pharmacy, to order medicines, in the National Capital Region of India. The study sought to address gaps in technology adoption research by integrating traditional adoption constructs with emerging online-health behavioral factors such as health literacy, trust, risk, and personal innovativeness and by assessing demographic differences in user responses.

### **Research Objective-**

- To explore the factors affecting e-pharmacy Adoption, Acceptance and Usage.
- To analyze the effect of predictor factors influencing e-pharmacy Adoption, Acceptance and Usage.
- To examine the moderating effect of demographics on relationship between predicting factors and e-pharmacy Adoption, Acceptance and Usage.
- To propose an empirical model of e-pharmacy adoption for National Capital Region’s end users.

## Propose Conceptual Model-



## Research Hypothesis-

H1: Effort Expectancy (EE) has a significant influence on the adoption (Ad) of e-pharmacies in the National Capital Region.

H1b: The relationship between Effort Expectancy (EE) and adoption (Ad) of the e-pharmacy is moderated by demographics (DEM) i.e. Age, Gender, Education and Income.

H2: Performance expectancy (PE) significantly enhances the likelihood of e-pharmacy adoption (Ad) among users in the National Capital Region.

H2b: The relationship between Performance expectancy (PE) and adoption (Ad) of the e-pharmacy is moderated by demographics (DEM) i.e. Age, Gender, Education and Income.

H3: Social Influence (SI) significantly supports the adoption (Ad) of e-pharmacies in the National Capital Region.

H3b: The relationship between Social Influence (SI) and adoption (Ad) of the e-pharmacy is moderated by demographics (DEM) i.e. Age, Gender, Education and Income.

H4: Facilitating Conditions (FC) significantly impacts the adoption (Ad) of e-pharmacies in the National Capital Region.

H4b: The relationship between Facilitating Conditions (FC) and adoption (Ad) of the e-pharmacy is moderated by demographics (DEM) i.e. Age, Gender, Education and Income.

H5: Hedonic motivation (HM) significantly influence the Adoption (Ad) of e-pharmacies in the National Capital Region.

H5b: The relationship between Hedonic motivation (HM) and adoption (Ad) of the e-pharmacy is moderated by demographics (DEM) i.e. Age, Gender, Education and Income.

H6: Health Literacy (HL) has a significant impact on the adoption (Ad) of e-pharmacies in the National Capital Region.

H6b: The relationship between Health Literacy (HL) and adoption (Ad) of the e-pharmacy is moderated by demographics (DEM) i.e. Age, Gender, Education and Income.

H7: Personal Innovativeness (PI) significantly influence the adoption (Ad) of e-pharmacies in the National Capital Region.

H7b: The relationship between Personal Innovativeness (PI) and adoption (Ad) of the e-pharmacy is moderated by demographics (DEM) i.e. Age, Gender, Education and Income.

H8: Price Value (PV) has a significant impact on the adoption (Ad) of e-pharmacies in the National Capital Region.

H8b: The relationship between Price Value (PV) and adoption (Ad) of the e-pharmacy is moderated by demographics (DEM) i.e. Age, Gender, Education and Income.

H9: Perceived Trust (PT) significantly influences the adoption (Ad) of e-pharmacies in the National Capital Region.

H9b: The relationship between Perceived Trust (PT) and adoption (Ad) of the e-pharmacy is moderated by demographics (DEM) i.e. Age, Gender, Education and Income.

H10: Perceived Risk (PR) has a significant influence on the adoption (Ad) of e-pharmacies in the National Capital Region.

H10b: The relationship between Perceived Risk (PR) and adoption (Ad) of the e-pharmacy is moderated by demographics (DEM) i.e. Age, Gender, Education and Income.

H11: Adoption (Ad) of e-pharmacies creates acceptance (ACC) of e-pharmacies.

H11b: The relationship between adoption (Ad) and acceptance of the e-pharmacy is moderated by demographics (DEM) i.e. Age, Gender, Education and Income.

H12: Acceptance (ACC) of e-pharmacies increases their usage (USE).

H12b: The relationship between acceptance (ACC) and usage (USE) of the e-pharmacy is moderated by demographics (DEM) i.e. Age, Gender, Education and Income.

**Scope of the Study-** This study focused on customers' intent to adopt, accept and use e-pharmacy in National Capital Region (NCR), India. The scope of this study was NCR in the northern part of India. The study sample was narrowed to the users of e-pharmacy, to order medicines, residing in NCR and data were collected from the sample using online survey instrument.

#### **Design/Methodology/Approach-**

To investigate the relationship between effect of predictor factors influencing e-pharmacy adoption, and subsequent acceptance and usage and the moderating effect of demographics on relationship between predicting factors and e-pharmacy Adoption, e-pharmacy Adoption → e-pharmacy Acceptance and e-pharmacy Acceptance → e-pharmacy Usage, this study employed a quantitative, cross-sectional online survey. Questionnaire specifically designed to capture various aspects of e-pharmacy adoption, acceptance and usage was distributed to the e-pharmacy users in NCR, India. The questionnaire was

disseminated digitally through email and various social media channels. A convenience sampling technique and non-probabilistic method was chosen for difficulty in precisely estimating the target population size. The study conducted with 443 respondents, which is considered sufficient to draw generalizability of the conclusions of the study. The research design of the study was descriptive in nature.

Measurement items were adapted from validated scales and assessed for reliability and validity using Cronbach's alpha, composite reliability, AVE, and HTMT. Preliminary analyses were carried out using Statistical Package for Social Sciences (SPSS) version 20. The conceptual model was tested using Partial Least Squares Structural Equation Modelling (PLS-SEM) via SmartPLS 4, allowing examination of moderation, complex relationships, and reflective-reflecatve constructs. Multi-Group Analysis (PLS-MGA) evaluated demographic moderation, while MICOM assessed measurement invariance. PLS-Predict established out-of-sample predictive power, and Importance-Performance Map Analysis (IPMA) identified high-priority improvement areas across adoption, acceptance, and usage.

### **Findings:**

- Measurement model assessment results verified the validity and reliability of the constructs (outer loading > 0.600, composite reliability 0.70-0.95) following the established guidelines.
- Every single construct, in the model demonstrates strong discriminant validity as HTMT values are well below the recommended thresholds of 0.85 or 0.9 and liberally suggested threshold of 0.95.
- Study addressed potential multicollinearity concerns as variance inflation factor values between 1.000 and 4.037 fall within the recommended threshold limits, safeguarding the integrity of the analysis.
- Standardized root mean square residual (SRMR) value = 0.085, within the critical threshold range of <0.08-0.1 (Kock, 2020) shows a good fit model.

- Study explored a significant positive correlation between the predictor variable and the adoption of e-pharmacy services, revealing an  $R^2$  value of 77.8%. This indicates that the model accounts for 77.8% of the variance in consumers' adoption of e-pharmacy services, encompassing factors such as Effort Expectancy, Performance Expectancy, Social Influence, Facilitating Conditions, Hedonic Motivation, Health Literacy, Price Value, Perceived Trust, Perceived Risk, and Personal. The acceptance construct has an R-square of 0.565, signifying that 56.5% of the variability in acceptance is attributed to consumers' previous adoption behavior. This level of explanation is moderate to high, suggesting that consumers who have adopted an e-pharmacy platform are inclined to form a favorable perception of continued use. The Usage (USE) construct reflects actual engagement with e-pharmacy platforms, with an R-square of 0.524. This implies that 52.4% of the variation in customer usage behavior is influenced by their acceptance level. This explanation highlights a crucial insight: acceptance acts as a link between the intention and the actual ongoing engagement with the system.
- Findings revealed that Effort Expectancy (EE), Performance Expectancy (PE), Social Influence (SI), Facilitating Conditions (FC), Health Literacy (HL), Personal Innovativeness (PI), Price Value (PV), and Perceived Trust (PT) significantly influenced Adoption (AD) (H1a, H2a, H3a, H4a, H6a, H7a, H8a, H9a) while Perceived Risk (PR) (H10a) was not significant. Adoption positively impacted Acceptance (H11a), which further drove Usage (H12a), highlighting the intervening role of Acceptance. Interestingly, Hedonic Motivation (HM) (H5a) did not significantly affect Adoption, indicating that functional and trust-based drivers outweighed hedonic ones in this context.
- High effect size for Adoption  $\rightarrow$  Acceptance ( $f^2 = 1.297$ ) and Acceptance  $\rightarrow$  Usage ( $f^2 = 1.107$ ) establish the behavioral outcome and continuum adoption to acceptance to usage of e-pharmacy.
- The prediction relevancy of the conceptual model has been evaluated and the results show that the model has a high predictive relevance for dependent variable

adoption and acceptance and low predictive relevance for usage indicate overall model has moderate to high out of sample predictive relevance.

- Four demographic variables (age, gender, income, and education) have been used to assess the moderating effect of these demographic variables on all the relationship e-pharmacy adoption, acceptance and usage. The results of the analysis show that these moderators strengthen the positive relationship except Education which fails MICOM, between construct of e-pharmacy adoption, acceptance, and usage but statistically results are insignificant except for relationship between price value and adoption moderate by gender. However, individual group analysis showed the significant and valuable findings.
- IPMA analysis identified strategic and managerial priorities. Among all constructs, Acceptance (ACC) (importance = 0.724; performance = 55.698) and Adoption (AD) (importance = 0.544; performance = 61.982) emerge as the most critical determinants of the outcome variable i.e. Usage (USE).

**Research Limitations/Future Direction-** This research contributes significantly to the existing knowledge on the integration of digital technologies like e- pharmacy in healthcare, yet it clearly highlights numerous avenues for further exploration. While this study gives valuable insights into how customers in NCR, India adopt, accept and use e-pharmacy, the data collection limited to this region restricts how broadly these findings can be applied nationwide or beyond. To gain a more comprehensive understanding of nuances of e-pharmacy adoption, acceptance and usage of e-pharmacy, future research should incorporate data from a sample that captures a wider geographical range within India. Further, this study captures data at a single point in time i.e. cross sectional. While this design effectively identifies the relationships between constructs such as adoption, acceptance, and usage, it does not allow for examination of behavioral change over time. Therefore, future research employing longitudinal design could provide deeper insights into how users shift happen across the adoption–acceptance–usage over time. Moreover, while this study, grounded in a detailed literature review, encompasses technological, social, behavioral, and cognitive factors and enhances the analysis by including online

health behavior-related constructs such as health literacy, trust, and innovativeness in relation to e-pharmacy adoption, acceptance, and usage, there remains the possibility of excluding other influential factors. Future researchers should consider broadening the conceptual framework to include additional psychological, ethical, and contextual factors that impact e-pharmacy adoption. Incorporating other relevant frameworks could provide enhanced insights for professionals and academics aiming to promote sustainable e-pharmacy usage in India and beyond.

**Implications of the Study-** The implications of the study were multi-fold: theoretically, it enriched technology adoption literature by extending it to online healthcare such as e-pharmacy by integrating various additional factors. Socially, it offered guidance for policymakers to enhance trust, affordability, health literacy, and regulatory support. For e-pharmacy managers, the evidence highlights the need of integrating various factors (trust, health literacy, and affordability) and demographic sensitivities contributing to a more accessible, informed, and customer centric e-pharmacy ecosystem.

**Originality/Value-** The novelty of the research lay in its integrated model that combined consumer, behavioral, and technological dimensions, offering a holistic framework for understanding e-pharmacy adoption, acceptance and usage in developing markets. The model has evaluated moderation effects and this comprehensive analysis is especially beneficial for India's rapidly expanding e-pharmacy industry. Policymakers have a distinct chance to utilize these insights. By developing specific strategies based on this research, they can greatly enhance the customer experience and trust in this growing area.

**Keywords-** e-pharmacy, e-pharmacy Adoption, e-pharmacy Acceptance, e-pharmacy Usage, Digital Healthcare, Customer Behavior, UTAUT-2, Health Literacy, Perceived Trust, Innovativeness, PLS-SEM, India

## **PREFACE**

Completing this thesis is an endeavor, marked by both challenges and moments of great satisfaction. As I look back on this journey, I am deeply grateful for the support of many individuals who were instrumental in bringing this thesis to completion but above all, I thank the Almighty for providing me with the strength, and perseverance accomplish this work. Firstly, I would like to express my humble gratitude to my research advisor, Dr. Pawan Kumar (Professor, Mittal School of Business, Lovely Professional University) for his invaluable guidance, patience, and encouragement throughout this process. His insights, expertise and excellence in subject matter were instrumental in shaping the direction of my research and refining my approach.

I would also like to express my heartfelt gratitude to Dr. Rajesh Verma (Professor and Head of School at Mittal School of Business), Dr. Pretty Bhalla (Professor, Mittal School of Business) for their valuable guidance during my end term presentations. I sincerely appreciate all support rendered to me by Dr. Harish Saini and encouragement provide by fellow research colleagues Harman, and Nandan (Research Scholar at Mittal School of Business, Lovely Professional University) and friends like Anil Punia. Additionally, I thank the experts who supported in validating my questionnaire and, importantly, all the participants who generously gave their time during the data collection phase.

At the completion of this research work, I owe my deepest and sincere gratitude to my wife Dr. Priya (PT), my mother Smt. Rajkumari, for being pillars of strength for me and my daughter Vaishnavi Singh for always showing rays of hope. I humbly dedicate this work to entire research fraternity.

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## **Chapter-1**

### **Introduction**

E-pharmacy is an online technology that facilitate the delivery of medicines, and health wellness products to customers at their convenience. Recent surge in e-commerce, accessibility to internet and other facilitators like COVID pandemic, government initiatives like Ayushman Bharat Digital Mission (ABDM) etc. It has helped in uptake of the e-pharmacy platforms. Customers prefer e-pharmacies to meet their health need for its convenience, home delivery of medicines, price advantage, availability of medicines etc. While e-pharmacy offers numerous benefits, it also comes with certain risks like counterfeit & spurious medicines, illegal e-pharmacies, self-medication, and no defined government rules & regulations governing e-pharmacies in India. Irrespective of e-pharmacy advantages and disadvantages, in today's Indian society, it provides an important alternative to traditional medicine access, and influences the people's decision to meet their health need.

#### **1.1 Background of the Study**

The healthcare industry has witnessed a dramatic transformation in recent years, especially with the advent of digital technologies that have revolutionized traditional service delivery models (Gopal et al., 2019; Haleem et al., 2023). Among these innovations, the rise of e-pharmacies has become a significant phenomenon. It offers customers the convenience of purchasing medicines and healthcare products online. E-pharmacy platforms are designed to enhance accessibility, make transactions easy & convenient, and provide doorstep delivery, making them especially relevant in urban regions where time constraints and lifestyle demand necessitate quicker and more efficient service models.

India has become a hub for online health ventures due to its increasing number of internet users and mobile phone access (Khandelwal, Kolte & Rossi, 2024). E-pharmacies helped customers shift from physical pharmacies and gained popularity with the start of the COVID-19 pandemic. Lockdowns and social distancing restrictions facilitated the use of online medical services as people sought safer, contactless means to fulfill their medical

needs (Imlach et al., 2021). This shift provided a driving force for behavioral changes during the pandemic and showcased the usefulness of digital platforms not only for convenience but also for safety and continuity in care.

Though e-pharmacy services are gaining interest, adoption is largely inconsistent. Some consumers easily transition to online healthcare platforms while others are more reluctant due to mistrust, unfamiliarity, lack of proper technology, or fear of fraudulent goods (Chatterjee & Kulkarni, 2021). This highlights the need of understanding the numerous factors that influence consumer perceptions and behaviors towards these platforms.

For this online transformation, it is also crucial to examine the structures that influence the adoption, acceptance and actual use of e-pharmacy services. Various technology adoption models evaluate the determinants of adoption and acceptance; however, the Unified Theory of Acceptance and Use of Technology'-2 (UTAUT2) provides a robust framework for behavior analysis, along with its extended versions (Dwivedi et al., 2019). Primary constructs, such as Effort Expectancy (EE) and Performance Expectancy (PE), evaluate the usability of the system and its ability to satisfy customer needs. A customer is more likely to adopt a service when performing an online medicine ordering process is perceived to be effortless, saves time, and produces the correct outcome (Chakraborty et al., 2023; Tandon, Kiran, & Sah, 2016). However, other social aspects also play a significant role in the adoption and acceptance of new technology. Social Influence (SI) refers to the impact of recommendations and endorsements on the decision to adopt a new service (Challa et al., 2018). Facilitating Conditions (FC) refer to the support of a technical or environmental nature, such as the possession of smartphones, internet availability, and accessible staff, which enable proper interfacing with the system (Serodio et al., 2023). These are some of the primary factors that contribute to consumers' willingness and capability to use e-pharmacy services.

Going beyond the social and technical aspects, psychological and behavioral components explain the intricacies of consumer preferences. Hedonic Motivation (HM) captures the enjoyment and satisfaction users derive from engaging with an interactive and visually appealing application. It's noted that experience with the system or platform translates into loyalty to the platform. Health Literacy (HL) is another extremely important factor; it

impacts how confidently users can articulate and comprehend health instructions, dosages, and side effects (Munsour, Mahmoud & Hussain, 2025). Generally, people with a higher level of health literacy tend to have more trust and reliance on online platforms concerning their healthcare needs.

Embracing novel technologies is captured under Personal Innovativeness (PI), which plays a focal role in early adoption. People with an inquisitive nature and readiness to explore new approaches are more likely to use e-pharmacy services (Fan & Ukaegbu, 2024). At the same time, Price Value (PV) in relation to economics directly impacts adoption in a price-sensitive environment. Consumers tend to appreciate the value of the service in its convenience vis-à-vis the costs incurred to use the service, including delivery charges or subscription fees (Sun et al., 2024).

One of the primary hurdles in the healthcare technology domain, like e-pharmacy, is Perceived Trust (PT), which covers trust in the system, such as platform credibility, authenticity of medicines, secure payment gateways, and data privacy (Adjekum, Blasimme & Vayena, 2018). Perceived Trust is often counterbalanced by Perceived Risk, which involves psychological behavior towards the possibility of receiving counterfeit drugs, misdiagnosed medical conditions, or misuse of personal health information. The two fundamentally opposing constructs have substantial impacts on shaping the consumers' comfort level and decision to adopt e-pharmacy. A mix of these dimensions creates a complete picture of an individual's preparedness for the e-pharmacy model and the motivational factors behind its continuous use. In combination, these dimensions set the course for Adoption (Ad), Acceptance (ACC), and Usage (USE). Adoption describes the initial intent to try the service, while acceptance denotes psychological trust in the system and its integration into the individual's daily routine. Usage indicates the frequency and consistency of the use (Mou, Shin & Cohen, 2017; Hu et al., 2019).

With the given context, there is limited scholarly attention given to exploring the phenomenon of e-pharmacy adoption in the Indian context, despite the country experiencing rapidly growing urbanization and digital proliferation. Current studies tend to oversimplify the problem with little consideration towards the diverse technology approaches, socio-economic factors, and health literacy knowledge levels in varying urban

centers (Omweri, 2024; Li & Guo, 2021). This shows a notable gap in the understanding from the academic and industry perspectives.

At the same time, as the national and regional players in e-pharmacies increase, it is essential to explore what maintains customer usage and satisfaction towards these e-pharmacy platforms. Better policy and business models can be developed with deeper insight analysis on behavioral intentions, comfort with technology, perception of risk, and level of interest engagement strategies (Shiau & Chau, 2016). This is also important in the context of Indian digital health initiatives, like Ayushman Bharat Digital Mission (ABDM), which aims “to develop the backbone necessary to support the integrated digital health infrastructure of the country”, that are advanced alongside the national healthcare objectives, alongside ensuring that progress in technologies results in universal, equitable access to medicines.

This study hopes to fill these gaps by conducting an in-depth analysis of the factors that determine consumer behavior towards e-pharmacy platforms. This analysis broadens the scope of the study beyond the single construct approach and contributes towards online technology strategy, platform design, consumer education, and ultimately, adaptability and robustness of e-pharmacies in the healthcare system.

## **1.2 E-Pharmacy- An Overview**

### **1.2.1 Emergence of E-Pharmacy**

The online platforms for ordering and delivering prescription and non-prescription medicines are referred to as e-pharmacy, and they have emerged as an important healthcare channel in India. The e-pharmacy sector is gaining a strong foothold due to the increased use of the internet and smartphones, digital payment systems, and home delivery mechanisms (Srivastava & Raina, 2021). With the onset of the COVID-19 pandemic, e-pharmacies became essential for providing effortless and safe access to medicines, further accelerating the digitalization of healthcare services (Assin et al., 2024). In comparison to traditional models, online ordering has evolved toward catalog-based systems that integrate teleconsultation, thus expanding the focus from mere medicine distribution to comprehensive healthcare solutions. Both consumers and suppliers have benefited; buyers

now enjoy greater convenience and reduced costs, while sellers experience improved inventory management and access to wider markets (Anis & Hassali, 2022; Almohammed et al., 2023).

As depicted in Figure 1.1, the trend of online medicine in India demonstrates a consistent increase in user engagement from 2012 to 2018, rising from 12% to nearly 60%. This growth trajectory reflects the expanding acceptance of e-pharmacy platforms and the digital transformation of healthcare. The marked increase observed between 2014 and 2016 coincides with the emergence of major e-pharmacy start-ups such as 1mg, PharmEasy, and Myra, which popularized online medicine delivery and normalized digital health behavior. The brief decline around 2017, followed by a rebound in 2018, captures the industry's transitional phase, during which concerns about regulatory clarity, prescription compliance, and consumer trust surfaced before stabilizing. This cyclical pattern visually substantiates the narrative that e-pharmacies are progressing from an early adoption phase toward a more mature, trusted, and integrated healthcare service model.

The use of e-pharmacy is particularly growing in the National Capital Region (NCR) due to higher levels of digital literacy, urban concentration, and robust transport and delivery systems. The region's diverse demographic mix, ranging from young professionals to elderly patients with chronic conditions, further amplifies the need for accessible and efficient medicine delivery systems. However, despite the visible upward trend in user engagement, the industry continues to confront challenges related to adherence to prescriptions, regulation, fraudulent practices, and trust deficits (Khan & Eab-Aggrey, 2025). Within this framework, the adoption, acceptance, and usage of e-pharmacy platforms are influenced by performance expectancy, effort expectancy, social influence, perceived trust and risk, facilitating conditions, and socio-demographic factors such as age, gender, education, and income (Dash & Sahoo, 2023, Sabbir, Islam & Das, 2021).

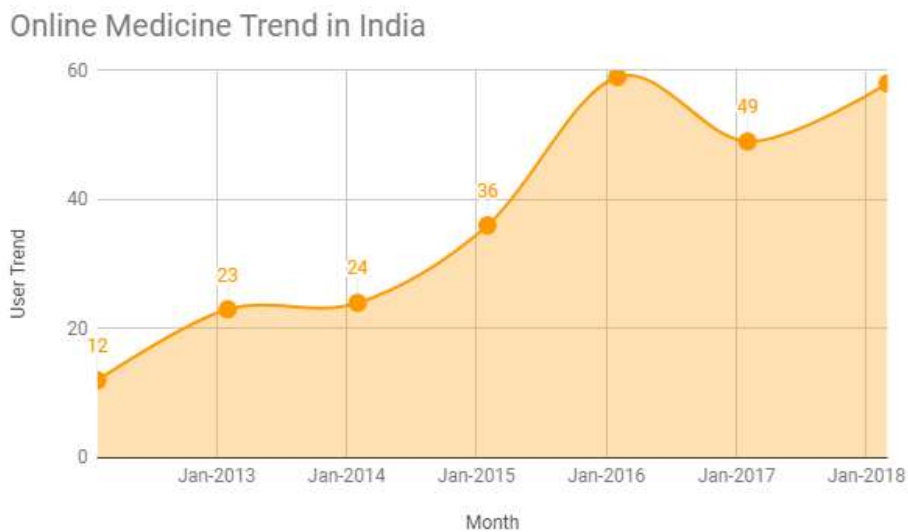


**Figure1.1:** Online Medicine Trend in India

**Source:** “Importance of e-pharmacies in digital India: benefits and future” (www.medlife.com)

### 1.2.2 Meaning and Definitions

E-pharmacy refers to the process of purchasing medicines and healthcare products through online platforms such as websites, mobile applications, or online portals (Srivastava & Raina, 2021). It enables consumers to upload prescriptions, place orders, and receive medicines at their doorstep, thereby offering greater convenience, accessibility, and affordability compared to traditional pharmacies. Along with medicine delivery, many e-pharmacies also extend services such as subscription-based refills for chronic patients, teleconsultations, diagnostic test bookings, and digital health record management. By integrating technology with healthcare systems, e-pharmacies have become an efficient and customer-friendly alternative that helps overcome challenges related to the availability and timely access of medicines (Raut et al., 2022).

Different public non-profit organizations have provided definitions that clarify the scope and functioning of e-pharmacies. The “Federation of Indian Chambers of Commerce and Industry” (FICCI) defines an e-pharmacy as an online platform that enables customers to purchase medicines and healthcare products over the internet, offering the added advantages of doorstep delivery and customer support. The Indian Internet Pharmacy

Association (IIPA) describes it as a registered online pharmacy that facilitates the sale and distribution of medicines and wellness products via digital platforms under the supervision of licensed pharmacists. Similarly, the World Health Organization (WHO, 2020) views e-pharmacies as internet-based entities that sell or distribute medicinal products directly to consumers while ensuring prescription verification and adherence to regulatory standards.

The effective adoption of e-pharmacies, is not merely dependent on technological infrastructure but also on the digital understanding and health literacy of users. As illustrated in Figure 1.2, eHealth Literacy represents the intersection of multiple literacies, traditional literacy and numeracy, computer literacy, information literacy, media literacy, science literacy, and health literacy, that collectively enable individuals to find, evaluate & understand, and apply online health information. This comprehensive literacy framework is essential for the safe and informed utilization of e-pharmacy platforms. It equips consumers with the ability to understand medical prescriptions, navigate online interfaces, assess the credibility of e-pharmacies, and make informed decisions. Therefore, enhancing eHealth literacy among both consumers and e-pharmacy managers is crucial for fostering trust, compliance, and the growth of the e-pharmacy ecosystem.

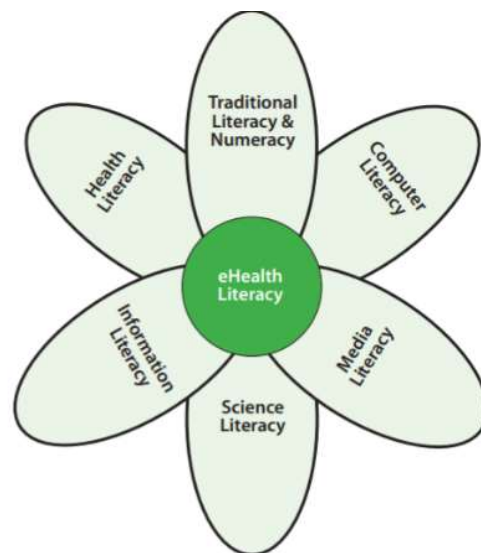


**Figure 1.2:** The Concept of eHealth Literacy

**Source:** Norman CD, Skinner HA. eHealth Literacy: Essential Skills for Consumer Health in a Networked World. J Med Internet Res. 2006 Apr-Jun; 8(2); e9

### **1.3 E-Pharmacy in NCR**

The National Capital Region (NCR) is quickly becoming one of the most prominent markets for e-pharmacy in India. This is motivated by the dense urban population, increased digital literacy, sophisticated logistics, and infrastructure. In NCR like other urban populations in India, there is a notable shift towards using e-pharmacy for purchasing medicines and health care products due to the widespread use of smartphones and digital payments (Pathak et al., 2024). NCR region not only has a concentrated healthcare ecosystem, such as hospitals, clinics, and diagnostic centers, but also has a dense healthcare network which makes e-pharmacy adoption easier through automated e-prescription systems and referral connections (Saini, Budhwar & Choudhary, 2022). It has been noted that young working professionals prefer the convenience of the ease of app-based medicine ordering and delivery to their homes, while elderly patients with chronic ailments appreciate subscription based services with automated refill alerts.

NCR's e-pharmacy sector has to address challenges that impact consumer perceptions and behavioral adoption, even with the rapid uptake. Critical issues in the sector include ensuring the authenticity of prescriptions, counterfeiting of drugs, and compliance with government regulations. In addition to this, consumer trust, perceived risk, and the practicality of using e-pharmacy platforms significantly shape adoption trends (Apte et al., 2024). Socioeconomic variables such as age, education, income, and gender also moderate these dynamics. For instance, younger users tend to embrace e-pharmacies more than older users, who are likely to prefer physical pharmacies. This makes the region of NCR particularly interesting for the study of determinants of e-pharmacy adoption, acceptance, and usage as it has the convergence of demand, digital readiness, and demographic diversity (Ahalawat et al., 2024).

### **1.4 Statement of the Research Problem**

The emergence of COVID-19 has showed us how more health services are being offered online and how the healthcare industry is transforming due to technology (Fittler et al., 2022; Guzzo & Cersosimo, 2021). In these transformations, e-pharmacy services are coming up to compete with the physical pharmacies. Some of the advantages of e-pharmacies include delivery of prescribed medications at patients' doorsteps, uploading

prescriptions, availability of a broader range of pharmaceutical products, tracking of orders, economical items, and automatic prescription renewals (Srivastava & Raina, 2021). These features are especially beneficial to those with chronic diseases, elderly people, and those living in rural areas. It also enables customers to manage the health of elderly and dependent family members with convenience. However, even with the benefits of convenience, productivity and efficiency, adoption, acceptance and usage of e-pharmacies is not sufficient and inconsistent compared to the population.

This gap between the availability of technology and its customer adoption indicates an issue that is more complicated than just having e-pharmacy infrastructure in place. Some of the consumers may not know about these services, or do not want to leave their brick-and-mortar pharmacies, or do not trust these online medicine platforms in terms of credibility or safety (Lee & Lee, 2021; Mbunge et al., 2021). This suggests that there are deeper underlying factors that encompass personal health attitudes, social influences, health literacy levels, and the perceived trust & risk of using e-pharmacies. It is suggested that these factors arise from inflexible attitude towards new technologies, insufficient digital skills, or a lack of trust in e-pharmacies (Fan & Ukaegbu, 2024). Therefore, the situation of inconsistent e-pharmacy adoption is not just related to technological approach and draws attention on other aspects related to the willingness and level of customers' acceptance of e-pharmacies.

The Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) frameworks have been used across multiple disciplines to study technology adoption (Salameh, 2022; Tandon, Kiran & Sah, 2016). However, they tend to ignore the more nuanced details of the healthcare field, particularly for new technology, such as e-pharmacy. The e-pharmacy industry does not merely deal with products, but also engages with sensitive medical types of consumer health data and professional consultations (Hossain et al., 2017). This requires an examination of Perceived Trust, Health Literacy, and Perceived Risk beyond traditional predictors of adoption such as Performance Expectancy, Effort Expectancy, etc.

New online consumers expect more than just ease of use. They seek value and an enjoyable experience (Parker & Wang, 2016). Economical and experiential factors such as Hedonic

Motivation (the pleasure derived from using a digital service) and Price Value gain importance. If a service platform is neither entertaining nor cost-effective, consumers may be less inclined to use it (Munsour, Mahmoud & Hussain, 2025). In the same vein, Facilitating Conditions, like the existence of a smartphone, digital payment tools, or even guidance for app navigation, allow potential users access to the service. Strikingly, many traditional models of technology adoption overlook these enabling dimensions of actual use (Hossain et al., 2017).

The role of Personal Innovativeness, which is the willingness of a person to try out new technologies, has not been adequately researched and adds to this complexity (Hsu et al., 2019; Sabbir, Islam & Das, 2021). This characteristic can enable companies and other community members to freely promote and try, respectively, their services, products, or innovations. At the same time, other behavioral parameters, such as Social Influence, which refers to the extent to which colleagues, relatives, or medical personnel endorse and support the use of e-pharmacy platforms, can strongly impact the consumer's intent and behavioral practices. All these factors, both social and behavioral, weave interdependencies that require a thorough understanding.

Engagement drivers are the ongoing factors that sustain user participation, such as interactive design, personalized communication, loyalty incentives, and customer care (Felix & Rembulan, 2023). Though initial adoption is a prerequisite, continued use coupled with acceptance defines sustained utilization. However, these aspects still remain largely unexamined. Furthermore, demographic moderators, including age, gender, income, and education, may impact the adoption and subsequently acceptance and usage of technologies within the scope of the study above. For example, younger customers may be primarily motivated by hedonic reasons and the appeal of the innovation, whereas older consumers may trust the product and focus on ease of use. Income could affect how consumers view price value and affordability, whereas education could relate to health literacy in assessing risk. These demographic layers add more complexity into the adoption landscape and illustrate the need for segmentation and focused approaches.

One of the most sensitive aspects of this research is Perceived Risk. Some consumers worry about counterfeit drugs, improper storage conditions, delivery lateness, data breaches, and

lack of pharmacist interaction (Singh & Chaddah, 2021; Joshi et al., 2025). These concerns undermine trust and prevent adoption. In contrast, Perceived Trust belief in the e-pharmacies trustworthiness to deliver genuine medicines in a secure manner and uphold confidential information which acts as a strong motivator for e-pharmacy adoption. It is, therefore, necessary to understand the connection between e-pharmacy adoption and e-pharmacy risk & trust to design safer and more credible systems for e-pharmacy.

While, technology adoption, acceptance and usage terms are used interchangeably in research, they refer to specific meaning when look deeper (Liu et al., 2019). With fast evolution of technologies and their rapid diffusion in customers' life provides opportunity, to understand the uptake of technologies beyond the traditional technology models adoption & acceptance, and inculcate experience of use (Liu & Miguel-Cruz, 2022).

Summarizing, the fundamental research problem is the lack of an interdisciplinary, empirically validated framework explaining the influencers driving customers towards e-pharmacy adoption, and subsequently acceptance, and usage of e-pharmacy. Some isolated investigations have studied parts of this problem, but research combining the technological, behavioral, psychological, economic, and demographic factors remains absent. Therefore, this research aims to construct and validate the model that describes gaps in e-pharmacies healthcare providers, technology builders, and regulators, demonstrating practical value for these groups. Solving this problem has importance beyond the knowledge domain, in relation to improving the accessibility and satisfaction of patients while transforming the healthcare services in the digital era.

### **1.5 Rationale of the Study**

The rapid advancement of digital technologies has reshaped many aspects of daily life, and healthcare is no exception. Among these digital innovations, e-pharmacy has emerged as a crucial service that allows consumers to order medicines and health-related products online (Misra, 2024; Assin et al., 2024). Despite the potential advantages, offered by e-pharmacy platforms i.e. increased convenience, reduced travel time, access to a wider range of medicines, and sometimes, lower prices, the actual uptake of e-pharmacy services remains uneven across consumer segments. While a portion of the population, particularly the tech-savvy and health-conscious users, has embraced e-pharmacies, a large section of potential

users still shows reluctance or limited engagement. This gap highlights the necessity of examining why consumers hesitate to adopt or continue using e-pharmacy services, despite their benefits and availability.

The rationale for this research is to dive deeper into the gap created by the advancement of technology and the actions of the consumers. Even when given the option of receiving medicines at home, many consumers still prefer to go to local pharmacies. This indicates that the matter of adoption is not merely about infrastructure or marketing, but rather adoption involves a complex interrelation of various psychological factors and socio-economic parameters. Other studies focus only on technological usability and infrastructural issues without considering trust, perception of risks, and user's confidence that could serve as emotional barriers (Ponce, Polasko & Molina, 2016; Alquran et al., 2024). This study fulfills this gap by creating an integrated model that incorporates Effort Expectancy (EE) and Performance Expectancy (PE) with Perceived Trust (PT) and Perceived Risk (PR) regarding the factors affecting the adoption, acceptance and usage of e-pharmacy services.

Models such as "Technology Acceptance Model" (TAM) and the "Unified Theory of Acceptance and Use of Technology" (UTAUT) have provided a theoretical foundation towards the study of adoption of technology (Dwivedi et al., 2019). Although useful, these frameworks focus on the functional aspects and therefore neglect contextual and emotive factors surrounding online health services like e-pharmacy. For instance, Performance Expectancy while it evaluates usefulness from the standpoint of the platform's functionality, it fails to consider health literacy or someone's apprehension of being given fake or outdated medication. The inclusion of Health Literacy (HL) and Personal Innovativeness (PI) in this study provides the rationale and emotion lens to capture e-pharmacy consumer behavior from a multidisciplinary perspective to gain a better understanding of consumer behavior and their decision-making processes in e-pharmacy use.

This research is timely and socially relevant, especially due to the impact of the digital transition that was experienced during and after the COVID-19 pandemic. E-pharmacies served an important function during the lockdowns and periods of limited physical access

to healthcare for numerous patients (Guzzo & Cersosimo, 2021). But once the situation started to normalize, it appeared that the momentum in the use of e-pharmacy was slowing, indicating that the upsurge was more situational than systemic. This scenario is concerning in terms of the potential integration and sustained use of e-pharmacy services into routine healthcare practices (Srivastava & Raina, 2021). Understanding the factors that influence the adoption of e-pharmacy services can help change the narrative from short-term reliance on technology to foster long lasting & enduring relationships with these services.

From a practical perspective, the results of this study are important to a wide range of stakeholders. Considering the e-pharmacy service providers and developers, the understanding of constructs such as Hedonic Motivation (HM), Facilitating Conditions (FC), and other consumer engagement drivers can greatly help in designing better platforms. For example, augmenting user interfaces, personalized alerts, ease of uploading prescription or teaching materials like drugs safety and administration guidelines can foster improved user experience which will lead to enhanced retention. In the framework of word-of-mouth and community reviews, marketers can leverage Social (SI) through community endorsements for consumers (Wu, Fan & Zhao, 2018). Thus, building trust and interest through influencer marketing campaigns will assist in achieving targeted marketing goals.

The information in this study is useful to regulators and policymakers as well. One of the most important reasons for not adopting e-pharmacy is perceived risk of receiving substandard or fake medicines (Assin et al., 2024; Adebo, Aladelusi & Mohammed, 2024). With the understanding of dimensions of Perceived Risk and Perceived Trust, the policymakers can adopt clearer guidelines on quality assurance, stricter licensing regulations, and enhance consumer grievance policies (Dcruz et al., 2022). These measures ensure that public interests are protected, at the same time improving trust in e-pharmacies.

Another rationale for this study is that it can help in the attainment of wider public health aims (FICCI, 2019). With appropriate policies and proper adoption, e-pharmacies can improve accessibility of medicines to patients who are immobile, constrained by time, or living in remote areas. They also allow better monitoring of prescriptions and can reduce self-medication and encourage proper medication use and adherence through digital attestation reminders (Lawal et al., 2025; Al-Worafi, 2023). Understanding the factors that

drive or hinder consumer's engagement with e-pharmacy enables effective and more comprehensive socio-planning and policy formulation to address the gaps created by limited consumer e-readiness towards e-pharmacy services.

By developing an online behavioral model combining activities, emotions, thoughts, and demographics, this research adds value to previously known consumer behavior frameworks. The research also makes suggestions for future work by developing a complex interrelation model based on consumer readiness & consumer engagement drivers, Adoption (Ad) to Acceptance (ACC) to Usage (USE) behavioral continuum. It can be applied to examine other areas of digital health like telemedicine or online diagnostics. It can be used in situated cross-region or cross demographic examinations.

Finally, the research aligns with the growing global and national focus on digital transformation and e-governance with digital health initiatives (refer to fig.1.3) like Ayushman Bharat Digital Mission (ABDM), which creates a nationwide digital health ecosystem using unique health IDs (ABHA) and electronic health records, eSanjeevani telemedicine service etc., in Indian context. The use of technology is one of the major issues in socio-economic development. E-pharmacies operate at the intersection of pharmacy, information technology, and retail. The concurrent advancements in these domains have the potential to produce significant and lasting impacts (Baali, 2023; Sarwal et al., 2021). This research attempts to provide perspectives on how this purpose can be achieved.

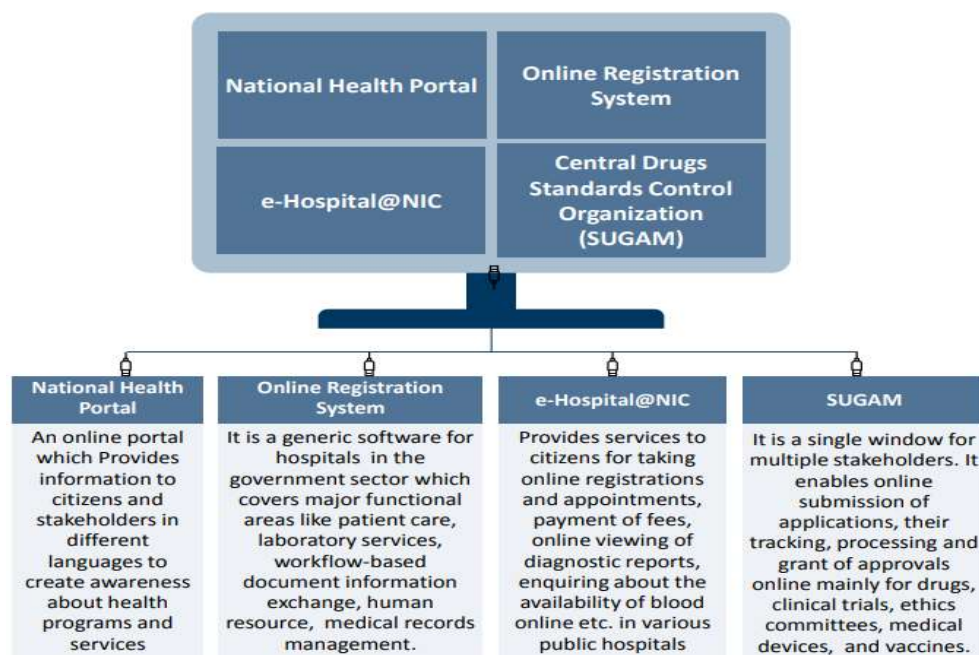


**Figure 1.3:** National Digital Health Infrastructure Supporting e-Pharmacy in India

**Source:** “Government initiative for e-Healthcare in India”

### 1.6 Scope of the Study

The scope of this study is centered on understanding the determinants of e-pharmacy adoption, acceptance and usage to order medicines in the National Capital Region (NCR). It examines the behavioral, technological, and demographic factors that influence consumers’ willingness to adopt and continue using e-pharmacy services to order medicines (Al Halbusi et al., 2025).

The area of focus for this study is the National Capital Region (NCR), which has been chosen specifically for its distinctive traits that facilitate research in the area of e-pharmacy adoption. NCR is characterized by high internet penetration, smartphone ownership, a well-developed logistics framework, and robust e-pharmacy infrastructure, all of which together support the growth of online medicine platforms (Khattar, 2025; Naz, Riaz & Nawab, 2024). The NCR region also covers a diverse demographic, including young professionals and elderly patient’s dependent on routine medication, as well as both high- and low-income groups seeking affordable healthcare options (NCRPB, 2015; Agewell

Foundation, 2012). This socio-economic variety enables meaningful comparisons regarding how age, gender, education, and income influence e-pharmacy adoption, making NCR a microcosm of India's healthcare and digital landscape.

E-pharmacies are offering many services like online doctor consultations, diagnostic lab test bookings, and the sale of personal care items, and nutrition supplements, apart from selling medicines in NCR regions. However, this research limits to e-pharmacy service of selling medicines i.e. the core definition of e-pharmacy by Indian Internet Pharmacy Association (IIPA) and FICCI.

The present study adopts the core constructs of the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) proposed by Venkatesh et al. (2012), one of the most influential frameworks in information systems and technology adoption research. UTAUT2 extends the original UTAUT model by incorporating consumer-oriented determinants of technology acceptance and usage behavior. The model has been widely applied in studies related to digital healthcare technologies, health information technologies (HITs), and e-pharmacy adoption (Tavares et al., 2017; Hasan et al., 2022; Sideiri et al., 2021; Alsadoun et al., 2023; Srivastava et al., 2020), thereby establishing its suitability as a theoretical foundation for the present research. UTAUT2 proposes that behavioral intention and actual technology usage are influenced by seven key determinants: performance expectancy (includes 5 constructs from previous technology adoption models i.e. perceived usefulness (Davis 1989), extrinsic motivation (Davis et al. 1992), job fit (Thompson et al. 1991), relative advantage (More and Benbasat 1991), outcome expectations (Compeau and Higgins 1995b, Compeau et al. 1999) (Venkatesh, et al., 2003)), effort expectancy (includes perceived ease of use from TAM/TAM2 (Davis, 1989; Davis et al., 1989), complexity from the model of personal computer utilization i.e. MPCU (Thompson et al. 1991), and ease of use from innovation diffusion theory i.e. IDT (Rogers, 1962) (Venkatesh et al., 2003) and the extent to which a person believes that the use of the technology will be free of effort (Yadav et al., 2016)), social influence (includes subjective norm (TRA, TAM2, TPB/IDTPB, and C-TAM-TPB), social factors (MPCU), and image (IDT) (Venkatesh et al., 2003)), facilitating conditions (includes perceived behavioural control (TPBI DTPB, C-TAM-TPB), facilitating conditions (MPCU), and compatibility

(IDT) (Venkatesh et al., 2003)), hedonic motivation, price value, and habit. However due to nascent stage of technology adoption of e-pharmacy and the users are early adopters (Tamilmani et al., 2019) habit construct has not been considered. Moreover, habit is misaligned in the context of healthcare and pertain more toward voluntary consumerism (Huang, W et al., 2024)

Hence, current study analyzes customers' decisions regarding e-pharmacy use to order medications in NCR, India; emerge from multifaceted interactions between behavioral, emotional, and contextual variables i.e. "Effort Expectancy (EE), Performance Expectancy (PE), Social Influence (SI), Facilitating Conditions (FC), Hedonic Motivation (HM), Health Literacy (HL), Personal Innovativeness (PI), Price Value (PV), Perceived Trust (PT), Perceived Risk (PR), Adoption (Ad), Acceptance (ACC), and Usage (USE)", each influencing consumer engagement at different stages of the journey from adoption to long-term use. The study further acknowledges that demographics, age, gender, education, and income, moderate these relationships.

Methodologically, this study employs a quantitative, hypothesis-testing approach using systematic surveys and Structural Equation Modeling (SEM) to statistically validate proposed relationships and moderation effects. A diverse sample ensures generalizability, and the focus on NCR's metropolitan and peri-urban zones enhances relevance to regions with similar socio-demographic profiles.

In essence, the scope of this study is both comprehensive and integrative, capturing technological, psychological, social, and economic aspects that collectively shape e-pharmacy adoption behavior. It traces the full continuum from adoption to continued usage and contributes valuable implications for the advancement of e-pharmacies in India.

### **1.7 Significance of the Study**

The significance of this study stems from its timely investigation into one of the most critical aspects of modern healthcare, the digital transformation of pharmaceutical services. With the evolution of the healthcare ecosystem, the emergence of e-pharmacies is reshaping the way individuals access medicines and healthcare products (Almeman, 2024; Rahaman et al., 2019). This transformation, while promising, brings with it a set of

challenges and opportunities that need to be empirically understood. Examining how various factors impact the adoption, acceptance, and usage of e-pharmacy sheds critical understanding in the gap to both academic and practical knowledge. The research goes beyond technology acceptance and analyzes more of users' understanding, including their technological preparedness, health literacy, trust levels, and risk perceptions, which creates a complete picture of e-pharmacy ecosystem in digital healthcare (Zolfaghari et al., 2025).

One of the notable contributions of this research is its attempt to integrate various factors to understand modern online consumer behavior. Different from other studies focusing on one, or a few constructs, like cost efficiency or ease of use, this study tries to widen the scope by including “Effort Expectancy (EE), Performance Expectancy (PE), Social Influence (SI), Facilitating Conditions (FC), Hedonic Motivation (HM), Health Literacy (HL), Personal Innovativeness (PI), Price Value (PV), Perceived Trust (PT), and Perceived Risk (PR)”. It captures the intricacies of e-pharmacy customers’ behavior in terms of why and how they make decisions to adopt e- pharmacies. Additionally, study looks into post adoption behavior with adoption to acceptance, and acceptance to usage of e-pharmacy to accelerate the uptake of e-pharmacies in rapidly evolving digital healthcare system (Liu & Miguel-Cruz, 2022).

The digital transformation of the healthcare industry is rapid and, like any other technology, its value is predicated on acceptance and actual use at the interoperability level of personal and system-wide connections (Kouroubali, & Katehakis, 2019). In the context of healthcare, Personal Innovativeness and other consumer readiness factors focused on self-readiness emphasize the previous emotions and psychological aspects. Consumers with different exposure to technology have different levels of risk appetite, motivation to face new challenges, and willingness to explore (Stock & Schulz, 2019). Consumer engagement drivers like performance and effort expectancy explain for what reason consumers remain active in these services. Understanding these matters has managerial implications that assist technology and platform developers towards more responsive, comprehensive, and easier to promote designs, which then increases adoption (Stamate et al., 2024).

Moreover, this research is very important for regulators and policymakers as well. The

rapid growth of e-pharmacy platforms has presented numerous ethical and legal problems, such as fake medication issues, security of consumer information, authentication of prescriptions, and regulatory compliance (Miller et al., 2021; Bester, 2023). The study demonstrates how Perceived Trust and Perceived Risk shape consumer behavior, proving where policy frameworks need to concentrate. This enables the creation of appropriate regulations that defend consumer interests while encouraging innovation. Policies of this nature will also help unify the practices within the industry and foster a healthy competitive environment critical for the sustainability of the e-pharmacy ecosystem in the long run (Bakar et al., 2022).

In terms of business and strategic management, this research will be useful for e-pharmacy chains, Pharmacy retail chains, healthcare entrepreneurship firms, digital advertising companies, and even commercial marketing firms. The understanding of the e-pharmacy use, a complex e-commerce service, can enable these businesses to tailor their service marketing and ease the customer interactions (de Oliveira Santos, 2021). As an example, a prominent segment of the public may not engage because of trust or risk issues. There is the possibility of creating educational or loyalty programs designed to build trust and confidence.

This research adds to the growing literature that crosses the boundaries of health communication, information systems, behavioral economics, and consumer psychology. It integrates concepts like the “Unified Theory of Acceptance and Use of Technology” (UTAUT) with health behavior theories to improve understanding of e-health adoption (Ma et al., 2023; Gu et al., 2021). It also offers new opportunities for further investigation by providing an empirically tested model that may be adapted or extended in diverse digital health applications, including telemedicine, e-diagnostics, and wearable health technologies. Thus, this research does not just respond to existing concerns; it establishes a foundation for prospective longitudinal and cross-regional inquiries within the evolving online health landscape.

In addition, one may think that the social significance of the study has been underestimated. The use of e-pharmacies in the proper manner can help solve the problem of healthcare

accessibility by vulnerable and marginalized populations (Rahaman et al., 2019). Such groups often face geographical, social, or financial barriers to accessing pharmacy and healthcare services. This study, through Health Literacy and Price Value, shows how using online healthcare can be made more accessible through the identified gaps in access and understanding. This impacts public healthcare programs designed to enhance medication adherence, disease management, and overall well-being in patients, especially those with chronic illnesses or restricted mobility (Religioni et al., 2025).

The importance of this research stems from its effort to evaluate the factors influencing the adoption, acceptance and use of e-pharmacies for ordering medicines in the National Capital Region (NCR) and, at the same time, addressing the overarching healthcare issues in the National Reports, FICCI (Federation of Indian Chambers of Commerce and Industry) report, as an example. The FICCI report on e-pharmacy highlights that one of the critical shortcomings of the Indian healthcare system is the last-mile delivery of affordable healthcare products, particularly in semi-urban and underserved urban areas. While brick-and-mortar pharmacies are widespread, they also face challenges such as limited stocking, prescription medicine availability, inconsistent availability of prescription drugs, and lack of affordability in certain regions. To improve access for consumers, e-pharmacies are filling this gap by offering medicines via home delivery, wider availability of products, and reasonable prices.

The current research is significant because it tracks consumer behavior and adoption trends within the NCR region, which exhibits both an advanced urban infrastructure and underserved regions grappling with the last-mile delivery challenge of medicines. Given the central focus on performance expectancy, effort expectancy, facilitating conditions, perceived trust, and demographic moderators, the study highlights how e-pharmacies can better address the last-mile delivery problem. Also, the study is useful in achieving some of the practical inputs needed by healthcare providers, policymakers, and e-pharmacy users to strengthen adoption, trust, compliance, and reliance on online healthcare by analyzing the actual users of the e-pharmacy platforms. This study is hence important not just in the context of expanding research on the adoption of technology in healthcare, but also in the context of the discussion on how to improve access to the last-mile delivery of medicines

in India.

Another dimension of significance is seen in emergency preparedness and public health resilience. Situations like pandemics, natural disasters, or immediate supply chain disruptions make it very challenging to access essential medicines; however, e-pharmacies can ensure continuity in the availability of these medicines (Chakraborty et al., 2023). From a policy-making perspective, understanding what affects consumer trust and their willingness to utilize these services during emergencies can enhance disaster management strategies. These findings can aid government and NGO initiatives aimed at enhancing public preparedness and ensuring that citizens are prepared to withstand pressure through the effective use of online health services.

The study addresses the empowerment concerns of consumers, particularly in the context of digital personalization and consumer-centric service delivery. It emphasizes the importance of considering the consumer's perspective (Nandy & Padhy, 2025). This research serves as a platform for consumers to articulate their issues, expectations, and behavioral patterns concerning services provided by e-pharmacies. By doing so, it ensures that technological advancements in healthcare are not unilateral but instead take into account the genuine needs, preferences, and values of users. As consumers become more informed, their ability to trust and adopt new digital and technological offerings is enhanced (Monteiro et al., 2019). Ultimately, this fosters an ecosystem characterized by improved efficiency, equity, accessibility, affordability, and long-term sustainability in healthcare delivery, particularly in the context of medication distribution via e-pharmacies.

### **1.8 Originality and Motivation behind the Study**

The advent of digital technologies has brought significant transformations in healthcare and pharmaceutical sectors (Herrmann et al., 2018). While the adoption of online platforms for medical consultations and health monitoring has been widely studied, the domain of e-pharmacy remains relatively underexplored, particularly in terms of understanding the multifaceted factors driving its acceptance, adoption, and sustained use (Dutta et al., 2025; Bester, 2023). This study is original in its attempt to fill this gap by developing a comprehensive and integrative framework that examines a wide array of psychological,

social, and technological constructs influencing e-pharmacy adoption, acceptance, and usage. Unlike prior research that often isolates a few variables or focuses primarily on technology acceptance, this study brings together constructs such as Health Literacy, Personal Innovativeness, Perceived Trust, and Perceived Risk in conjunction with traditional acceptance models, offering a novel and holistic view of consumer behavior in the online pharmaceuticals context.

The uniqueness of this study is further emphasized by attempting to connect behavioral science with the application technologies through their adoption theories. Many researchers employed the “Unified Theory of Acceptance and Use of Technology” (UTAUT) to understand technology uptake, but its application to health-related digital services like e-pharmacy often lacks the integration of health behavioral drivers (Dwivedi et al., 2019; Maruping et al., 2017). This gap is addressed in this research by applying health literacy, which is often overlooked but very crucial in determining how people use and seek health information, to adoption (Mackert et al., 2016). This approach also understands that the use of e-pharmacy is far beyond technology acceptance; it is intricately linked to the consumer’s health information comprehension and their willingness to use online health tools and information. This integration represents a substantial improvement in the research on technology adoption and the study of communication in health.

Another motivating factor behind this study is the recognition of the growing importance of e-pharmacies in the healthcare delivery system. The impact of e-pharmacies is unique within the healthcare delivery system because it removes existing barriers of distance, time, and even cost (Apte et al., 2024). While these benefits are worthwhile, many potential adopters do not trust e-pharmacies and instead portray them as potential sources of harm through invasion of privacy, fraud, and counterfeit products. A number of these apprehensions are rational in several contexts where regulatory policies and mechanisms to guarantee and assure the quality of services are still developing (Graz, 2016). The examination of these perceptions was also motivated by the need to understand and take advantage of the gaps within consumer perception in order to create e-pharmacy infrastructure that is appealing, safe, and easy to use.

The driving force arises from the pressure and competition emerging in the e-pharmacy market, where all stakeholders are required to have a deep understanding of their consumers to stay relevant. E-pharmacies are no longer niche players; they are rapidly becoming the preferred option for purchasing medications (de Oliveira Santos, 2021). Along with the growth of this market, policy makers and industries need to resolve issues such as trust, price, involvement, and health knowledge of the consumers (Peattie, 2016). Using frameworks like Price Value, Perceived Trust, and customer engagement drivers like performance and effort expectancy helps the e-pharmacy sector achieve sustainable growth and equitable inclusion through proper strategies.

Equally significant, the originality of the study stems from its consumer preparedness and involvement. Most past studies have considered adoption as a one-off occurrence (Giua, Materia & Camanzi, 2022), but this study highlights the persistent usage of e-pharmacy by investigating the adoption to acceptance to usage continuum. It factors in the level of preparedness and the willingness of consumers to act on e-pharmacy services and what maintains their engagement over time. This balance of readiness and longitudinal focus is important because, particularly in healthcare, trust and satisfaction develop over time (Ottrey et al., 2022). With this understanding, e-pharmacy providers can strategically develop interventions and loyalty programs aimed at reducing attrition.

The study is further motivated by the growing relevance of consumer empowerment and individual-focused health care needs. With patients managing their health more proactively, they expect to have more control over accessing medication and related information. By offering customized suggestions, e-pharmacies can help enhance individual consumer empowerment alongside transparent pricing and health educational materials. However, empowerment can only be wielded if these platforms are trusted and consumers possess sufficient health literacy. This study's analysis of such psychological and social aspects are important to ensure that innovations in online health system like e-pharmacy can transform into reality for the users from different socio-economic classes (Niltakan, 2024; Çetin & Gümüş, 2023).

Additionally, the research is driven by global health concerns emphasized by recent occurrences, including the COVID-19 pandemic. The pandemic steered the global

adoption of digital health technologies, revealing both strengths and shortcomings in the existing systems (Wang et al., 2021). During the pandemic, e-pharmacies were central to providing uninterrupted access to medications when movement was heavily curtailed (Miller et al., 2021). This period also exposed gaps in trust, regulation, and the digital divide. This study seeks to analyze the lessons that can be drawn from this rapid transition, focusing on how e-pharmacy frameworks can be made more robust and inclusive in the face of future challenges.

Also, an important motivating factor is the advancing social and economic impact of e-pharmacies on improving equity within the healthcare system (Fan & Ukaegbu, 2024). Accessibility of traditional pharmacies excludes certain demographics, such as the elderly, those living in rural areas, or people with limited mobility (Pednekar & Peterson, 2018). Using the Social Influence and Facilitating Conditions frameworks, this study aims to demonstrate how e-pharmacies can be effectively useful to bridge the gaps in access to medicines. Such insights are important for strategic planners in health care as well as for NGOs and government bodies that aim to promote fair utilization of essential medicines and health services.

Lastly, the reason the research is undertaken is that it combines both building knowledge and putting it into practice at the same time. The study seeks to enhance the academic literature by constructing a comprehensive model of e-pharmacy adoption, acceptance, and usage. The practicality of the study, addressing the needs of e-pharmacy platform developers, marketers, healthcare professionals, and regulators. The combination of these two aspects increases its importance and originality by making it useful for many parties who are involved in online health care innovations.

### **1.9 Operational Definition of Key Terms**

**Acceptance (of technology):** relates to the extent to which people are ready to adopt, assimilate, and integrate a technological innovation and its use into their routines (Awa, Ojiabo & Orokor, 2017). It goes further than just adoption to level of engagement by the users with the technology (Adell, Várhelyi & Nilsson, 2018). Acceptance, to a certain scope, represents psychological readiness and commitment to action. It means users recognize and appreciate the system's usefulness, ease of use, and demonstrate trust in the

system's reliability (Liu et al., 2019). The concept captures the intention-behavior gap, focusing on whether technology moves from theoretical approval to practical use. In the context of this research, technology acceptance involves an individual's choice to incorporate or exclude a technology from their everyday routine. Consequently, some scholars describe the technology acceptance process as taking a "micro-perspective on change" in relation to how a person accepts technology.

**Adoption (of technology):** Adoption of technology refers to the decision-making process through which individuals, groups, or organizations choose to begin using a new technological system, product, or service (Cheng & Lok, 2015; Afolayan & De la Harpe, 2019). It represents the stage where a user moves from awareness and evaluation of the technology to making a conscious choice to apply it for specific purposes. In the context of this research, technology adoption refers to state where technology effectively meets all the users' needs and requirements and it begins with a combination of individual beliefs that must first align to trigger a specific change in behavior before deciding whether to accepting the technology.

**Customer:** An individual who buys products and services for personal or someone else's use is referred to as a customer. The terms "buyer" and "purchaser" can all refer to the same person.

**Customer Engagement:** Customer Engagement is the interaction between a customer and a company's brand, product, or services, and is characterized by multiple dimensions, both psychological and emotional, stemming from meaningful engagements (Pansari & Kumar, 2017). Customer engagement includes the entire interaction paradigm that focuses on the evolution of a relationship between a customer and a business. With regards to e-pharmacies, customer engagement may manifest as habitual log-ins to the platform, responsiveness to marketing campaigns, participating in feedback sessions, or loyalty to a particular branded service. Robust engagement usually reflects the level of commitment and emotional investment customers have with a brand, thus enabling relationship and advocacy.

**Customer Readiness:** Customer Readiness signifies the descriptive factors of the customers' capacity and willingness to accept a new product, service, or a new technology (Tuan, 2022). It includes customers' awareness, confidence, level of knowledge, and willingness to accept digital solutions as in the case with e pharmacy platforms. Readiness is determined by ease of use (effort expectancy), benefits to be gained (performance expectancy), customer trust, and technology exposure. In e-pharmacy, customer readiness is particularly important in highlighting the preparedness of customers to shift from the traditional to the digital way of purchasing medicine.

**Electronic Pharmacies (e-pharmacies):** Electronic pharmacies (e-pharmacies) refer to digital platforms that allow customers to purchase medicines, health products, and related services through online systems rather than traditional brick-and-mortar outlets (Srivastava & Raina, 2021).

**Health Literacy:** Health Literacy pertains to one's skill to acquire, comprehend, evaluate, and utilize information pertaining to healthcare to make informed healthcare and wellness choices, decisions, and actions (Parnell et al., 2019).

**Information and communication technology (ICT):** This encompasses any equipment, systems, and facilities that can be used to gather, process, store, and disseminate data, including technologically advanced instruments like computers and the internet, as well as traditional media like radio and television (Njoh, 2012).

**Information System (IS):** An Information System (IS) is defined as an organized system for the collection, organization, storage and communication of information consisting of people, hardware, software, data, procedures and telecommunications to achieve a specific goal (Boell & Cecez-Kecmanovic, 2015). In regard to e-pharmacies, the use of Information System (IS) facilitates the incorporation of the online system of e-pharmacies, database and e-portals to enable effective and efficient interaction of the customers with prescription, payment, and delivery services and to improve service access and quality.

**Innovativeness:** The concept of innovativeness traces to the capability of individuals' inclination to adopt changes to ideas, technologies, and new methods in practices (Pinho, Franco & Mendes, 2021). For consumers, innovativeness entails their readiness to adopt

new and novel products and services, for instance, e-pharmacies as opposed to traditional pharmacy outlets. In the context of healthcare and pharmacy, innovativeness entails the resolve to bring about greater operational efficiency, enhance the customer service experience, and stay relevant in the era of digitalization.

**Moderating Variable:** A moderating variable is a term that refers to a variable that has a significant contingent influence on the connection amid dependent and independent variables.

**Partial Least Squares Structural Equation Modelling (PLS-SEM):** is a statistical approach for modelling complex multivariable associations between observed and latent variables (Vinzi et al., 2010). PLS-SEM is also a causal-predictive method to SEM, according to Hair et al. (2019), that prioritizes prediction while estimating statistical models with structures targeted at providing causal explanations.

**Risk:** Risk describes the concern regarding uncertainty that may arise as a result of a decision, product, or service, and its potentially adverse outcomes (Kurhade & Wankhade, 2016). In the case of e-pharmacies, risk includes receiving counter quality or substandard medicines, data and privacy issues, delays, absence of in-person consultations with pharmacists, and more. Consumers assess all of these risks prior to adoption. High perceived risk often diminishes trust, acceptance, and the actual use of the platform.

**Structural Equation Modelling (SEM):** SEM is a multivariate statistical technique that combines factor analysis and multiple regression to examine complex relationships among observed and latent variables. It allows researchers to test theoretical models by assessing both direct and indirect relationships, including mediation and moderation effects. In the context of e-pharmacy adoption, SEM helps in understanding how constructs such as consumer readiness, health literacy, perceived trust, and risk collectively influence adoption, acceptance, and continued usage of e-pharmacy.

**Trust:** This is the concern with a belief of an individual in the reliability of others which may be influenced by their perceived integrity, competence, and kindness (Al-Debei et al., 2015). According to Kim, Ferrin, and Rao (2008), trust refers to the willingness of an individual to rely on or depend on a trusted trade partner.

**The Unified theory of acceptance and use of technology (UTAUT2).** Venkatesh et al. (2012) established a consolidated set of theoretically and empirically applicable notions to describe consumer acceptance of information technology. The UTAUT2 theory considered seven constructs notably “effort expectancy, performance expectancy, social influence, facilitating conditions, hedonic motivation, habit, and price value” when predicting behavioural intention and user behaviour in relation to the acceptance of a new system or technology. Use Behaviour concerns the real conditions for using a particular technology or system (Jackson, Chow, and Leitch, 1997).

**Usage** is defined as the actual action (Taylor & Todd, 1995) and refers to individuals’ actual use of technology. In the context of this research, user behavior is regarded as accepting e-pharmacy and include the use, the frequency of use (Liu et al., 2019).

### **1.10 Structure of the Thesis**

This study covers five chapters in detail. Below is the structure of the research work.

#### **Chapter – 1: Introduction**

This chapter is the introductory one which contains background, relevance, scope, significance and originality of the study.

#### **Chapter – 2: Literature Review**

This chapter reflects in detail about theoretical background and historical development of adoption of e-pharmacy in the National Capital Region (NCR). Based on the literature review, the hypotheses for the study are formulated.

#### **Chapter – 3: Research Methodology**

This chapter provides clarity on research methodology undertaken in this research and includes universe, sampling procedure, sampling technique, sample size, sources of data, tools of data collection, and uses of various statistical tools for validation of models and to draw the conclusion.

#### **Chapter – 4: Data Analysis and Findings**

This chapter gives a picture on adoption, acceptance and usage of e-pharmacy in the National Capital Region (NCR). Based on opinion survey of respondents and data were analyzed to extract the results of the study. It also provides a detailed discussion and draws inferences from the findings of the study.

#### Chapter – 5: Conclusion, Implications and Future Scope

This chapter focus on concluding the research reflecting the summary, conclusion, implications, limitations, recommendations related to the research and discusses the scope of future research for this study.

## **Chapter-2**

### **Literature Review**

The current chapter offers a summary of prior studies on the adoption of e-pharmacies, especially in context of NCR, India. It outlines e-pharmacy, defines fundamental e-pharmacy concepts and categories, and discusses the benefits and challenges associated with e-pharmacy. The primary aim of this section is to review the existing literature on e-pharmacy industry, e-pharmacy adoption, acceptance, usage, attitude, behavioral intention, and related theoretical models such as TRA, TPB, TAM, UTAUT etc. Various journals, e-books, and industry reports contributed to enhance the knowledge and identify research gaps.

#### **2.1 Introduction**

The internet has brought about a transformation in our lifestyle, modes of communication, and even our buying habits and patterns. As internet accessibility grows, its use in pharmaceutical and healthcare sectors is also increasing. It's projected that approximately 4.5% of all global internet searches are associated with healthcare injuries or data (Haagsma et al., 2016). Beyond this, modern consumers utilize the internet not just for retrieving healthcare information, but also for self-diagnosis and acquiring a range of other healthcare services and products.

E-pharmacy, often known as an online pharmacy, is the direct distribution of drugs to customers through a website. E-pharmacies have grown rapidly in recent years due to increased access of internet, digital literacy, self-diagnosis, and an integrated e-commerce supply chain (Gyorgy, 2018).

Our everyday life, communication patterns, and consumer behavior, including our attitude to healthcare, have been profoundly changed by the internet. The healthcare sector has realized the rising significance of its influence as the internet becomes more and more accessible. Studies shows roughly 4.5% of internet searches globally center on healthcare information or data, therefore underlining the growing relevance of online platforms in this field (Usman et al., 2024). Apart from information retrieval, consumers today depend on

the internet for self-diagnosis and for obtaining a broad spectrum of healthcare goods and services.

E-pharmacy, also known as online pharmacy, has emerged as a notable trend where medications are directly delivered to consumers through dedicated websites. This growth is driven by improved internet accessibility, digital literacy, and a well-integrated e-commerce supply chain (Tyagi, Singh & Dhiman, 2023). The E-pharmacies have gained a wide customer base with the advantages of convenience and privacy, particularly for pharmaceuticals that either have stigma attached to their use or are in some way difficult to acquire by conventional means (Lyall et al., 2023). Nonetheless, the relative lack of regulation regarding numerous E-pharmacies raises both legal and ethical considerations, which potentially have effects on public health.

It's essential to recognize that purchasing pharmaceuticals online also raises concerns about counterfeit products, emphasizing the risks associated with the convenience. E-pharmacies attract huge numbers of clients that face difficulties to access certain prescription drugs or those whose use is stigmatized. However, this comfort comes with accompanying hazards (Fittler et al., 2018). This does not prevent many e-pharmacies from breaking the law in a manner that is against medical ethics and regulations thereby putting public health at risk. Consequently, patients may end up with wrong doses, dangerous combinations or even get different drugs than those prescribed to them. Besides, no professional advice or guidance could result in abuse as opposed to proper usage of medication thus aggravating health problems instead of curing those (Saini et al., 2017). Therefore, despite substantial benefits that people acquire from e-pharmacies, regulatory agencies need to tighten their control and introduce more stringent regulations for safety and security reasons regarding customers' health within such enterprise.

Errors such as wrong dosages, dangerous interactions, and even medication substitution bear great risks without strong regulatory control. Plus, the lack of interaction with healthcare professionals could lead to misuse or overuse of pharmaceuticals, increasing health conditions rather than alleviating those. In the presence of all the services that e-

pharmacies offer, regulatory authorities should strengthen the requirements for overseeing their activities to ensure public protection.

In today's fast-paced digital landscape, modern healthcare is making significant advancements in the integration of e-pharmacies into broader patient care and treatment pathways. This integration is now widely regarded as a vital component for developing comprehensive healthcare solutions. E-pharmacy, which encompasses the online distribution and management of both prescription and non-prescription medications, is experiencing rapid adoption across the extensive healthcare spectrum (de Oliveira Santos, 2021). This upward trend is notably enhancing patient convenience and accessibility, allowing individuals to more readily obtain necessary medications while simultaneously accessing a range of additional healthcare services. Therefore, the perceptions, attitudes, and behaviors of consumers toward e-pharmacy have emerged as critical areas of focus for researchers, industry practitioners, stakeholders, and decision-makers alike (Chatterjee et al., 2024).

E-pharmacy is well poised to significantly improve patient access to essential medications and healthcare services, effectively addressing the persistent gaps that exist within the often fragmented and inefficient healthcare system we face today (FICCI, 2019). Ultimately, the acceptance and practical use of e-pharmacy across diverse demographics represents the primary objective of these innovative systems that aim to streamline healthcare delivery (Srivastava & Raina, 2021). This reality highlights the urgent and ongoing need for deeper engagement, greater understanding, and heightened responsiveness from healthcare providers and stakeholders involved. E-pharmacy finds itself well-positioned for continued growth within the fragmented landscape characterizing the Indian healthcare system. As innovative e-services expand and evolve, they provide consumers with increasingly convenient, user-friendly, and potentially cost-effective methods for accessing vital healthcare solutions.

The evolution and rise of e-pharmacy in conjunction with other critical e-services underscore a historic transformation in healthcare delivery (Ashrafi, Ahmed, & Shahid, 2024). In order to sustain this ongoing growth trajectory, it is essential to fully comprehend

the diverse factors that influence consumer adoption, acceptance, and active engagement with e-pharmacies. These influencing factors can significantly affect technology acceptance rates, and their impact tends to vary across different consumer segments, creating a need for nuanced approaches and strategies. Within the complex context of health services, the decision-making processes are inherently complicated and heavily reliant on consumer input and ongoing engagement (Park, 2020). The rise of online health information seekers has led to a remarkable increase in the number of patients who actively access comprehensive healthcare information across various platforms, which further illustrates the trend toward digital engagement.

This growing trend underscores the indispensability of understanding and adequately addressing patient perceptions related to the e-pharmacy system, aiming to foster trust and confidence among users interacting with these services (Al Halbusi et al., 2025). Despite the potential benefits, significant barriers to e-pharmacy adoption persist, particularly concerning safety and security issues. Deep-seated concerns regarding the sensitive transmission of medical information and compliance standards by e-pharmacy continue to complicate the intricate landscape in which e-pharmacies operate. E-pharmacy is evolving beyond merely disseminating basic medical information and is increasingly being recognized as a legitimate medicines provider (Fan & Ukaegbu, 2024). It offers valuable features and advantages, such as the convenience of online prescription fulfillment and home delivery, which effectively eliminate many of the traditional challenges associated with obtaining necessary medications.

Average consumers, as well as non-traditional pharmacy buyers, are beginning to understand and appreciate the relevance and importance of these innovative services in their everyday lives. However, critical decisions surrounding drugs, medical information requirements, and attitudes toward specific treatment options are influenced by multiple factors, including the specifics of various diseases, existing medical conditions, and overarching customer demographics. E-pharmacy faces intense competition from well-established traditional brick and mortar pharmacy practices that have become entrenched in the healthcare system in India (Sharma, 2021). The presence of regulatory challenges further complicates the development and growth of e-pharmacies, exerting a profound

influence on public perceptions and shaping the acceptance of e-pharmacy services. The path toward widespread integration of e-pharmacy is multifaceted and complex, entailing coordinated efforts from all parties involved in the healthcare ecosystem to navigate the challenges effectively and promote the successful implementation of these vital services (Mim, 2017).

## **2.2 E-Pharmacy Industry**

The E-Pharmacy industry relates to the organized segment of the economy which facilitates the delivery of pharmaceutical products, healthcare services, and allied products through the internet, using websites, mobile applications, or telemedicine portals (Almeman, 2024). It includes the businesses which have evolved to improve the access of consumers to prescription & generic medicines, wellness products, and medical consultations, conveying through secure payment systems to deliver the goods to one's home (Khattar, 2025). This industry has a transformative impact on modern healthcare systems by enhancing the convenience, reducing the geographical barriers, increasing the level of openness and enhancing the compliance of people with medical treatments.

The E-Pharmacy industry has equally evolved over the recent years fueled by the penetration of the internet, the increase in the scope of the digital payment ecosystem, and the demand for contactless services triggered strived by the COVID-19 pandemic (Fittler et al., 2022; Miller et al., 2021; Dutta & Bhattacharjee, 2021; Dhale & Singh, 2022). It serves both urban and rural populations, overcoming the challenge of traditional pharmacy outlets located in areas with sparse populations (Fittler et al., 2013). A number of e-pharmacies integrates digital health records with online consultations and AI driven recommendations to provide a comprehensive healthcare ecosystem to the consumers (Almeman, 2024).

Nonetheless, the sector encounters problems with adherence to regulations, verifying the authenticity of medications, data privacy, and trust from the consumer end. Government and healthcare officials are particularly concerned about the prescription drug abuse epidemic and patient safety, which require rigorous oversight. In spite of these challenges, the E-Pharmacy Industry continues to innovate and adapt, fueled by the ever-growing

amalgamation of technology within the healthcare system to seamlessly support the needs of the contemporary population.

### **2.2.1 E-Pharmacy Typology**

E-Pharmacy typology relates to the models of online pharmacies and organizes them according to their frameworks, methods of operation, and service delivery systems (Ibrahim & Xue, 2024). Since e-pharmacies are distinct from physical pharmacies, their classification is crucial in understanding their business models, legal frameworks, and strategies for consumer engagement. The typology includes B2C models, B2B systems, hybrids, and digital pharmacies under government or hospital regulation. Every classification meets the needs of certain groups of consumers, health service providers, and players in the supply chain.

B2C e-pharmacies are the most prevalent, selling medications and healthcare products directly to consumers via websites and mobile applications. B2B e-pharmacies serve as suppliers to small pharmacies, clinics, or hospitals, purchasing medicines in bulk and managing large inventories (Raut et al., 2022). Also known as blended e-pharmacies, hybrid e-pharmacies merge physical and digital sales. They provide the reputation of physical stores and the ease of online access. Some e-pharmacies are integrated with telemedicine, providing virtual consultations and prescribing medicines for delivery.

Regarded from a regulatory perspective, e-pharmacy typology contains both legal categories and illegal, unregulated offshoots where the legal categories comply to government policies on e-prescription verification, drug verification and authentication, and pharmacovigilance data privacy, while the illegal categories have the potential for counterfeit or unapproved sale of drugs. In comparison, these typologies differ from one region to another, based on the region's infrastructure of healthcare services, adoption of technology, and the governing policies in place (Jain, Siu, & Anthony, 2020). Framing healthcare policies, attending to the needs of patients, and even the consumers themselves, makes it imperative for everyone in the healthcare sector to understand e-pharmacy typology to grasp its ramifications and e-pharmacy services strategically leverage the risks while maximizing the potential benefits.

### **2.2.2 E-Pharmacy Industry in India**

The Indian e-pharmacy sector has seen remarkable growth over the past ten years, supported by the adoption of digital health tools, internet access, and the need for easily accessible health services (Srivastava & Raina, 2021). Providing services in a more convenient and modern way as compared to conventional pharmacies, e-pharmacies offer medications, wellness goods, and healthcare items for seamless online ordering and deliver them to the customer's doorstep at reasonable prices. Since India ranks second in online shopping, the potential for e-pharmacies is vast, given the large population, increasing health and wellness awareness, as well as government policies like Digital India and ABDM (Ayushman Bharat Digital Mission).

The sector received a significant push during the COVID-19 pandemic, as movement restrictions and the need for contactless healthcare services propelled the adoption of online medicine delivery. Consumers began to prefer Pharm Easy, 1mg (now Tata 1mg), Net meds, Medlife, and Apollo 24/7, who offered bundled services comprising of medicine, diagnostics, tele consults, and wellness products. Apart from gaining consumers' trust, the online purchasing behavior for medicines transformed permanently, for the better. The major advantages included ease of order, lower prices, delivery to remote areas, and more.

Compliance is critical in the Indian e-pharmacy industry. The sale of medicines online is governed by The Drugs and Cosmetics Act of 1940 and the Information Technology Act of 2000. However, there is no specific legislation pertaining to e-pharmacies, which creates legal ambiguity. In 2018, the government proposed draft rules aimed at simplified licensing, validation of prescriptions, privacy of patient data, and data security (Draft Drugs and Cosmetics (Amendment) Rules, 2018; Desai, 2016). However, final rules are still pending. Regardless of the lack of clarity on policies, the sector continues to attract investment due to strong participation from corporates and startups, and even foreign investment, due to the tremendous growth prospects of the sector.

Estimates suggest the Indian e-pharmacy market can grow to USD 10 to 12 billion by the year 2025. Projections of growth will come from the increased prevalence of chronic diseases, the surge in demand for affordable medicines, integration of e-pharmacies with telehealth services, and innovation from health-tech startups (Chen et al., 2018). However,

threats to sustainable growth include lack of regulatory clarity, prevention of counterfeit drugs, and providing equitable access to rural areas. India's e-pharmacy industry can completely transform the healthcare system by making it easier, cheaper, and more efficient, if there is the right mix of policies and collaboration from key players in the industry.

### **2.2.3 Rules and Regulations Governing E-Pharmacy in India**

In India, the regulatory framework supervising e-pharmacies aims to protect patient safety, ethical standards, and quality control while encouraging innovation. The primary legislation directing e-pharmacies is the Drugs and Cosmetics Act of 1940 and its corresponding 1945 rules, which contain the regulations on the sale, distribution, and storage of medicines. According to these provisions, only pharmacies that have been duly licensed can sell medicinal products, and prescription medicines can only be sold upon presentation of a prescription issued by a registered physician. However, over-the-counter (OTC) medicines can be sold without prescriptions.

In 2018, the MoHFW (Ministry of Health and Family Welfare) published a draft set of rules called the e-pharmacy rules that required e-pharmacies to register with the Central Licensing Authority. These rules focused on mandating the maintenance of a secure digital platform, the protection of e-patient data confidentiality, the prevention of sale of narcotics and psychotropic drugs, and detailed transaction documentation. Although the final rules have not been published, a number of e-pharmacy operators in India are already adopting these draft rules to ensure compliance.

Moreover, the Information Technology Act, 2000 has provisions on privacy, data protection, and cybersecurity, safeguarding sensitive health information shared on e-pharmacy platforms. Also, The Pharmacy Act, 1948 is relevant, as it mandates the dispensing of medicines under the supervision of a licensed pharmacist. In some instances, state governments grant supplementary licenses or impose additional restrictions; therefore, compliance becomes a multi-layered challenge.

In addition, e-pharmacy business models are more freely embraced due to legitimized online consultations and the issuance of digital prescriptions under the authority of The

Telemedicine Practice Guidelines (2020), which indirectly supports e-pharmacy activities. The government aims to formulate a comprehensive regulatory policy that balances robust regulations with the enabling of accelerated development in the digital healthcare sector as it continues to evolve and adapt to advancements in technology.

### **2.3 Advantages of E-Pharmacy**

The growth of e-pharmacies in India has transformed the healthcare ecosystem as well as brought numerous advantages to the patients. E-pharmacies provide patients with the much-needed convenience. They can order medicines online as and when they need from the comfort of their homes (Apte et al., 2024). This is particularly helpful for the elderly, people with mobility issues, or those staying in remote areas, as they are often short of physical pharmacies. This also helps in saving time and effort as a visit to a drugstore is no longer needed.

The other advantage is the availability of medicines which can now easily accessed from online e-pharmacies platforms. Unlike many local pharmacies that may face stock shortages, e-pharmacies usually maintain a vast inventory and can provide access to rare or specialized drugs that are needed for chronic conditions. E-pharmacies provide customers with a more affordable alternative healthcare with significantly lower priced medicines (Adkonkar, Angrish & Bansal, 2022). This is often due to the lower operational costs which offer medicines at discounted prices.

E-pharmacies provide additional privacy for patients. Individuals who feel uneasy purchasing prescriptions for sensitive issues like mental health or sexual health medicine can order them through protected channels, which ensures absolute confidentiality of the prescriptions and personal information (Roy, P. (2025, Nov. 5)). Moreover, these platforms provide information regarding every medicine which includes dosage, side effects, and even substitutes. This level of openness allows patients to make better choices and improves the safety of medicines.

E-pharmacies bolster adherence to treatments through features like digital prescriptions, order history, and refill notifications (Haque et al., 2021). Patients can also view the status of their orders in real time which ensures transparency regarding the dependability of the

delivery process. Importantly, e-pharmacies also help to narrow the urban-rural healthcare divide, ensuring that people in underserved regions gain access to critical medicines that are difficult to obtain locally (Fittler, Brachmann, & Botz, 2013). Lastly, the healthcare ecosystem is further enhanced by the combination of e-pharmacies with other digital healthcare platforms, such as telemedicine. Patients can access their healthcare providers through video calls, obtain electronic prescriptions, and have their medications delivered to their homes, which fosters a seamless, comprehensive, and patient-oriented process.

## **2.4 Challenges with E-Pharmacy**

E-pharmacies are attempting to transform India's health care delivery, but they encounter challenges hindering their operations (Apte et al., 2024). One of the foremost challenges is the lack of an adequate regulatory framework. Even though there have been some policies put in place, there is still significant confusion regarding the legal policies of issuing licenses, online prescriptions, and the sale of some medication due to the lack of comprehensive legal policies. This lack of legal policy is not only a hindrance to legitimate operators, but also attracts unregulated and unethical platforms that could endanger the safety of the patients (Dcruz et al., 2022).

Another significant issue is the online sale of medicine and the authentication and quality associated with it. A patient is vulnerable due to the fact that they will never have the opportunity to scrutinize the medications they are supplied with, exposing them to the dangers of receiving counterfeit and expired medication (Bhatia, Grover & Mittal, 2024). These risks are amplified due to the lack of proper checks to ensure the safety of the supply chain. For temperature-sensitive medications like insulin and vaccines, these risks are magnified. The lack of standardization across thousands of sellers makes it difficult to enforce.

E-pharmacies are faced with dire concerns when it comes to data privacy and security. Financial records, health registers, and prescriptions put the customer's sensitive data at risk (Apte et al., 2024). Considering the current rise in cyber-attacks, the patient's sensitive data needs to have robust protection and strict adherence to privacy and data policies. These systems may be lacking in smaller e-pharmacies.

In addition to this, e-pharmacies have a problem with operational issues in remote areas because of logistical issues. Providing medicines on time is very important for the patients, but poor infrastructure, bad weather, and lack of last-mile connectivity can negatively impact consumer trust (Miller et al., 2021). In addition, the population in rural areas, even though they need affordable medicines, digitally face challenges with a lack of internet, which further limits the reach of e-pharmacies.

The opposition from existing brick and mortar pharmacies is also problematic. Many local chemists have regards e-pharmacies to be a threat to their livelihood and have a raised a claim of unfair competition (Dcruz et al., 2022). This conflict has caused, on some occasions, public protests which has caused the adoption of online models to be much slower than predicted. In addition to this, the public in India is still very much inclined to the personal touch and relationship with local pharmacies and their prompt advice and medicine availability.

Lastly, proper prescription compliance is critical. Many patients might try to order prescription drugs without real prescriptions, and that is very hard to monitor. This could contribute to drug misuse, abuse, or even self-medication which could be a severe health risk.

## **2.5 E-pharmacy Adoption**

The implementation of e-pharmacy in the global perspective signifies a shift from face-to-face pharmacies to online stores offering medicines, healthcare items, and related services (Almeman, 2024). The shift is mainly due to technological innovations, the presence of the internet around the globe, and the rising demand for healthcare services that are easy to access and cost-effective. The acceptance of e-pharmacies by consumers will vary based on trust in the system, the brand and quality of the medicines, ease of access, safety of private information, and the cost in comparison to convenience offered. Furthermore, healthcare systems in both advanced and emerging countries are acknowledging e-pharmacies as an adjunct to fortify the healthcare system for the distribution of medicines and in the provision of healthcare services (Ersöz, Nissen, & Schütte, 2023).

The use of e-pharmacies across the world has skyrocketed due to the COVID-19 pandemic, which brought to light the significance of contactless medicine delivery as well as digital health services (Ahalawat et al., 2024). Adoption in developed countries is aided by robust infrastructure, advanced logistics, and integration with health insurance systems. Adoption in developing countries, on the other hand, is mostly driven by geographic barriers and lack of physical pharmacy access. Regardless of developed or developing nations, the infrastructure is still impacted by counterfeit drugs, diverse regulatory frameworks, lack of digital access, and lower levels of technology. Even with these concerns, the use of e-pharmacies is predicted to continue increasing at an extraordinary rate, thus transforming healthcare to be more efficient and centered around the patient.

### **2.5.1 Adoption of E-pharmacy in India**

The adoption of e-pharmacy in India has been steadily rising, driven by rapid internet penetration, increasing smartphone usage, growing awareness of digital healthcare, and the demand for convenient, affordable, and accessible medicines (Dhale & Singh, 2022). Indian consumers, particularly in urban and semi-urban areas, are increasingly shifting toward online platforms for purchasing medicines due to benefits such as home delivery, discounts, wider product availability, and 24/7 access. The COVID-19 pandemic further accelerated this adoption by creating a strong need for contactless healthcare services. While regulatory uncertainties and concerns over counterfeit drugs remain challenges, the increasing trust in online platforms, integration with telemedicine, and government support for digital health initiatives are making e-pharmacy adoption in India a transformative step toward strengthening the country's healthcare ecosystem (FICCI, 2019).

## **2.6 Theoretical Development**

The adoption and utilization of technology has been explained through individual, social and organizational perspectives frameworks. Various perspective from psychology, sociology, economics, and information systems, intervened together, helped in understanding consumer's technology adoption behavior through decades of theoretical development. The following section outlines the chronological evolution of the theories that underpin key constructs used in this study and serves the basis of this research.

### **2.6.1 Theory of Reasoned Action (TRA)**

TRA, which serves as a precursor to TPB, examines how subjective norms and attitudes shape the formation of intentions, a foundation initially developed by Fishbein. This theory highlights the influence of personal attitudes and societal norms on the intention to act. According to TRA, intentions are precursors to behavior and are largely shaped by an individual's attitude towards the behavior and the societal norms they perceive. The theory suggests that a person is more likely to form an intention to engage in a behavior if they view it positively and believe that important others expect them to do so. This model underscores that the intention to perform a specific behavior is a key predictor of whether the behavior will actually occur (Fishbein & Ajzen, 1977). TRA has been applied to study how intentions are formed in the context of adopting new technology, with a focus on how societal expectations influence adoption actions. Subjective norms, which encompass the social pressures or expectations faced by consumers of new technology, significantly impact their decision-making processes. This studies concepts of performance expectancy and effort expectancy stem from the attitudinal evaluation of outcomes, whereas social influence derives from subjective norms. Ultimately, the theory supports the notion that the adoption of technology is dependent on the social and personal attitudes of the consumers.

### **2.6.2 Theory of Planned Behavior**

The Theory of Planned Behavior (TPB) is among the pioneering models developed to elucidate the connection between an individual's intentions and their actions (Ajzen, 1991). Within the TPB, three primary factors are recognized as shaping behavioral intentions: norms, attitudes, and perceived behavioral control. Attitude refers to an individual's positive or negative assessment of the behavior in question. Subjective norms, on the other hand, pertain to the perceived social pressures an individual experiences regarding whether to engage in a specific behavior. Meanwhile, perceived behavioral control is referred as an individual's perception of how easy or difficult it is to conduct the certain behavior.

In context of technology adoption and this study, effort expectancy parallels perceived behavioral control, subjective norm mimics social influence, while facilitating conditions mirror external enablers supporting system use. TPB also accommodates individual

difference variables, paving the way for constructs such as personal innovativeness that influence adoption through control beliefs and attitudes.

### **2.6.3 Expectancy-Value and Self Determination Theory**

Building upon TRA, the Expectancy-Value Theory proposed by Vroom (1964) and further refined and value added by Eccles et al. (1983) emphasized that individuals are motivated to act based on the expectation that effort leads to improved outcomes. This theoretical foundation directly forms performance expectancy the belief that using technology enhances productivity, and effort expectancy the belief that technology use requires minimal effort.

Simultaneously, Self-Determination Theory (SDT) by Deci and Ryan (1985) differentiated between intrinsic and extrinsic motivations. The notion of hedonic motivation, referring to the enjoyment derived from technology use, is grounded in intrinsic motivation, while price value aligns with extrinsic motivation through cost–benefit considerations. These theories extended adoption research beyond utilitarian beliefs to include emotional and value-based dimensions.

### **2.6.4 Perceived Risk and Trust Theories**

Parallel developments in consumer behavior introduced the Perceived Risk Theory, which posited that consumers experience uncertainty regarding the potential negative outcomes of a purchase decision (Bauer, 1960; Cunningham, 1967). Within the technology context, perceived risk represents users' apprehensions regarding privacy, financial, or performance-related consequences.

Complementing this, Trust Theory emphasized the importance of belief in the benevolence, integrity, and competence of the technology provider (Rotter, 1967; Mayer et al., 1995). Perceived trust subsequently emerged as a crucial construct mitigating perceived risk and fostering intention to use technologies, particularly in online, e-commerce, and healthcare applications (Gefen et al., 2003; Pavlou, 2003).

### **2.6.5 Innovation Diffusion Theory**

Rogers' Diffusion of Innovation (DOI) Theory, categorizes adopters of innovation into: innovators, early adopters, early majority, late majority and laggards (Elsherif, 2011). This

model considers technology adoption to be influenced by factors like “relative advantage, compatibility, complexity, trialability and observability”. This theory broadened the perspective from individual cognition to societal diffusion processes. Performance expectancy aligns with "relative advantage, while effort expectancy relates to complexity. DOI also introduced personal innovativeness, defined as the degree to which an individual is receptive to new technologies and is an early adopter (Rogers, 1995).

#### **2.6.6 Technology Acceptance Model (TAM)**

Close to Rogers’ Theory is the “Technology Acceptance Model” (TAM) by Davis (1989). It put more focus on user’s acceptance by claiming that it is centered around PU and PEOU. These two factors shape attitude and intention toward usage. TAM proposed that “Perceived Usefulness (PU) and Perceived Ease of Use (PEOU)” determine users’ attitudes toward technology and behavioral intention. PU corresponds to performance expectancy, while PEOU aligns with effort expectancy in later models. TAM empirically validated the significance of cognitive beliefs in predicting intention and actual use of information systems, establishing a theoretical baseline for subsequent models (Davis, 1989).

#### **2.6.7 Social Cognitive Theory**

(Bandura, 1991) introduced Social Cognitive Theory (SCT) to elucidate how personal, environmental, and behavioral factors interact as elements of human behavior. SCT emphasizes self-efficacy, or the belief in one's ability to accomplish specific goals, as a crucial factor in behavioral change. Bandura asserts that individuals are not passive observers but active participants in their environment, capable of self-regulation and reflection. This theory suggests that learning is fundamentally social, involving not only direct experiences but also the observation of others' actions. SCT is particularly pertinent in understanding how consumers cultivate the belief and ability to initiate and use new technology. When individuals have confidence in their capacity to engage in technology adoption activities, their self-efficacy level becomes a key determinant. Hence, the concept of self-efficacy underpins effort expectancy and facilitating conditions. Additionally, SCT introduced observational learning and social modeling as mechanisms through which social influence operates.

### **2.6.8 Unified Theory of Acceptance and Use of Technology (UTAUT)**

Synthesizing insights from TAM, TPB, DOI, and SCT, Venkatesh et al. (2003) proposed the “Unified Theory of Acceptance and Use of Technology” (UTAUT). UTAUT identified four core determinants: performance expectancy, effort expectancy, social influence, and facilitating conditions, with gender, age, experience, and voluntariness of use as moderators. This unification provided a parsimonious yet comprehensive model explaining technology acceptance across organizational contexts, substantially improving predictive power compared to earlier models.

### **2.6.9 UTAUT2**

The UTAUT2 model, created in 2012, extends the UTAUT model from Venkatesh et al. from 2003. Its main aim is to provide a deeper insight into the adoption and usage of technology from a consumer perspective, rather than an organizational one. UTAUT2 modifies the UTAUT model by including additional constructs that capture the social, personal, and consumer joy aspects, thus shifting the focus to the consumer (Dhiman et al., 2020). The model maintains the technology acceptance predictors- “performance expectancy, effort expectancy, social influence, facilitating conditions” but adds “hedonic motivation, price value, and habit”. These additional constructs together with the core predictors provide a fuller picture of the adoption and actual usage of technology.

UTAUT2 has also been implemented in other fields like mobile banking, e-commerce, healthcare, and other digital services which makes it a strong model for studying how people interact in the digital world (Dwivedi et al., 2019; Shevtsova et al.). In the case of e-pharmacy use, performance expectancy (usefulness of medicine access), effort expectancy (app or website ease of use), social influence (peer or doctor endorsement), and facilitating conditions (payment systems, delivery and customer services) are instrumental. Hedonic motivation concerns the enjoyment captured from using the digital platform, while price value reviews cost effectiveness against traditional brick and mortar stores and habit denotes use repetition.

In holistic terms, UTAUT2 captures both the utilitarian and the experiential which makes it useful for studying consumer behavior towards adoption and continued use of services provided by technology like e-pharmacies in the digital economy.

#### **2.6.10 Trust, Risk, Health literacy and Innovativeness in Post-UTAUT Research**

Subsequent research integrated constructs of perceived trust, perceived risk, and personal innovativeness into UTAUT-based frameworks to enhance explanatory power in high-risk and data-sensitive contexts. Perceived trust and risk are particularly critical in e-commerce, mobile health, and digital financial services, where uncertainty and data privacy concerns prevail (Gefen et al., 2003; Pavlou, 2003; Baptista & Oliveira, 2015). Personal innovativeness, derived from DOI (Rogers, 1995) and operationalized by Agarwal and Prasad (1998), captures trait-level willingness to experiment with new technologies and moderates the influence of cognitive beliefs on adoption intention. Recent literature underscores the role of health literacy, “the capacity to obtain, process, and understand basic health information needed to make appropriate health decisions” (Nutbeam, 2000) as a determinant in Health Information Technology (HIT) adoption. Health literacy has been conceptually linked to both effort expectancy and performance expectancy, as individuals with higher health literacy perceive health technologies as easier to use and more beneficial (Neter & Brainin, 2012). The Health Belief Model (HBM) (Rosenstock, 1974) and Self-Efficacy Theory (Bandura, 1986) provide theoretical underpinnings for this construct by emphasizing perceived competence and control in health-related decision-making. In digital contexts, eHealth literacy extends traditional literacy to encompass the ability to seek, evaluate, and apply health information from electronic sources (Norman & Skinner, 2006). Studies demonstrate that individuals with higher eHealth literacy exhibit stronger behavioral intention toward technology adoption due to greater confidence, trust, and reduced perceived risk (Knapp et al., 2011; Stellefson et al., 2011).

These integrations mark a shift toward holistic frameworks that combine utilitarian, affective, and dispositional factors in technology adoption.

#### **2.7 Past Literature in E-Pharmacy Context**

It is so important in the dynamic domain of e-pharmacy that we understand the dynamics of e-pharmacy uptake in this fast-evolving field. The preliminary studies, such as Agarwal (2023), gave important grounds in regard to the factors that will affect consumer attitude and behavior toward e-Pharmacy services in Urban India, wherein convenience, cost-

effectiveness, and accessibility emerged as the key drivers. Furthermore, growing legal frameworks and technological developments have given an added dimension to the discussion related to e-pharmacy adoption. Panggabean et al. (2024) researched how changes in regulatory policy and advances in digital infrastructures informed consumer trust and adoption behaviors in urban areas, bringing out insights on the dynamic interaction between regulatory environments and consumer behavior. According to Verma and Sharma (2021) the common themes and emerging trends in e-pharmacy adoption have been identified as follows: Influencing factors related to digital literacy and socioeconomic variables with patterns of adoption, particularly within the metropolitan regions like the National Capital Region, are increasingly important.

When the consumer is deciding on the benefits of integrating online applications within health-related practices, TPB highlights attitudes, subjective norms, and perceived control in behavioral modification (Rajput & Seetharaman, 2022). Within a theoretical framework, attitude reflects a perception of the benefit and negative consequences of e-pharmacies by an individual in their personal experiences and societal elements. Subjective norms, therefore, magnify the influence of peer recommendations and expert endorsements on perceptions of social acceptability and helpfulness (Wong et al., 2020; Han & Han, 2023).

Recent researches highlight key drivers for adopting and accepting e-pharmacy include perceived ease-of-use and perceived usefulness of these platforms that influence consumer behavior aligned with extended TAM theory. Under the theory of TAM (Technology Acceptance Model), perceived simplicity and utility of e-pharmacy platforms plays an integral role in choices of users (Zhu et al., 2023). It has been found that perceived usefulness and ease-of-use play pivotal roles in e-pharmacy adoption determinants, stressing the need for user-friendly platforms due to these significant factors. Alaşehir, Sezgin,& Özkan, (2013) also found that perceived usefulness and ease-of-use are important determinant in pharmacist's attitude towards e-pharmacy

TAM also sheds light on the associated ideas and behaviors regarding the adoption and acceptance of e-pharmacy technology. In their 2023 study, Ahmed et al. discovered that perceived usefulness (PU), perceived ease of use (PEOU), along with perceived security

and delivery, positively impact the perceived trust in app-based medicine services. Similarly, Ma (2021) identified the importance of trustworthiness and perceived risk, alongside perceived usefulness and ease of use, in understanding the intentions of non-adopters to use internet pharmacies. Svorc (2012) concluded in their research that perceived risk and perceived usefulness are key predictors of the intention to purchase medicines online.

With the widespread shift towards digitalization due to the rapid increase in online transactions across various sectors, healthcare providers are increasingly focusing on developing customized e-services to cater to the evolving needs of patients and clients seeking more convenient and efficient healthcare solutions. There has been a significant rise in the focus on understanding the critical issues related to the adoption, acceptance, and actual use of e-pharmacy services, which are seen as a valuable alternative to traditional pharmacy methods (Srivastava & Raina, 2021). UTAUT, an advancement of TAM, has been used to identify factors influencing e-pharmacy adoption and has been found to be effective (Sabbir, Islam & Das, 2021). Adebo, Aladelusi & Mohammed (2024), in their study using UTAUT, identified performance expectancy as the primary factor driving e-pharmacy adoption. Yin, Li & Qiao (2016), also using UTAUT, found that performance expectancy and social influence have a direct and significant impact on consumers' intention to purchase medicine online. Srivastava & Raina (2021), employing UTAUT2, found that performance expectancy, effort expectancy, social influence, and hedonic motivation positively correlate with the adoption of e-pharmacy and the intention to recommend it.

Consumers' attitude toward accepting and using e-pharmacies is a direct function of perceived effort, expected performance, social influence, peer recommendations, the availability of resources, and support (Tanchareon, 2023). Taken together, these variables have a profound impact on consumers' inclination and eagerness to use e-pharmacy services. Similarly, trust and perceived risk are crucial constructs. Customer's growing trust in the safety and privacy of e-pharmacies accelerates their use while concerns about pharmaceutical legality coupled with online transaction security remain substantial barriers.

In adoption of e-pharmacies, trust and perceived risk play a key role. Consumers' inclination towards using e-pharmacy platforms elevates when they place trust in the security and privacy of their information, and observes substantial obstacles due perceived risks such as doubts on drug authenticity through online purchase legitimacy and concerns over transactional security (Yin, Li & Qiao, 2016).

In a highly developed study based on these fundamentals, Mou, Shin, & Cohen (2017) stated that there were qualitatively described consumer perceptions regarding trust and security in online transactions associated with e-services adoption, like e-pharmacy, concerns which heavily reflected the overall adoption rate, especially among urban populations including within the National Capital Region.

In addition to these prominent determinants, several other factors that influence the extent of consumers' acceptance of e-pharmacy services have also been identified (Al Halbusi et al., 2025). These factors can be categorized as social, cultural, and technological in nature, thus adding multiple layers of complexity to the issue of e-pharmacy adoption.

In the evaluation, examination, and measurement of e-pharmacy and e-healthcare acceptance and usage, consumer readiness has received prominence as a construct (Borketey, 2017). Consumer readiness encompasses psychographic and technological as well as functional components. The determinants of this construct influence a consumer's preparedness to use online pharmacy services. With technological readiness, we refer to the technical access to online medical pharmacy (Yusif, Hafeez-Baig, & Soar, 2017). It represents the direct relationship between the utilitarian personalized online environment and expert skill structure.

The other component of consumer readiness refers to the perceptions towards the technological artifacts and towards human-computer interaction (Kim & Chiu, 2019). The functional determinant of this construct includes the charisma of health knowledge, skills, talent, and knowledge of disease or medical knowledge. People are more comfortable dealing with artifacts, which value them; i.e., how other people can use their abilities. Thus, people will become more familiar with the Internet, which ultimately becomes part of their

psyche. People who use computers tend to have a desire to interact in a better way (Yusif, Hafeez-Baig & Soar, 2017).

The measurement of health and pharmacy literacy, perceived accessibility, and the degree of capabilities for ease of use are the contents of technological readiness (Blebil et al., 2023). Health literacy is a combined construct of a person who can read, understand, and finally, apply the medical instructions in their life.

Psychological readiness is linked to the attitudes and usage behavior of online pharmacy and e-healthcare development as well as use in relation to accessing the pharmaceutical industry (Srivastava & Raina, 2021). The greater novelty of pharmaceutical sites and online hospitals, the more acceptable they become to any kind of user. The linkage of novelty approach with acceptance accessibility is based on the aspect of familiarities that are experienced with the e-pharmacy website (Al Halbusi et al., 2025). The readier the online pharmacy user, the easier the utilization of e-pharmacy will be for them.

Consumer readiness is a strong presumption of e-pharmacy utilization (TJ, George, & Sivakumar, 2022). If a group is more ready but does not utilize, this could lead to dissatisfaction with the present offering, or at least a need to find out why consumers did not use it.

Consumer participation in e-pharmacies is driven by hedonic, health literacy, and personal innovativeness (Sabbir, Islam & Das, 2021; Al Halbusi et al., 2025). Health literacy through collaboration with others comes to make informed decisions about health, and innovativeness results in the early adoption and use of e-pharmacy. Consumer engagement drivers are responsible for determining the quality of consumer engagement (Piligrimiene et al., 2020). Conceptually, it is a multi-dimensional concept and suggests the process of active consumer involvement, emotional attachment, and commitment to the relationship between the consumer and an online service provider.

Three major drivers of consumer engagement in previous literature are value or fairness, interaction factors or cues, and motivation (Do, Rahman, & Robinson, 2020). Consumers undergo experiential buying, have an interactive experience, and evaluate perceived value,

benefits, and product performance. Positive interactions influence perceived value, the congruence of values builds trust, and overall service satisfaction leads to product repurchase (Wu et al., 2014). Alternatively, satisfaction can also drive further interaction. Buyer-seller relationships can be formed by reducing uncertainty in the choice-relevant environment.

Consequently, e-pharmacies may become an important engagement area with possible interaction, cues, and trust drivers (Misra, 2024). Interaction between sellers and buyers may well contribute to consumer engagement in creating a commitment when favorable interactions exist as proxy indicators across the website. Satisfaction, post-choice satisfaction with the service encounter, e-pharmacy performance, and trust in this online e-pharmacy may further enhance this engagement (Fan & Ukaegbu, 2024). The key drivers of consumer engagement clearly have the capacity to produce engagement whether the e-pharmacy can offer features such as virtual communities, quite like the established e-retailers sector of travel virtual communities.

Following table (table no. 2.1) summarize and analytically compares the above discussed key studies.

**Table 2.1.** Literature Review Summary

| <b>Author(s)<br/>&amp; Year</b> | <b>Theoretical Lens / Context</b>     | <b>Key<br/>Variables /<br/>Constructs</b>         | <b>Major<br/>Findings</b>                                                            | <b>Critical<br/>Analysis /<br/>Research<br/>Gap</b>                                              |
|---------------------------------|---------------------------------------|---------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Agarwal<br>(2023)               | E-pharmacy adoption in Urban<br>India | Convenience, cost-effectiveness,<br>accessibility | Convenience and accessibility emerged<br>as major drivers of e-pharmacy<br>adoption. | The study provides strong contextual<br>understanding of urban adoption<br>behavior; however, it |

|                         |                                                        |                                                           |                                                                                                           |                                                                                                                                                                         |
|-------------------------|--------------------------------------------------------|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                         |                                                        |                                                           |                                                                                                           | focuses largely on functional benefits and provides limited theoretical integration of behavioral or psychological variables.                                           |
| Panggaban et al. (2024) | Regulatory and technological environment in e-pharmacy | Regulatory policy, digital infrastructure, consumer trust | Regulatory frameworks and technological advancements significantly influence trust and adoption behavior. | The study highlights the institutional role in technology adoption but provides limited analysis of individual behavioral intentions and consumer readiness dimensions. |
| Verma & Sharma (2021)   | E-pharmacy adoption trends in metropolitan regions     | Digital literacy, socioeconomic variables                 | Digital literacy and socioeconomic status strongly influence adoption patterns in metropolitan regions.   | The study emphasizes demographic influences but lacks integration with broader technology acceptance theories.                                                          |

|                                      |                                             |                                                          |                                                                                                      |                                                                                                                                         |
|--------------------------------------|---------------------------------------------|----------------------------------------------------------|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
|                                      |                                             |                                                          |                                                                                                      | such as TAM or UTAUT.                                                                                                                   |
| Rajput & Seetharaman (2022)          | Theory of Planned Behavior (TPB)            | Attitude, subjective norms, perceived behavioral control | Consumer adoption decisions are shaped by attitudes, social norms, and perceived behavioral control. | TPB effectively explains behavioral intention but pays limited attention to technological usability and system-specific attributes.     |
| Wong et al. (2020); Han & Han (2023) | Social influence in digital health adoption | Peer recommendations, expert endorsements                | Social acceptability and peer influence positively affect adoption intentions.                       | These studies strengthen understanding of social norms but provide insufficient discussion on trust, risk, and facilitating conditions. |
| Zhu et al. (2023)                    | Technology Acceptance Model (TAM)           | Perceived usefulness (PU), perceived ease of use (PEOU)  | Simplicity and usefulness of e-pharmacy platforms significantly influence consumer behavior.         | TAM explains utilitarian acceptance effectively but overlooks contextual, psychological, and healthcare-specific factors.               |

|                                 |                                              |                                               |                                                                                                            |                                                                                                                              |
|---------------------------------|----------------------------------------------|-----------------------------------------------|------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Alaşehir, Sezgin & Özkan (2013) | TAM in pharmacist adoption behavior          | Usefulness, ease of use                       | Perceived usefulness and ease of use influence pharmacists' attitudes toward e-pharmacy.                   | The study validates TAM constructs in healthcare settings but lacks consumer-centered behavioral analysis.                   |
| Ahmed et al. (2023)             | TAM extension in app-based medicine services | PU, PEOU, perceived security, delivery, trust | Perceived usefulness, ease of use, and security positively influence trust in app-based medicine services. | Extends TAM by incorporating trust and security; however, broader social and facilitating dimensions remain underexplored.   |
| Ma (2021)                       | Internet pharmacy adoption                   | Trustworthiness, perceived risk, PU, PEOU     | Trust and risk significantly affect non-adopters' intention to use internet pharmacies.                    | The study broadens TAM through risk-trust integration but remains focused on intention rather than continued usage behavior. |
| Svorc (2012)                    | Online medicine purchase intention           | Perceived risk, perceived usefulness          | Risk and usefulness are major predictors of online medicine                                                | Highlights healthcare-specific concerns; however, the                                                                        |

|                                    |                                  |                                                                                 |                                                                              |                                                                                                                                             |
|------------------------------------|----------------------------------|---------------------------------------------------------------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
|                                    |                                  |                                                                                 | purchase intention.                                                          | framework lacks integration of social and environmental factors.                                                                            |
| Srivastava & Raina (2021)          | E-pharmacy adoption using UTAUT2 | Performance expectancy, effort expectancy, social influence, hedonic motivation | These constructs positively influence adoption and recommendation intention. | UTAUT2 provides broader explanatory capability, though hedonic dimensions may have limited relevance in utility-driven healthcare contexts. |
| Sabbir, Islam & Das (2021)         | UTAUT in e-pharmacy adoption     | Performance expectancy, engagement, innovativeness                              | UTAUT effectively explains e-pharmacy adoption behavior.                     | The study validates UTAUT applicability but provides limited focus on mediating or moderating effects.                                      |
| Adebo, Aladelusi & Mohammed (2024) | UTAUT framework                  | Performance expectancy                                                          | Performance expectancy emerged as the strongest determinant of adoption.     | Reinforces utilitarian motivation in healthcare technology adoption but lacks discussion                                                    |

|                          |                                             |                                                                                      |                                                                                                                                   |                                                                                                                                 |
|--------------------------|---------------------------------------------|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
|                          |                                             |                                                                                      |                                                                                                                                   | on trust and risk.                                                                                                              |
| Yin, Li & Qiao (2016)    | UTAUT and online medicine purchase behavior | Performance expectancy, social influence, trust, perceived risk                      | Social influence and performance expectancy significantly influence intention; trust enhances adoption while risk inhibits usage. | Integrates both technological and psychological dimensions effectively, though longitudinal validation is absent.               |
| Tanchareon (2023)        | Consumer behavior in e-pharmacy             | Effort expectancy, performance expectancy, social influence, facilitating conditions | Consumer willingness to adopt e-pharmacy is driven by usability, social factors, and resource support.                            | The study comprehensively explains adoption drivers but provides limited empirical discussion on continued engagement behavior. |
| Mou, Shin & Cohen (2017) | Trust and security in e-services adoption   | Trust, security perceptions                                                          | Consumer concerns regarding security strongly affect adoption rates of e-services.                                                | Highlights trust-security relationship effectively but lacks healthcare-specific contextualization.                             |

|                                  |                                          |                                                         |                                                                                                       |                                                                                                                            |
|----------------------------------|------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| Al Halbusi et al. (2025)         | Consumer acceptance of e-pharmacy        | Social, cultural, technological factors                 | E-pharmacy acceptance is multidimensional and influenced by broader social and cultural determinants. | Expands understanding beyond technological constructs; however, operationalization of cultural dimensions remains limited. |
| Borketey (2017)                  | Consumer readiness in e-healthcare       | Psychographic, technological, functional readiness      | Consumer readiness significantly affects e-healthcare acceptance and usage.                           | Introduces readiness as a multidimensional construct but lacks integration with mainstream adoption theories.              |
| Yusif, Hafeez-Baig & Soar (2017) | Technological readiness                  | Technical access, internet familiarity, skill structure | Familiarity with technology and internet capability improve readiness and usage behavior.             | The study provides strong technological readiness insights but insufficiently addresses trust and risk dimensions.         |
| Kim & Chiu (2019)                | Human–computer interaction and readiness | Perceptions toward technological artifacts              | Positive perceptions toward technology improve online                                                 | The study explains psychological readiness but lacks                                                                       |

|                               |                                    |                                                      |                                                                                          |                                                                                                                           |
|-------------------------------|------------------------------------|------------------------------------------------------|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
|                               |                                    |                                                      | healthcare acceptance .                                                                  | broader ecosystem and social influence analysis.                                                                          |
| Blebil et al. (2023)          | Health literacy and readiness      | Health literacy, accessibility, ease of use          | Health literacy improves effective usage of online healthcare systems.                   | Establishes the importance of literacy in digital healthcare adoption but does not integrate behavioral intention models. |
| TJ, George & Sivakumar (2022) | Consumer readiness and utilization | Readiness, utilization behavior                      | Consumer readiness strongly predicts e-pharmacy utilization.                             | Suggests readiness as a precursor to usage; however, reasons for non-utilization despite readiness remain unexplored .    |
| Pilgrimine et al. (2020)      | Consumer engagement theory         | Engagement quality, emotional attachment, commitment | Consumer engagement is multidimensional and influences long-term platform relationships. | Provides deeper engagement perspective but lacks direct application to healthcare-specific digital platforms.             |

|                              |                                            |                                          |                                                                                       |                                                                                                                  |
|------------------------------|--------------------------------------------|------------------------------------------|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| Do, Rahman & Robinson (2020) | Drivers of consumer engagement             | Value, interaction cues, motivation      | Perceived value and interactive experiences strengthen consumer engagement.           | Highlights experiential dimensions but underemphasizes trust and regulatory concerns in healthcare settings.     |
| Wu et al. (2014)             | Buyer–seller relationship and satisfaction | Perceived value, trust, satisfaction     | Positive interactions enhance trust, satisfaction, and repurchase intentions.         | The study strengthens relationship marketing perspective but is not specifically focused on e-pharmacy adoption. |
| Misra (2024)                 | Consumer engagement in e-pharmacy          | Interaction, trust drivers, engagement   | Trust and interaction cues significantly improve consumer engagement in e-pharmacies. | Provides contextual relevance to e-pharmacy engagement; however, empirical validation remains limited.           |
| Fan & Ukaegbu (2024)         | Service encounter and online trust         | Satisfaction, trust, service performance | Service satisfaction and trust enhance engagement and repeat usage.                   | Emphasizes post-adoption behavior but lacks integration with adoption-stage determinants.                        |

## **2.8 Adoption of E-Pharmacy**

Adoption of any new technology, innovation or system refers to, an individual or organizations initial decision to use technology, innovation or system based on perceived benefits, innovation characteristics, and readiness (Rogers, 2003). According to Rogers DOI theory, innovation i.e. use of any technology or system is a diffusion process where potential users start becoming aware about the innovation, evaluate its benefit and compare relative advantages over existing alternative. Adoption process moves from knowledge and persuasion to acceptance (or rejection). Empirical studies have shown healthcare technologies perceived as cost effective, useful and easy to use are adopted rapidly (Karahoca, Karahoca, & Aksöz, 2018; Ahmed et. al., 2023).

In modern retail settings, e-commerce has become more common and has gained popularity during the past decades (Jain, Malviya & Arya, 2021). E-pharmacy adoption refers to the process by which consumers begin to embrace e-pharmacy platforms for purchasing medicines instead of or alongside traditional brick-and-mortar pharmacies. Adoption of e-pharmacies relates to the customers' initial intention of usage for meeting pharmaceutical needs through online spaces in National Capital Region (NCR) (Garg & Anand, 2017). Drivers of adoption would include convenience, the ability to order prescriptions and refills from home, lower cost as compared to their brick-and-mortar counterpart, trust in the security of these kinds of transactions, and availability of total health care servicing over e-pharmacy among others (Baid & Ghosh, 2021).

Services provided by such portals can range from simple over-the-counter medication to important prescription drugs, and they also serve a wide array of customer segments from infants to older adults. The demand for such pharmacies is growing due to technological advancement, changes in lifestyle, and increased awareness related to one's health status (Singh, Majumdar, & Malviya, 2020). People are now more interested and new technologies or factors such as convenience, information, and support systems provided by e-pharmacies are eye-catching to customers. Along with various products, the field of pharmaceuticals has seen a lot of development mainly due to the ease and accessibility for

customers to use the online purchase resources available as compared to the conventional method of purchasing pharmaceuticals.

The usage of various information technology systems eases the complexity and thereby provides a friendly healthcare support system (Meri et al., 2019). The support systems might include secure payment gateways, proprietary secure prescription apps, and maintain these documents and share the information between the patient counseling team and various medical practitioners.

Hence, e-pharmacy adoption is not a mere initial decision to use but a complex, evaluative, and motivational multi-stage process and sets the trajectory for subsequent stages of e-pharmacy acceptance and usage (Lian & Yen, 2014). It has, apart from technological factors, psychological and cognitive factors involved. Understanding of such e-pharmacy adoption factors is benefitting for stakeholders, policymakers, and healthcare practitioners in incorporating e-pharmacies in the health landscape of urban centers, for instance, the NCR.

## **2.9 Antecedents of E-Pharmacy Adoption**

### **2.9.1 Performance Expectancy**

Performance expectancy is a person's opinion that e-pharmacies improve healthcare management. It affects the adoption and use of e-pharmacies (Adebo, Aladelusi & Mohammed, 2024). Users see convenience, efficiency as benefits, which leads to increased adoption and continued use. Performance expectancy is defined as the perceived degree to which a system can significantly enhance a user's overall performance and efficiency. Performance expectancy is meticulously considered as the degree to which an individual believes that using the system will not only help him gain essential skills but also provide net benefits, ultimately leading to an enhancement in job performance that is both noticeable and valuable (Srivastava & Raina, 2021).

In the context of e-pharmacies, it is the degree to which an individual believes that using an accessible web-based platform will significantly assist him in gaining vital skills, achieving net benefits, and subsequently enhancing overall job performance in a

meaningful manner (Srivastava & Raina, 2021). Performance expectancy can have a direct and profound effect on behavioral intentions and actual usage of the system. It is also asserted that a high level of performance expectancy will lead to increased feelings of familiarity and reliability concerning the system, which together greatly influences its overall usage patterns (Shin, Lee, & Hwang, 2017).

For instance, it is argued that the more familiar and reliant individuals become on ATMs and their functionalities, the more frequently they will be utilized in daily banking activities and transactions. In the same manner, if it is a person's opinion that e-pharmacies improve healthcare management it affects the adoption and use of e-pharmacies (Adebo, Aladelusi, & Mohammed, 2024). Users see convenience, efficiency as benefits, which leads to increased adoption and continued use.

Performance expectancy can lead to one of the intentions to use computer systems. In the UTAUT2 model, it is argued that performance expectancy can have a positive and direct effect on users' behavioral intentions of use and is influenced by factors such as perceived usefulness, ease of use, and result demonstrability. Performance expectancy of using computers has a significant positive effect on personal information adoption (Sair & Danish, 2018). The more one expects the performance outcome of using a computer system to be, the greater his intention of using the system is.

The advantage or benefit perceived about using a computer application system that impacts the decision to use the computer in his framework is called individual motivation to use computers. The concept is linked to the individual's intention of adopting new transactions by considering risks. E-pharmacy users acquire benefits or efficiency from the usage of the service. In extant research, performance expectancy is one of the perceived ease of use and perceived usefulness that also impacts individual intention to use it (Assin et al., 2024).

There is a salient effect of comfort perceived, i.e., satisfaction while adopting the e-pharmacy system (Gonzalez, 2020). Satisfaction influences action that results from a comparison of net benefits received from using a system relative to a user's expectation. Satisfaction among users is actually related to past experiences with all the things

associated with e-pharmacy system features, service quality, and image attributes (Urbanaviciute, 2022).

### **2.9.2 Effort Expectancy**

Effort expectancy refers to the perceived ease of use of a technology (Bendary & Al-Sahouly, 2018). This construct influences user behaviors within computerized environments. Imagine visiting a website. If you find that web page simple to navigate, low in complexity, and not time-consuming, this demonstrates perceived ease of use. Its application in the field of e-pharmacy is rooted in user experience and interaction. Adoption-based technology models can ensure high system satisfaction and a positive technology acceptance towards the utilization of e-pharmacy facilities (Adebo, Aladelusi & Mohammed, 2024). As such, the proposition of low effort expectancy suggests an increased likelihood of technology adoption.

Effort expectancy, the ease of using e-pharmacy services, is crucial for understanding e-pharmacy adoption and acceptability (Srivastava & Raina, 2021). It influences users' first decision and subsequent use over time. Analyzing this, along with other predictors and demographic influences, contributes to a comprehensive model for e-pharmacies' adoption.

One challenge associated with online exchanges of pharmaceuticals for perceived non-adherence results from the perceived effort expectancy related to checking and ordering medication (Bandiera et al., 2022). The measurement of effort expectancy as a construct becomes increasingly important, with the industry heavily depending on adherence to subsequent resource expectations, including those of time, psychology, and money. Users face many barriers to the perceived effort expectancy of e-pharmacy usage, including trust and privacy, associated fears through misinformation and disinformation, knowing that an involved doctor is real, and dealing with the technology. It is therefore imperative to streamline these (Srivastava & Raina, 2021). E-pharmacies, pharmaceutical companies and others in this market can benefit by capitalizing on the increase in users turning to and utilizing e-pharmacy.

### **2.9.3 Social Influence**

Social Influence significantly influence e-pharmacy adoption and acceptance. An individual's social settings, friends, and family influence the behavior therefore social influence must be evaluated on how it drives the consumer behavior to adopt e-pharmacies in the National Capital Region.

Social influence refers to the ways in which individuals or groups, as part of networks or communities, can influence an individual's decision-making processes and choices (Flache et al., 2017). For consumers, these influences can be from individuals who are relatives, close friends, or colleagues, or from communities and social networks composed of other health professionals. These interactions suggest a process of shared opinions, shared beliefs, and shared knowledge, and underpin a repeated theme in e-commerce adoption research suggesting that there is an increased likelihood of technology adoption if an individual's social networks adopt before them.

Consumers' use of e-pharmacy services is significantly influenced by social factors, involving family, healthcare experts, and online social communities. These networks form an individual's social circle which has an influence on technology adoption (Bandiera et al., 2022). Observing peers order and pay for medicines online through e-pharmacies, creates a perception of ease of use and significantly increases adoption. This social endorsement lessens ambiguity and aids reticent consumers in "crossing over" from physical pharmacies to online pharmacies. Commercial messages through social influence such as endorsements or referrals from physicians have the tendency to highlight the social value of e-pharmacies (Adebo, Aladelusi & Mohammed, 2025; Misra, 2024).

With regard to India, the influence is even more accentuated because of the collectivist ethos, where people operate as a group and share the same perspective (Ezeudoka & Fan, 2024). The e-pharmacy platforms are endorsed by family doctors, pharmacists, and even social media and online opinion leaders. Furthermore, the reviews, ratings, and testimonials on the e-pharmacy platforms, enhance the perceived value and reliability of the services. Hence, social influence not only serves as an adoption trigger but also acts as a support system to deepen the confidence and adoption of e-pharmacy services.

#### **2.9.4 Facilitating Conditions**

Facilitating conditions are the second of the four main technology adoption predispositions in the original concept and refer to the resources, support, or opportunities available to help individuals engage in the targeted behavior or action (Macedo, 2017). Facilitating conditions are relevant to e-pharmacy adoption in terms of the greater technological resources that might be required and additional support from pharmacists needed for reordering prescriptions and obtaining medication detailed in a patient-centered orientation (Ezeudoka & Fan, 2024). In healthcare, the locations and proximity of providers, including pharmacies, clinics, and hospitals, are all potentially facilitating conditions for service adoption.

Facilitating conditions pertain to the availability of resources, infrastructure, and support systems which allow consumers to utilize e-pharmacies effectively. These deal with availability of stable internet, smartphones or computers, digital payments, as well as order applications (Misra, 2024). From the consumers' perspective, the assurance of reliable logistics and delivery, return or replace policies, as well as responsive customer care polishes their trust on the e-pharmacies. With these systems and resources in place, consumers are less confused in adopting e-pharmacy over the traditional pharmacies.

In the Indian scenario, facilitating conditions also cover regulatory frameworks, government policies, and campaigns geared to promote the safe and legal use of e-pharmacy services (Fan & Ukaegbu, 2024). For example, the adoption of Aadhaar-based prescription verification, secure payment gateways, and digital literacy promotion enable adoption. Additionally, prescribing patients with e-pharmacy recommendations, from their healthcare practitioner, add another layer of facilitation. Therefore, the availability of well-defined facilitating conditions not only diminishes perceived risks and improves adoption, but also enhances the likelihood of long lasting adoption, acceptance and usage of e-pharmacies.

However, the technology adoption research on these solutions primarily focuses on those beliefs immediate to the adoption process, such as perceptions of usefulness or ease of use,

and does not explicitly provide a set of social constructs to explore whether individuals have the facilitating conditions for adoption (Greenhalgh et al., 2017).

### **2.9.5 Hedonic Motivations**

Hedonic motivation is an intrinsic pleasure and delight derived from using a product or service; it has a significant impact on the consumer usage and adoption of e-pharmacies (Tamilmani et al., 2019). Hedonic motivations drive people to engage in activities as they expect worth, pleasure, enjoyment, and fun from doing those tasks. It is a norm that people perform tasks because they see pleasure, interest, or enjoyment, and when a user perceives harm from the use of these tasks, they repress them, creating discomfort (Fan & Ukaegbu, 2024). Moreover, hedonic motivation results from sensory pleasure or other psychological enjoyment experienced by a person during the use of a specific facility offered to them.

There are four components of enjoyment: the first is the function of magnitude, the second is that mental activity persists, and the current research indicates that the amount of activity does not increase after the optimum (Ainley & Hidi, 2014). For the current study, the exploration of e-pharmacy and the intention to use e-pharmacy are directly associated with the hedonic motivations of a person (Srivastava & Raina, 2021). This concept refers to a user's motivation to experience normative pleasure from various e-pharmacy facilities or tools. It includes various pleasure-derived factors while visiting an e-pharmacy web page, such as enjoyment of browsing products and services after visiting their site, users experience pleasure as they do not have to go through any type of intermediary or agent during their transaction. Traditionally, healthcare & pharmaceuticals is considered a utilitarian domain. Shifting away from their bare necessities, modern consumers, particularly in metropolitan areas like the National Capital Region (NCR), engage with health technologies not only for convenience, but also for satisfaction and enjoyment. E-pharmacies that provide an engaging, effortless, beautiful, and gratifying user experience tend to gain more users, particularly those that are already accustomed to using tools such as e-commerce, and other digital platforms (Proenca, 2021). The transaction path must be seamless, pleasurable and satisfactory for customer while using e-pharmacy system (Misra, 2024). An e-pharmacy helps a user serve their individual wants and desires. This creates happiness that a user experiences upon revisiting the site, i.e., dwell time. The main essence

of these factors is to delineate the emotional aspect, also called hedonic motivations, of a web consumer, which plays an indirect role in shaping their behavior in adopting e-pharmacy.

#### **2.9.6 Price Value**

For retail pharmacy services to survive in the age of online healthcare, price value must be prevalent, clear, and perceived (Luo et al., 2019). Traditional consumers are acutely sensitive to the cost of pharmaceuticals in the marketplace (Lakdawalla, 2018). The buyers' discretion in purchasing over-the-counter or prescription pharmaceutical products often affected by affordability of the medication to which they are committed. In contrast, although often more convenient, utilizing the modern convenience services of the e-pharmacy model is supposed to be more expensive.

Price value greatly influences the adoption of e-pharmacies since it influences the choices that the consumer will make. Obviously, the cost-benefit analysis of e-pharmacies would be by balancing expenditures with benefits influenced by affordability of online transactions, effort savings, and time (Adebo, Aladelusi, & Mohammed, 2024). This could be useful in ensuring user satisfaction and continuation over time in the diverse regions.

E-pharmacies, when explored from the ecosystem of grocery and mass-market health and beauty aids, are economically profitable on several factors, including price/interest elasticity and price offerings as related to the overall competitive marketplace (Scott & Walker, 2018). Indeed, the price value of pharmaceutical services should be viewed as an intricate consumer decision-making process. There exist economic benefits derived in the form of perceived as well as actual savings for consumers who utilize retail pharmacy. For consumers that retain third-party copay benefits, the out-of-pocket cost for pharmaceuticals is further decreased inside a retail pharmacy services model (Vogler, Dedet, & Pedersen, 2019). This economic benefit of price value extends to those that retain category items including health and beauty, over-the-counter and prescription fertilization and hormone replacement therapy pharmaceuticals, and other grocery-related items. However, it is noted that consumers like the retail experience.

In e-pharmacy adoption context, price value refers to a consumer's mental balance of the e-pharmacy's priced medicines with the advantages of convenience, accessibility, and added services. E-pharmacy adoption and continued usage are reinforced when consumers perceive e-pharmacies to have lower price, greater discounts, and more cost savings relative to physical pharmacies. On the other hand, adoption and usage may decrease when pricing is perceived to be unjust, or not in alignment with the value received. Thus, price value is a key determinant of consumer behavior and acts as a strong motivation or deterrent to the adoption, acceptance and continued use of e-pharmacies.

### **2.9.7 Perceived Trust**

Perceived trust is the belief in the reliability, integrity, and competence of an entity. It comes from the original idea of trust and extends it to the context of the current digital era. There are various dimensions that contribute to the perception of trust. On an individual level, there are numerous psychological variables, such as processing style, that have been shown to be significantly involved (Phillips et al., 2016). Regarding circumstantial factors, it has also been highlighted that dimensional trust can be influenced by various situational factors. If customer perceive the situation favorably, they are more likely to trust. In the context of e-pharmacy where dependability and safety are paramount, trust is one characteristic that influences consumer discretion towards adopting e-pharmacy services (Fan & Ukaegbu, 2024). As digital healthcare diverges, consumers find themselves increasingly exposed to different online pharmacy platforms and it becomes crucial as to which platforms they decide to adopt and use consistently (Almeman, 2024). Criteria such as trust whether it is a genuine platform, preserving privacy, transmitting sensitive data and other services like timely and accurate service greatly influence making a e-pharmacy platform dependable.

The brand's trustworthiness, operational transparency, secure payment gateways, prescription verification, and prior consumer feedback all contribute to the trust in e-pharmacies (Shinde et al., 2025). Trust is often composed of multifaceted factors. E-pharmacies are viewed as more credible by consumers who think that the online pharmacy adheres to legal frameworks, works with reputable suppliers, and sells authentic products (Baali, 2023). Customers expect e-pharmacies to offer more than just competitive pricing

and ease of access, they want foundational trust that can differentiate the e-pharmacy in order to foster long-term loyalty.

Trust will be even more prominent for elderly users and first-time users who wish to move from a physical interface to a digital one (Knowles & Hanson, 2018). The fear of receiving counterfeit medications, late delivery, or misuse of personal information results in reduced interaction with e-pharmacy systems. Contrarily, lack of trust in e-pharmacies proves to be a significant challenge when trying to adopt, regardless of supporting structures that include performance expectancy or price contrast (Santos, 2022).

About perceived trust and e-pharmacies, perceived trust further seems to be influenced by the nature of the website. The effectiveness of the website and the assurance that the products are appropriately being sold is experienced by the website surfers, who apparently do not have any clue about e-pharmacy, as proof of the quality of the website. This is based on the design, perceived security, professional credentials, and so on. Users are more likely to trust and, of course, purchase from an aptly accredited website. In essence, a e-pharmacy website could be considered secure that ensure consumer safety about transacting online. These include website features, such as providing information regarding the existence and background of the user, details of the drugs, and offering free or low-cost deliveries given certain criteria (Fan & Ukaegbu, 2024).

If the level of trust appeal presented on a website is low, then the online seller is likely to lose potential sales. Further, building trust with customers helps them to use this perceived trust to their advantage (Kang & Hustvedt, 2014). Having good customer testimonials presented on the site will encourage these surfers to make their purchase. In this regard, trust is perceived as one of the factors driving an active user towards acceptance of an e-pharmacy site and defining continued usage.

The perceived trust in e-pharmacies plays a significantly important role in determining the adoption and acceptance of the user since it affects trust related to the security, reliability, and legitimacy of the e-pharmacy (Rajput & Seetharamam, 2022). Therefore, this is also influenced by the demographic characteristics, and there lies an imperative need for the

initiatives to enhance this trust for all diversities of users from the National Capital Region, India.

### **2.9.8 Perceived Risk**

The most influential factor with regards to e-pharmacy adoption and acceptance involves perceived risk. It includes security, quality, and privacy concerns of the user in general (AlSideiri, Cob & Drus, 2022). Understanding the knowledge about this risk can be instrumental in recognizing the impediments that users have and hence availing strategies that will be applied to alleviate them. That understanding can be used in better designing e-pharmacy platforms, dispensing the medicines and securing the customers private information.

Perceived risk is considered a multi-dimensional construct (Pappas, 2016). It has been conceptualized in various dimensions such as financial risks, privacy risk, performance risk, and health or well-being risks. In general, the perception of any kind of risk may hinder potential users from adopting e-pharmacy. As e-pharmacy services are basically related to health and money or financial transactions, a perceived financial risk may be very crucial (Renwick & Mossialos, 2017). When the parties involved are the retail pharmacy and the patient, the financial risk may be very low as the patients know the pharmacies.

However, as pharmaceutical e-commerce is impersonal in nature, consumers can have doubts related to this (Chen, Zarifis, & Kroenung, 2017). In general, it is the higher price of pharmaceuticals that indicates a higher perceived financial risk. Health risks are very serious risks that may distract potential users from adopting e-pharmacy (Gregorio, 2016). If consumers see this online transaction as dangerous, perceiving a probable privacy or security problem, it is likely that they will not accept this technology.

Many people have some form of psychological barrier to dealing with health personnel in relation to undesirable treatment, as they cannot jeopardize their privacy. Understanding such perceptions of perceived risk is very crucial, as they may directly or indirectly take part in minimizing the risk (Hong, 2015). It is risk that is considered the base of trust. The

construct of perceived risk supports the study on intentions of adoption of technology as well as the use behavior of the users. Both privacy and security hazards notably contribute to the risk perception. E-pharmacies require users to provide sensitive health data, details of prescriptions, and payment information (Tuula, Sepp & Volmer, 2022). In a data driven economy, worries about the potential abuse of personal information and confidentiality or a lack of it, or data breach can inhibit consumers from using e-pharmacies.

Product risk is one of the most highly pronounced forms of perceived risk while adopting an e-pharmacy (Santos, 2022). This involves orderly categorization and the concern that they may receive the wrong drug or one that is either outdated or expired and few being fraudulent. Because medication is sensitive, end users are most concerned about any void in terms of quality and authenticity of prescribed medicines or drugs. This lack of clarity often results in reluctance or total avoidance for purchasing medicines, particularly for chronic or serious medical conditions (Kobue, Moch & Watermeyer, 2017).

Healthcare as an industry is unique in that timely delivery is critical, as anything less can have serious repercussions (Tabish & Nabil, 2015). Users of services who have had unpleasant experiences with other online services are likely to extend the same negative perceptions to e-pharmacies. Furthermore, during emergencies, a lot of consumers continue to rely on physical pharmacies where medicines are available instantly as opposed to waiting for delivery (Alam et al., 2018).

Some prior research tends to imply how perceived risk can be minimized or ignored, as perceived benefits can overcome perceived risk. If the benefits are seen as higher than or equal to the perceived risks, then an individual may try the adoption of e-pharmacy (Srivastava & Raina, 2021). But it does not imply that this initial trial will result in reward, since in the later stages they may make a judgment. It is only an initial step. E-pharmacies can combine perceived risk with performance risk, as this performance can be determined over a concern of health risk. Therefore, if the technologies support the judgment of risks better and more accurately, then it may be perceived as a higher beneficence factor (Srivastava & Raina, 2021). Risk, as a barrier, remains one of the fundamental structures that influence directly how a consumer uses an e-pharmacy platform (Srivastava & Raina,

2021; Adebo, Aladelusi & Mohammed, 2025). As cited previously, healthcare is the most sensitive industry where risks pertaining e-pharmacy use remains a major concern.

### **2.9.9 Personal Innovativeness**

Personal innovativeness is a predisposition to uptake new technologies or service, which will strongly determine the adoption and acceptability of the e-pharmacy platform (Kaushik & Rahman, 2014). Innovative individuals are more inclined towards experimentation and adoption of the e-pharmacy. These are the individuals who are interested in digital or online services and are willing to search for new or advanced systems that can help in saving time, effort, and resources in regard to healthcare (Kitsios et al., 2023).

Personal innovativeness (PI) has been defined as the measure of the propensity of an individual to adopt new ideas, technologies, or practices earlier than others (Wu & Yu, 2022). In the context of determinants of e-pharmacy, PI is a suitable construct since it functions in two ways. First, it portrays the element of evidence in human behavior of being naturally inclined towards the acceptance of a healthcare innovation. Second, it also has a hint of the reception and perception of the ease that new age apps orchestrating pharmacies promise. Personal innovativeness is majorly a construct open to change, particularly technological change.

E-pharmacy remains a novel approach to selling drugs, which is in consonance with the general upswing of electronic commerce (Baviharan & Vijayalakshmi, 2024). Personal innovativeness impacts the way users perceive the risk and the level of complication involved with the e-pharmacy platform. More innovative people tend to be more adept at using foreign systems and more forgiving of problems related to applications such as delays in delivery, digital payments, and so forth (Talwar et al., 2021; Hussain, Gupta & Bhardwaj, 2024). A customer wanting to avail themselves of these retailers' services should be able to handle the e-sharing of electronic medical records. Personal innovativeness, a systematized approach to risk-taking, comfort levels with technology, and prior technology exposure are some of the factors that affect the adoption of e-pharmacy services. Fostering personal innovativeness among would-be customers is

beneficial in the context of e-pharmacies in nations that have an appreciable count of consumers who are internet users.

In addition, personal innovativeness also helps in the design of services that the on-boarded customers can take to more comfortably and is also likely to elevate long-term customer relations something that e-pharmacies could do well to take note of (Hwang & Hyun, 2016). Innate innovativeness, which is technology-friendly, also holds proclivity to adopting e-pharmacy for their medication needs.

#### **2.9.10 Health Literacy**

Health Literacy impacts the adoption, acceptance and usage of e-pharmacy as it influences an individual's capacity to understand digital healthcare, medical information, and make decisions (Punakivi, 2019). This level of literacy represents the trust-risk and supports the ability to implement e-pharmacy strategies. Health literacy can be simply defined as possessing the skills needed to access, understand, evaluate, and utilize health information effectively. Being able to read and follow the instructions on a prescription label, talking to your pharmacist about dosing errors or instructions that you do not agree with, determining which medication to purchase out of many available on the market, and deciding the best method to treat a mental health issue are all types of decisions that involve varying levels of health literacy. At its core, health literacy involves more than technical reading skills and basic math; it involves the knowledge, motivation, and ability to make good decisions about health (Wittink & Oosterhaven, 2018).

In an online health environment, health literacy goes one step further: in order to access necessary medical records, use a digital health system to communicate with a care professional, or keep track of glucose data with a mobile phone app, patients must be able to interact on a digital and e-commerce level, unless family or friends are performing the actions for them, which is becoming increasingly common (Busse et al., 2022). For example, patients must be able to read and provide the information that the electronic health record systems are prompting. Patients must also possess the knowledge and ability to navigate the pharmacy's website or app to do what one would have done in person at a local pharmacy: browse and purchase medications, find health information or contact a

pharmacist, or make appointments, for example (Davies et al., 2014). Without the ability to navigate the digital written information on the e-pharmacy platform, some will not be able to use an e-pharmacy effectively.

Literate customers in health matters are generally more proactive towards managing their health which enables them to comprehend a prescription and its corresponding dosage as well as appreciate the need for compliance (Car et al., 2017; Riad, 2024). Therefore, they stand a better chance of exploring e-pharmacies that have convenience, control, and rich medical information interfaces. On the other hand, low health literacy hinders the adoption of e-pharmacies. Patients with low health literacy will often have difficulty understanding most content about medications or interpreting off terms which appear to be technical or assessing the trustworthiness of information put out on the web (Diviani et al., 2015; Chen et al., 2018). These factors add to the confusion, distrust, or misuse of the pharmacy services offered online. Such individuals, particularly those with chronic or complicated conditions, are unlikely to change from face-to-face pharmacies where instructions are given in-person to rely on e-pharmacies because they are used to depend on face-to-face explanations and instructions.

Interestingly, high health literacy has been found to be associated with greater adoption of e-pharmacies (Fan & Ukaegbu, 2024; Sabbir, Islam & Das, 2021). Medical information dispensed by the e-pharmacy and presented on their website is enjoyed by those who have the capacity to understand and benefit from it, making them ready and avid consumers. Those who possess low health literacy were far too skeptical or confused about such information to take an interest (Fan & Ukaegbu, 2024). The construct also correlates with e-pharmacy usage. In sum, a person who has high health literacy is more ready and equipped to use a service, connectivity, or even the internet to engage in an e-pharmacy, whether they actually will or not. On a healthcare scale, high health literacy associates with the best outcomes, and so too with e-pharmacies.

## **2.10 Acceptance of E-pharmacy**

Acceptance of e-pharmacy refer to experiential stage where user evaluate the authenticity, satisfaction and usability of the e-pharmacy platforms. Acceptance of any technology

platform e.g. e-pharmacy occurs when a technology sufficiently satisfies all the needs and requirements of its users (Liu et al., 2019).

Technology acceptance models, like TAM, the Theory of Planned Behavior (TPB) and later, the “Unified Theory of Acceptance and Use of Technology” (UTAUT) has conceptualized adoption intention as primary predictor factor of individuals’ engagement with technological system. However, recent studies argued that initial adoption, only, cannot suggest sustained use, an essential requirement for improving patient adherence, chronic disease management, and health outcomes, especially in a risk prone domain like healthcare. While Adoption reflects initial evaluation decision but acceptance refers to attitudinal state after adoption, developed through direct experience, reliability and trust formation (Tamilmani et al., 2019; Limayem et al., 2007; Bhattacharjee, 2001).

In the context of e-pharmacy, acceptance as subsequent state after adoption becomes more important as initial adoption of e-pharmacies is determined by perceived benefits like convenience, rapid delivery etc. and perceived cost advantage (Rajput & Seetharaman, 2022). However, acceptance developed after users weigh value for price against anticipated benefit. Trust in the safety of the platform is seen to minimize risks (Panggabean et al., 2024; Al-Debei et al., 2015; Pavlou, 2003). This effect could be moderated by demographic factors to provide variations on sensitivity levels of users toward the predictors.

The user behavior between the adoption of e-pharmacies as an institutional-based activity and the acceptance of the system as a system-in-use-based activity will establish the linkage between the former and the latter (Varghese Assin, George, & Sivakumar, 2022; Hassan, 2024). We are interested in what determines the latter that can imply how well-integrated e-pharmacies are in the existing pharmaceutical marketplace. This forms the theoretical foundation of this research premise that the acceptance of e-pharmacies is determined largely by the user perspective towards the system-in-use.

### **2.11 Usage of E-pharmacy**

The usage of e-pharmacies refers to the actual participation and behavior of people in using online platforms for their pharmaceutical requirements. This is inclusive of how often and to what extent people buy medicines provided by the e-pharmacies. The convenience of

the internet, cheap prices, assurance in online transactions, and the convenience of obtaining health care services online play a contributing factor to utilization as well (Ye et al., 2022).

The usage construct refers to the duration, frequency, intensity, or temporality of use of a product, as well as the sequence or measured entry point into the use structure of a product (Al Halbusi et al., 2025). While adoption measure initial willingness and acceptance captures users' attitudinal alignment after initial exposure, usage signifies the transition into stable, repeated, and value-driven engagement. In the health sector, usage refers to the extent and manner of interaction and can reflect several factors including initial adoption, initiation, first use, exploration, completed intention, ongoing active use, or abandonment. Conceptually, usage is fundamentally the extent of the use of a product. There are different types of usage, including levels of frequency, extent, strength, closeness, persistence, or depth (Kim et al., 2019).

Usage signifies the degree of user satisfaction or user dissatisfaction concerning the system in question (Urbanaviciute, 2022). Usage distinguishes between active and passive engagement; the latter describes a situation in which a user has adopted a system but has not engaged with it for an extended period. Various terms have been employed to define usage, including the acceptance of use, which involves the completion of a sequence of continuous yes/no behavioral intention decisions (Kim et al., 2019).

Various studies have found that there are several factors that facilitate continued usage, for example, repeated positive experience with the system converts acceptance into usage (Limayem et al., 2007) and trust in e-pharmacies that shows consistent product authenticity and transparent operations strengthen the user's long-term commitment (Mayer et al., 1995; Gefen et al., 2003). Usage grows when e-pharmacies contribute meaningfully to customer with convenience, time saving, chronic medication refills, reminders, or integrated teleconsultation (Dhiman et al., 2020; Liu et al., 2019; Al-Debei et al., 2015; Brata et al., 2017)

In the context of e-pharmacy, transition from adoption to acceptance to usage is important as continued usage ensures medication adherence, chronic disease management, and health system efficiency.

### **2.12 Demographic Characteristics and E-pharmacy Adoption, Acceptance and Usage**

Age, gender, education, and level of income also play a significant role in the propensity toward adoption and embracing e-pharmacies. (Adebo, Aladelusi & Mohammed, 2024). Such findings could be applied to design the e-pharmacy platforms to cater to consumer needs further and, hence, to increase the reach and efficiency of e-pharmacies within the National Capital Region.

Demographics as a construct is a popular area of systems analysis, as it determines not only the previous status quo in the domain in which the benefits of the system may now be added to through adoptions, but it also marks certain limitations on the adoption and use of innovative services (Cesare, 2018). While demographic characteristics, such as age, gender, socioeconomic status, and their interrelationships within the construct of "educational and economic capital," have come up in the forefront of discussions of e-pharmacy, they were introduced in this literature as background information only. They were hypothesized to influence thematic roles through their associations with the independent variables, as age was hypothesized to influence hyperbolic discounting in the domain of influenza vaccination adoption (Bate & Robert, 2023).

Until now, demographic groups, including age, have been tested only as background characteristics or univariate associations, rather than building, systematizing, and testing the full quantitative linkages within the theoretical model from healthcare utilization like nursing service utilization. The implementation of e-commerce, in general, involves an understanding of the different groups of users and a dim view of their preferences, perceptions, and reasons (Brag & Gulamhusein, 2024). Different users of e-pharmacies are expected to have a different mixture of reasons and perceptions or reasons and resistance (Santos, 2022).

### **2.12.1 Income:**

Income plays a crucial role in shaping consumers' purchasing power and their ability to adopt new technologies. In today's digital era, an increasing number of people are investing in technological gadgets, with affluent individuals often being more technology-savvy compared to those with lower income levels (Viswanathan & Sreekumar, 2019).

Past literature suggests, individuals with varying income level differ in their sensitivity to price, digital savviness', trust, and perceived value of online medical services (Pikkarainen et al., 2004; Pavlou, 2003; Al-Debei et al., 2015). For example, low-income group individuals are more sensitive to savings offered by e-pharmacies in form of discounts, cashback, bulk-order value, and delivery charges (Pansari & Kumar, 2017), while high income group individuals may prefer e-pharmacies for convenience rather than financial benefits. Similarly, Income strongly correlates with educational background and digital access, affecting the ability to evaluate online health information (Norman & Skinner, 2006; Neter & Brainin, 2012). It has been found that lower-income customers often depend on trust cues, such as pharmacist verification, return policies, brand reputation, and medicine authenticity, before engaging with online medicine purchase (Kim, Ferrin & Rao, 2008).

Hence, customers' access to resources, affordability, risk averseness, and digital behaviors is moderated by Income. Income also suggested to be moderate customers' psychological movement from the state of acceptance to continued usage.

### **2.12.2 Age:**

Age is an important demographic variable that significantly influences technology adoption. In the context of online health behavior, age influence the mental processing of the digital information, health needs, confidence, and perceived value of digital and online services. Prior studies show that younger adults differ markedly from older adults in their behavior in interaction with digital technologies because of variations in digital literacy, technological familiarity, and motivational drivers (Venkatesh et al., 2003; Limayem et al., 2007; Yusif, Hafeez-Baig & Soar, 2017).

In the e-pharmacy context, age shapes how individuals evaluate risk, trustworthiness, ease of use, and the benefits of purchasing medicines online. For example, Older adults may experience lower digital health literacy levels (Norman & Skinner, 2006; Neter & Brainin, 2012), requiring more cognitive effort to navigate e-pharmacy platforms. Similarly, older adults tend to perceive higher risks in online purchasing and data sharing compared to younger users (Kim, Ferrin & Rao, 2008).

### **2.12.3 Gender:**

Gender plays a crucial role in shaping technology adoption and acceptance patterns. Traditionally, males have been perceived as more likely to adopt and experiment with new technologies due to higher exposure and interest in technological innovations. Men tend to assess technologies based on performance, efficiency, usefulness, and functional capability that makes them more responsive to factors such as performance expectancy, price value, and innovativeness (Agarwal & Prasad, 1998; Lai, Lai & Lowry, 2016). However, with changing societal trends and increasing digital literacy, female attitudes toward technology are also evolving. Women are no longer seen as technology-challenged; instead, they are increasingly regarded as technology-savvy, actively engaging with digital tools and platforms for both personal and professional purposes. However, in contrast to men, women evaluate technologies based on its ease of use, social interaction quality, perceived risk, and trust, as they often place greater importance on safety, emotional reassurance, and reliability in digital environments (Gefen et al., 2003; Kim, Ferrin & Rao, 2008). This gender gap in behavior towards technology adoption highlights the importance of considering gender dynamics when analyzing customer behavior in the digital era in the context of e-pharmacies.

### **2.12.4 Education:**

The level of one's education critically determines their digital literacy as well as their acceptance of technology. Despite the fact that primary education is free in India, the literacy rate is low when compared on a global scale, which impacts the level of engagement individuals have with sophisticated technologies (Assin et al., 2024). It has been found that higher education levels are strongly associated with greater digital literacy, information processing capability, and health-information comprehension (Norman &

Skinner, 2006; Neter & Brainin, 2012). It has also been reported that high educated people rely less on external validation for trust, while less educated online users more often depends on the external reassurance, social validation, and platform reputation (Gefen et al., 2003; Pavlou, 2003). Moreover, motivation to use and engage in online services differs by education level i.e. highly educated users may seek efficiency, advanced features, and deeper informational & knowledge value (Moon & Kim, 2001; Tamilmani et al., 2019).

Hence, education shapes the cognitive evaluation of the underlying usefulness, ease of use, trust, and perceived risk, making it a key contextual factor in predicting adoption behavior (Agarwal & Prasad, 1998; Venkatesh et al., 2003).

## **2.13 Research Gap**

Academic and industry studies have investigated the various factors that might determine consumers' motivation to favor the use of e-pharmacy services over the conventional brick-and-mortar pharmacy setup that many individuals have relied on for years, often without question (Panggabean et al., 2024). Among these critical determinants, the perceived ease of use and the perceived usefulness of these innovative e-services stand out as being the most significant and influential on consumer behavior. The results arising from these diverse studies are mixed and varied, indicating a distinct and novel direction for further exploration to understand these factors more deeply in relation customer behavior to e-pharmacies.

- Most of the existing e-pharmacy studies either studied contextual & functional adoption behavior with limited theoretical integration (Panggabean et al., 2024; Agarwal, 2023; Verma & Sharma, 2021) or rely heavily on the traditional technology adoption models like TAM, TPB, UTAUT etc. which looks at adoption intention as final behavioral outcome and miss or overlook the deeper stages of acceptance and continued usage (Zhu et al., 2023; Rajput & Seetharaman, 2022; Alaşehir, Sezgin & Özkan, 2013).
- While there are evidences that suggests online health behavior need post-adoption evaluation (Limayem et al., 2007; Bhattacharjee, 2001; Pavlou, 2003), but literature

rarely examine post adoption stages like adoption to acceptance to usage of e-pharmacy.

- A small number of studies have taken the initiative to thoroughly investigate the contributions of family dynamics, internet or web experience, as well as circulation patterns in relation to the utilization of e-pharmacy services, which adds depth to our understanding of user behavior (Matafwali, 2024). However, it is noteworthy that none of these existing studies have critically examined essential factors such as perceived usefulness, trust, health status etc. in their detailed examination of how these pivotal elements affect the customer behavior towards e-pharmacy (Almeman, 2024). Literature suggests online health specific determinants like health literacy, perceived trust, perceived risk and personal innovativeness are rarely investigated and seldom integrated in a unified e-pharmacy adoption model, creating a theoretical void in explaining the e-pharmacy engagement in real world situations.
  - Indian e-pharmacy research remains even more limited and fragmented, with very few studies employing advanced causal modelling approaches such as PLS-SEM to understand the structural and psychological determinants of user behavior (Dhiman et al., 2020; Rajput & Seetharaman, 2022; Kathiwada et al., 2024)
- Demographic moderators such as age, gender, income, and education are inconsistently examined, especially in Indian context, in earlier e-pharmacy studies.
  - There is minimal investigation of how demographic groups differ in their responses to trust, usefulness, risk, literacy, and price value etc., even though these differences are well established in technology and digital health research (Kim, Ferrin & Rao, 2008; Norman & Skinner, 2006; Al-Debei et al., 2015).
- There is limited holistic research integrating cognitive factors like performance expectancy, effort expectancy, price value, social influence, personal innovativeness, and facilitating conditions; emotional factors like hedonic

motivation; literacy based factor like health literacy; and trust-based constructs like trust and risk, into a single behavioral model to understand long-term and deeper digital medication purchase behavior.

Consequently, in a far more systematic approach, present study adapts the current advancements in theoretical and methodological knowledge to address the research gaps and offer empirical evidence. For this reason, primary objective of this study is to identify customers' adoption, acceptance and usage of e-pharmacies, using a hypothetical prototype based on up-to-date theoretical standards, and hence to present a comprehensive view of the factors considered critical.

Therefore, the topic "Customer's Adoption, Acceptance, and Usage of E-Pharmacy in National Capital Region, India" has been taken for the present study.

## **Chapter-3**

### **Research Methodology**

The methodology used for the investigation is provided in this chapter. The chapter begins by outlining the goals of the current study, which were determined after reviewing pertinent literature. Along with the population, sample, and sampling techniques, it also includes a description of the research environment, philosophy, design, and strategy. The chapter also covered the methods for gathering the data, the instrument's pilot study validation, and the data analysis methodology.

The chapter concludes with a summary of the key points covered.

#### **3.1 Research Questions**

Through this study, the researcher tries to address the below questions related to the research.

- What are the key factors that influence the adoption, acceptance and usage of e-pharmacy services?
  - How do UTAUT-2 constructs like “Effort Expectancy, Performance Expectancy, Social Influence, Facilitating Conditions, Hedonic Motivation and Price Value” impacts customer adoption of e-pharmacy?
  - Will Health Literacy, Personal Innovativeness, Perceived Trust, and Perceived risks influence adoption of e-pharmacies in NCR, India?
- Does post-adoption behavior in Adoption to Acceptance to Usage of e-pharmacies exist in NCR, India?
- How do demographic factors like age, gender, income and education moderate the relationship between influencing factors and e-pharmacy adoption, acceptance and usage?

#### **3.2 Research Objectives**

The primary objective to develop and assess a comprehensive research model to gauge the use of e-pharmacies for medication purchases in the Delhi-NCR region. Taking into

consideration the review's limits and shortcomings, the current study set out to accomplish the following objectives:

- To explore the factors affecting e-pharmacy Adoption, Acceptance and Usage.

Method/Analytical Approach: To accomplish the objective, researcher will conduct detailed literature review; identify research gap, develop the constructs and their respective items for quantitative study, perform the pilot study; perform the reliability and validity of model.

Expected Outcome: A validated set of e-pharmacy adoption, acceptance, and usage determinants.

- To analyze the effect of predictor factors influencing e-pharmacy Adoption, Acceptance and Usage.

Method/Analytical Approach: To accomplish the objective, researcher will perform quantitative assessment of the model to analyze the significance of predictor factor on e-pharmacy adoption, and assess structural relationships between adoption, acceptance and usage of e-pharmacy.

Expected Outcome: Identify determinants significantly influencing e-pharmacy adoption, and significance of adoption on acceptance and acceptance on usage to establish the customer's behavioral adoption-acceptance-usage continuum.

- To examine the moderating effect of demographics on relationship between predicting factors and e-pharmacy Adoption, Acceptance and Usage.

Method/Analytical Approach: To accomplish the objective, researcher will quantitatively investigate demographic moderating effects (gender, age, income, education) on the paths of the model.

Expected Outcome: Demographic moderating effects (gender, age, income, education) on e-pharmacy adoption, acceptance, and usage.

- To propose an empirical model of e-pharmacy adoption for National Capital Region's end users.

Method/Analytical Approach: To accomplish the objective, researcher will quantitatively assess the predictive validity and behavioral predictability of the proposed model, identify high-importance and priority-improvement constructs for enhancing user experience, and propose practical, managerial, and policy recommendations for strengthening end-user engagement with e-pharmacy platforms

Expected Outcome: Out-of-sample predictive performance of the model, importance & performance are requiring attention and recommendations.

### **3.3 Formulation of Research Hypotheses**

The development of hypothesis is focused on how certain factors affect the adoption, acceptance, and use of e-pharmacy services (Fan & Ukaegbu, 2024). Formulating research hypotheses is a critical step in any empirical investigation, as it provides a clear direction to the study and establishes the basis for testing relationships between variables. A hypothesis is essentially a tentative assumption or proposition that can be empirically tested using collected data. It bridges the gap between theory and practical research by translating abstract concepts into measurable statements. In the context of e-pharmacy adoption, for instance, hypotheses can be derived from established models like the TAM or “Unified Theory of Acceptance and Use of Technology” (UTAUT), ensuring that the study aligns with existing theoretical underpinnings.

The formulation process typically begins with an in-depth review of the literature, through which researchers identify patterns, contradictions, and gaps in prior studies. From these insights, specific hypotheses are crafted to address the research questions. This process helps ensure that the hypotheses are grounded in prior evidence while also pushing the boundaries of knowledge by testing new relationships in specific contexts. The following hypotheses have been framed to study the problem during the present research.

H1a: Effort Expectancy (EE) has a significant influence on the adoption (Ad) of e-pharmacies in the National Capital Region.

H1b: The relationship between Effort Expectancy (EE) and adoption (Ad) of the e-pharmacy is moderated by demographics (DEM) i.e. Age, Gender, Education and Income.

H2a: Performance expectancy (PE) significantly enhances the likelihood of e-pharmacy adoption (Ad) among users in the National Capital Region.

H2b: The relationship between Performance expectancy (PE) and adoption (Ad) of the e-pharmacy is moderated by demographics (DEM) i.e. Age, Gender, Education and Income.

H3a: Social Influence (SI) significantly supports the adoption (Ad) of e-pharmacies in the National Capital Region.

H3b: The relationship between Social Influence (SI) and adoption (Ad) of the e-pharmacy is moderated by demographics (DEM) i.e. Age, Gender, Education and Income.

H4a: Facilitating Conditions (FC) significantly impacts the adoption (Ad) of e-pharmacies in the National Capital Region.

H4b: The relationship between Facilitating Conditions (FC) and adoption (Ad) of the e-pharmacy is moderated by demographics (DEM) i.e. Age, Gender, Education and Income.

H5a: Hedonic motivation (HM) significantly influence the Adoption (Ad) of e-pharmacies in the National Capital Region.

H5b: The relationship between Hedonic motivation (HM) and adoption (Ad) of the e-pharmacy is moderated by demographics (DEM) i.e. Age, Gender, Education and Income.

H6a: Health Literacy (HL) has a significant impact on the adoption (Ad) of e-pharmacies in the National Capital Region.

H6b: The relationship between Health Literacy (HL) and adoption (Ad) of the e-pharmacy is moderated by demographics (DEM) i.e. Age, Gender, Education and Income.

H7a: Personal Innovativeness (PI) significantly influence the adoption (Ad) of e-pharmacies in the National Capital Region.

H7b: The relationship between Personal Innovativeness (PI) and adoption (Ad) of the e-pharmacy is moderated by demographics (DEM) i.e. Age, Gender, Education and Income.

H8a: Price Value (PV) has a significant impact on the adoption (Ad) of e-pharmacies in the National Capital Region.

H8b: The relationship between Price Value (PV) and adoption (Ad) of the e-pharmacy is moderated by demographics (DEM) i.e. Age, Gender, Education and Income.

H9a: Perceived Trust (PT) significantly influences the adoption (Ad) of e-pharmacies in the National Capital Region.

H9b: The relationship between Perceived Trust (PT) and adoption (Ad) of the e-pharmacy is moderated by demographics (DEM) i.e. Age, Gender, Education and Income.

H10a: Perceived Risk (PR) has a significant influence on the adoption (Ad) of e-pharmacies in the National Capital Region.

H10b: The relationship between Perceived Risk (PR) and adoption (Ad) of the e-pharmacy is moderated by demographics (DEM) i.e. Age, Gender, Education and Income.

H11a: Adoption (Ad) of e-pharmacies creates acceptance (ACC) of e-pharmacies.

H11b: The relationship between adoption (Ad) and acceptance of the e-pharmacy is moderated by demographics (DEM) i.e. Age, Gender, Education and Income.

H12a: Acceptance (ACC) of e-pharmacies increases their usage (USE).

H12b: The relationship between acceptance (ACC) and usage (USE) of the e-pharmacy is moderated by demographics (DEM) i.e. Age, Gender, Education and Income.

### **3.4 Proposed Research Model**

The proposed research model throws light on the increased relationship amongst “effort expectancy, performance expectancy, social influence, facilitating conditions, hedonic motivation, health literacy, personal innovativeness, price value, perceived trust, perceived risk, adoption, acceptance and usage of e-pharmacies” (Al Halbusi et al., 2025) in the National Capital Region of India. The determinants of consumer readiness, engagement

drivers, and brand equity influence the growth of e-pharmacies. Primary culturalization of e-pharmacy adoption occurs with the moderating variables such as age, gender, income, and education driving these associations (AlSidieri et al., 2022). These dynamics then become the cornerstone to mainstream e-pharmacies.

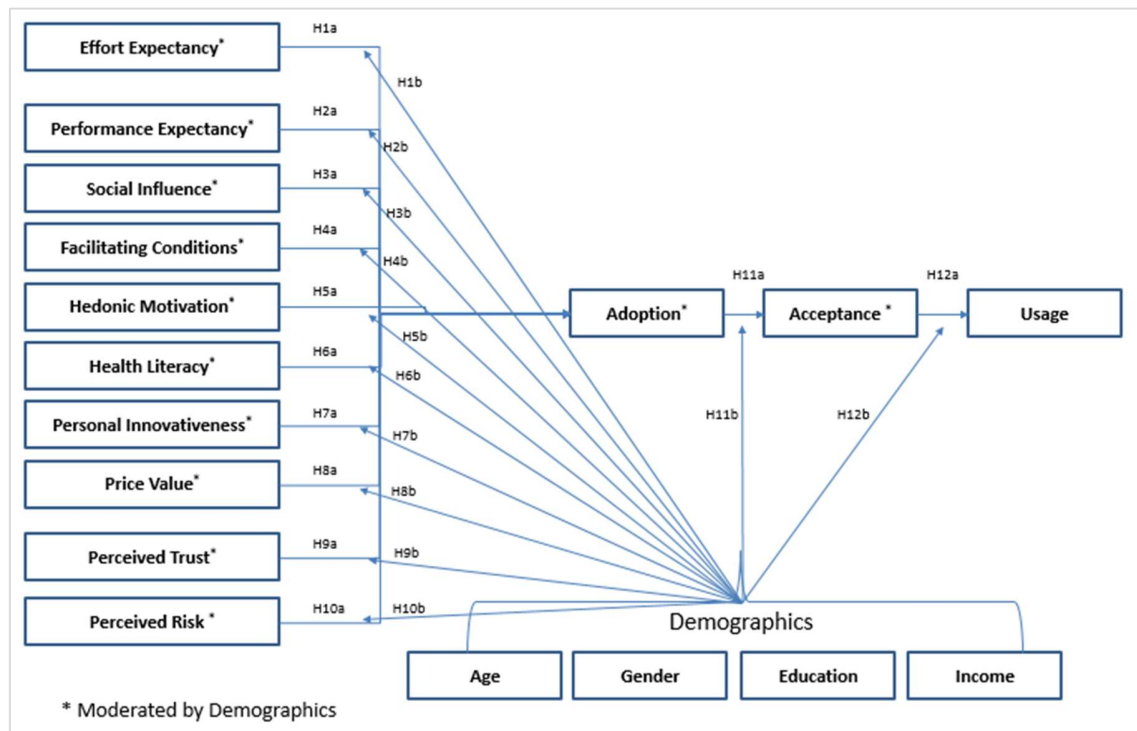


**Figure 3.1:** Research Model

**Source:** By Author

### 3.5 Research Context

The study area was Delhi-NCR region, which is in northern India. NCR is the metropolitan area of Delhi which encompasses satellite cities like Faridabad, Gurgaon, Ghaziabad and Noida, covering an area of about 55, 083 square kilometer (National Capital Region Planning Board, 2017). The NCR is a rural-urban region, with a population of over 46,069,000 and an urbanization level of 62.6% (Census, 2011). The Delhi Extended Urban Agglomeration, a part of the NCR, had an estimated GDP of \$370 billion (measured in terms of GDP PPP) in 2015–16 (With GDP of \$370 billion, Delhi-NCR muscles out Mumbai as economic capital of India, 2016).

Delhi, at the core of NCR, has the highest number of internet broadband user base at 8.7 million users (Telecom Regulatory Authority of India, 2015). Delhi also accounts for 10 to 15% of the national e-pharmacy market (Delhi accounts for 10-15% of trade, 2015)

Justifications for choosing Delhi-NCR as the study area as firstly, Delhi-NCR region is economically booming region and includes Delhi, the capital of India, with a population that is distinct in terms of cultural, income, level of education, religion, and language. Second, Delhi-NCR is an urbanized and multicultural region where several local and foreign enterprises offered e commerce services. Thirdly, majority of firms, immigrant entrepreneurs, private and public schools, banks, governmental organizations reside in Delhi-NCR region. Fourthly, bulk of telecommunications firms, internet service providers, e-pharmacy providers as well as bulk of internet users reside here. Lastly, little is known about the adoption, acceptance and usage of e-pharmacy to order medicines in Delhi-NCR context.

### **3.6 Research Philosophy, Design and Strategy**

The research philosophical approach, design, and strategy employed in this survey were covered in this section.

#### **3.6.1 Research Philosophy**

Research philosophies are typically categorized as either positivist or interpretivist. This study adopts a positivist philosophy, emphasizing the formulation and testing of quantifiable hypotheses, with findings interpreted through the lens of quantitative analysis. The research follows a deductive approach, where hypotheses are derived from existing theories in the field and subsequently examined using empirical data (Bryman & Bell, 2007). This approach aligns with the study's objectives, as both the hypotheses and data collection are informed by established theoretical frameworks and models.

#### **3.6.2 Research Design**

A research design consists of an arrangement of methodologies and constraints that facilitates the collection of data, which enables to gather in-depth insights regarding the research constructs and elements. The research design can guide the researcher to envision the objectives and equips them with a course of action to pursue (Antony and Banuelas,

2002; Hing and Antony, 2001). Specifically, it involves the combination of different perspectives of a specific study. These perspectives include theoretical robustness, methodological accuracy, and ethical soundness of the study. Descriptive, non-experimental and multivariate research types are appropriate for this study.

According to Given (2008), descriptive research is quite helpful in deriving solution with respect to a certain problem statement. The logic behind selecting this research design revolves around its ability to categorize the different aspects and elements of the research problem (Polit and Beck, 2004). Therefore, the research design tries to cover several aspects of research problem that can ultimately affect the study outcome. The primary aim of the current study lies in validation of a comprehensive research model, which explains the link between the constructs of interest.

Despite the wide acknowledgement from prior researchers, there seems to be gap since no study has attempted to investigate a comprehensive model involving all these factors. In response, this research tries to validate the inter-linkages between these constructs through a holistic examination. The descriptive research design involves an important feature that requires no investigator interference while measuring the research variables. Since the study was non-experimental, the researcher did not use control research settings and manipulation of research variables. Therefore, it was expected this research approach would generate relevant and unbiased samples to conduct a thorough analysis.

Usually, the cross-sectional design compares different population groups and assesses any phenomenon at one time. The advantage of adopting this design includes: a) Cross-sectional design helps to gather relevant responses from survey respondents belonging to different backgrounds (Wang et al., 2014), b) large samples for ensuring generalization and validity of the research findings (Kerlinger & Lein, 1986), c) aids in evaluating many variables (Kerlinger & Lein, 1986), d) Economical to use considering the amount of information it generates for the researcher.

Based on the advantages of cross-sectional design and the specific research objectives, the choice of selecting this design for the study seems appropriate. Confidentiality and privacy of survey responses were guaranteed to the participants. Therefore, exploring opinions of

the customers of e-pharmacies in the National Capital Region (NCR) of India which aligns with the study objectives. Further, the implementation of cross-sectional design may assist to generate information from large samples in a simple and cost-effective manner.

### **3.6.3 Research Strategy**

This is the systematic approach to gathering and analyzing information with specific goals in mind (Yin, 2009). The selection of the research strategy is imperative for building a well-structured two-part study. Given the principal objectives of this research, a survey was considered the most appropriate strategy because it facilitated the collection of primary information via a structured questionnaire. This method is common in research concerning online shopping and is appropriate in this case because it aids in the gathering of information that is quantifiable for statistical evaluation. Surveys also permit the evaluation of respondents' perceptions, opinions, attitudes, intentions, and behaviors in the population of interest (Zhou, Dai & Zhang, 2007; Zikmund et al., 2013). With this approach, data was collected from customers using e-pharmacy to order medicines about their demographics and shopping experiences. A cross-sectional design was used, which allowed data collection at a single time. This method was suitable for the study's timeline since there was no longitudinal data available regarding shoppers' experiences. Therefore, respondents completed the questionnaire only a single time.

### **3.7 Instrument Development for Data Collection**

The research questionnaire was developed based on cues from the prior studies to effectively measure the model constructs. The existing literature was referred to recognize the research gaps. In this regard, the earlier research provides insights regarding the measures used to capture the study constructs, which enables to develop the final scale. The six independent and relevant variables for the current study stems from the UTAUT2 model which includes: "effort expectancy, performance expectancy, facilitating conditions, hedonic motivation, social influence and price value". Perceived trust, perceived risk, personal innovativeness and health literacy were added to the model as additional variables. The dependent variables were adoption i.e. behavioral intention and acceptance i.e. user behavior which were also taken from the main UTAUT2 and continuum of adoption process was completed with addition of usage as final dependent

variable. The moderated variables considered here include demographic aspects from the UTAUT2 and literature review: age, gender, income and education.

Generally, two types of scaling methods are followed in such research- comparative scaling as well as non-comparative scaling. Comparative scaling directly compares two or more stimulus objects with each other. Non-comparative scaling evaluates the stimulus object of each independently. This research applies a non-comparative 5-point Likert scale to gather data from the survey participants. The Likert scale is easy to develop, understand, and administer to the respondents. The measurement items of the survey instrument have been captured using a 5-point Likert scale that ranges from 1 (strongly disagree) to 5 (strongly agree). The items for the specific constructs were modified to suit the context and objectives of this study. The initial section of the questionnaire includes the socio-demographic information. On the other hand, the second section comprises queries about the constructs of interest based on the respondent, for the customers of e-pharmacies in the National Capital Region (NCR) of India.

This study designed 61 measurement items based on previous research. The items were changed because previous studies showed these items to be valid and reliable across several contexts. Many scholars have utilized these items in their studies in order to understand the predictors of technology adoption. However, all of the items from the constructs are measured on a 5-point Likert scale where strongly disagree (1), disagree (2), neutral (3), disagree (4) and strongly agree (5) as the highest. Each item was followed by a question asking respondents to rank their level of agreement or disagreement. A few experts and respondents pre-tested the questionnaire to identify any issues with the choice of variables, sequence, and the wordings of the respective items. Based on the suggestions from the respondents, the questionnaire was modified to ensure appropriate readability as well as comprehension. Below are these constructs and their measurement items.

**Table 3.1:** Instrument Constructs and Measurement Items

| <b>Construct</b>       | <b>Code</b> | <b>Measurement Items</b>                                        | <b>Sources</b>         |
|------------------------|-------------|-----------------------------------------------------------------|------------------------|
| Performance Expectancy | PE1         | I believe purchasing medicine from E-pharmacy is useful for me. | Venkatesh et al.(2012) |

|                   |     |                                                                                                       |                                                                         |
|-------------------|-----|-------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
|                   | PE2 | I believe purchasing medicine from E-pharmacy increases my chances of meeting my health needs.        | Sabbir et al. (2020)<br>Yin, Li & Qiao (2016)                           |
|                   | PE3 | I believe using E-pharmacy to order medicines, helps me in managing my health efficiently.            |                                                                         |
|                   | PE4 | I believe using E-pharmacy to order medicines helps me in managing my close one's health efficiently. |                                                                         |
|                   | PE5 | I believe purchasing medicine from E-pharmacy is productive for me.                                   |                                                                         |
|                   | PE6 | I believe purchasing medicine from E-pharmacy is convenient for me.                                   |                                                                         |
|                   |     |                                                                                                       |                                                                         |
| Effort Expectancy | EE1 | I believe purchasing medicine from E-pharmacy is easy for me.                                         | Venkatesh et al.(2012)<br>Sabbir et al. (2020)<br>Yin, Li & Qiao (2016) |
|                   | EE2 | I believe learning to purchase medicine from E-pharmacy is easy for me.                               |                                                                         |
|                   | EE3 | I believe operation of purchasing medicine from E-pharmacy is easy for me.                            |                                                                         |
|                   | EE4 | I believe with less effort one can place orders through E-pharmacy for their required medicines.      |                                                                         |
| Social Influence  | SI1 | E-pharmacy is popular, that's why I am using it.                                                      | Venkatesh et al.(2012)                                                  |
|                   | SI2 | People who are important to me, expect that I should use E-pharmacy to order medicines online.        | Sabbir et al. (2020)<br>Yin, Li & Qiao (2016)                           |

|                         |     |                                                                                                                       |                                                                        |
|-------------------------|-----|-----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
|                         | SI3 | People who influence my behavior encouraged me to use E-pharmacy to order medicines online.                           |                                                                        |
|                         | SI4 | People whose opinion I value, suggested me to use E-pharmacy to order medicines online.                               |                                                                        |
|                         | SI5 | I believe people in my social circle, who use E-pharmacy to order medicines have higher status than those who do not. |                                                                        |
| Facilitating Conditions | FC1 | I believe I have the resources necessary to use E-pharmacy to order medicines.                                        | Venkatesh et al.(2012)<br>Sabbir et al. (2020)                         |
|                         | FC2 | I believe I have the knowledge necessary to use E-pharmacy to order medicines.                                        |                                                                        |
|                         | FC3 | I believe E-pharmacy are compatible with other technologies I use.                                                    |                                                                        |
|                         | FC4 | I believe I can easily get help when I find difficulties while using E-pharmacy to order medicines.                   |                                                                        |
|                         | FC5 | I believe use of E-pharmacy is encouraged in India in recent times.                                                   |                                                                        |
| Hedonic Motivations     | HM1 | I believe using E-pharmacy to order medicines is fun.                                                                 | Moon & Kim (2001), Pikkarainen et al. (2004), Venkatesh et al. (2012). |
|                         | HM2 | I believe using E-pharmacy to order medicines is enjoyable.                                                           |                                                                        |
|                         | HM3 | I believe using E-pharmacy to order medicines is entertaining.                                                        |                                                                        |

|                 |     |                                                                                                                                          |                                               |
|-----------------|-----|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
|                 | HM4 | I believe I am always at peace with using E-pharmacy to order medicines.                                                                 |                                               |
| Price Value     | PV1 | I believe benefits of using E-pharmacy to order medicines outweigh the monetary cost of using it.                                        | Venkatesh et al. (2012)                       |
|                 | PV2 | I believe medicines are reasonably priced on E-pharmacy.                                                                                 |                                               |
|                 | PV3 | I believe using E-pharmacy to order medicines online is a good value for the money.                                                      |                                               |
|                 | PV4 | I believe at the current price, using E-pharmacy to order medicines online provides a good value compared to shopping at physical store. |                                               |
|                 | PV5 | I believe using E-pharmacy to order medicines online can save money compared to offline shopping.                                        |                                               |
| Perceived Trust | PT1 | I believe purchasing medicines from E-pharmacy is trustworthy.                                                                           | Sabbir et al. (2020)<br>Yin, Li & Qiao (2016) |
|                 | PT2 | I believe purchasing medicines from E-pharmacy is safe.                                                                                  |                                               |
|                 | PT3 | I believe purchasing medicines from E-pharmacy is reliable.                                                                              |                                               |
|                 | PT4 | I believe E-pharmacy keep promises.                                                                                                      |                                               |
|                 | PT5 | I believe E-pharmacy have integrity.                                                                                                     |                                               |

|                         |     |                                                                                                         |                                               |
|-------------------------|-----|---------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| Perceived Risk          | PR1 | I believe purchasing medicine from E-pharmacy has a big risk.                                           | Sabbir et al. (2020)<br>Yin, Li & Qiao (2016) |
|                         | PR2 | I'm afraid that purchasing medicine from E-pharmacy will reveal my identity.                            |                                               |
|                         | PR3 | I'm afraid that medicine from E-pharmacy are counterfeit or poor quality.                               |                                               |
|                         | PR4 | I'm afraid that medicine from E-pharmacy are harmful to my health.                                      |                                               |
|                         | PR5 | I'm afraid that medicine from E-pharmacy are harmful to my health.                                      |                                               |
| Personal Innovativeness | PI1 | I enjoy trying novel idea's like E-pharmacy to order medicines.                                         | Sabbir et al. (2020)                          |
|                         | PI2 | If I heard about new information technology, I would look for ways to experiment with it.               |                                               |
|                         | PI3 | In my Social circle, I am usually the first to try out new information technologies.                    |                                               |
|                         | PI4 | I am not hesitant to try out new information technologies.                                              |                                               |
| Health Literacy         | HL1 | I have all the information to maintain good health whenever I purchase medicine online from E-pharmacy. | Sabbir et al. (2020)                          |
|                         | HL2 | I'm aware about the recent, local and national, health related issues.                                  |                                               |
|                         | HL3 | I have the ability to find information about health problems.                                           |                                               |

|            |     |                                                                                               |                                                            |
|------------|-----|-----------------------------------------------------------------------------------------------|------------------------------------------------------------|
|            | HL4 | I believe that I can read and understand all the information related to health and medicines. |                                                            |
| Adoption   | AD1 | I believe E-pharmacy satisfies all my needs pertaining to medicines.                          | Wills (2008), Venkatesh et al. (2012), Tak & Panwar (2017) |
|            | AD2 | I believe using E-pharmacy, to order medicines, helps me to achieve my objective in health.   |                                                            |
|            | AD3 | I believe ordering medicines from E-Pharmacy don't have any risk for me.                      |                                                            |
|            | AD4 | I believe E-pharmacy deliver genuine medicines on time.                                       |                                                            |
|            | AD5 | I believe ordering medicines from E- Pharmacy is comfortable for me.                          |                                                            |
|            | AD6 | If need arises, E-pharmacy will be my first choice to order medicines.                        |                                                            |
| Acceptance | AC1 | I intend to continue to use E-pharmacy in near future.                                        | Liu et al., 2019                                           |
|            | AC2 | E-pharmacy is my first choice to order medicines compared to physical store.                  |                                                            |
|            | AC3 | I would like to recommend people to use E-pharmacy to order medicines.                        |                                                            |
|            | AC4 | I am planning to increase the use of E-pharmacy to order medicines.                           |                                                            |
| Usage      | US1 | I rarely order medicines from E-pharmacy.                                                     | Alshehri et al. (2012), Venkatesh                          |

|  |     |                                              |                                    |
|--|-----|----------------------------------------------|------------------------------------|
|  | US2 | I sometimes order medicines from E-pharmacy. | et al. (2012), Tak & Panwar (2017) |
|  | US3 | I often order medicines from E-pharmacy.     |                                    |
|  | US4 | I order medicines from on regular basis.     |                                    |

Source: By Author

### 3.7.1 Content Validity of the Instrument

In the second stage of instrument development for data collection, the survey tool went through a rigorous pre-testing process to ascertain its content validity. A panel of experts evaluated and ranked each survey item on a scale from one (least significant) to five (most important). Based on the collective feedback and recommendations from the experts, adjustments were made to various components of the survey items to better align with the research objectives.

#### 3.7.1.1 Profile of the Panel Members

To establish the content validity of the instrument, a panel of **eight experts** was carefully selected to provide a balanced mix of academic and professional perspectives. The panel included:

- **Four subject matter experts** with extensive academic experience and research contributions in technology adoption, e-pharmaceutical & technology system management, pharmaceutical sciences.
- **Two internationally recognized authors**, known for their scholarly publications and research work in e-pharmacy usage intentions, innovation, and behavioral studies.
- **Two industry experts**, possessing deep professional insight into strategic and operational aspects of e-pharmacy organizational development, management and initiatives.

The selection of these experts ensured that the evaluation incorporated both theoretical and applied viewpoints. Their combined expertise facilitated a critical review of the instrument's conceptual relevance, linguistic clarity, and practical applicability. The inclusion of international experts further enhanced the global perspective of the instrument, aligning it with current research trends and theoretical rigor. Such diversity in the expert panel is essential for improving the reliability and comprehensiveness of the content validation process (Polit & Beck, 2006; Lynn, 1986).

#### **3.7.1.2 Content Validity Analysis Using the Content Validity Index (CVI)**

The content validity of the instrument was assessed using Content Validity Index (Lynn, 1986; Polit & Beck, 2006; Polit, Beck, & Owen, 2007) technique, which quantifies the extent to which experts agree on the essentiality of individual items. Each of the eight panel members were requested to rate the items on a scale of 1 to 4 where 1 represents 'Not Relevant', 2 represents 'Somewhat Relevant', 3 represents 'Relevant', and 4 represents 'Completely Relevant'.

For item level CVI computation, responses rated as "essential" (scores of 3 or 4) were considered. The CVI for each item was calculated using the formula:

$$CVI = \frac{(n_e)}{N}$$

where  $n_e$  represents the number of experts rating an item as essential, and  $N$  is the total number of experts.

According to Lynn (1986), and further validated by Polit & Beck (2006) and Polit et al. (2007), the minimum acceptable CVI value for a panel of eight experts is 0.83. Items meeting or exceeding this threshold were retained in the instrument.

Initially, the instrument comprised 61 items. After expert evaluation and CVI computation:

- 49 items were retained without modification,
- 6 items were retained with minor modifications in wording or clarity based on expert feedback, and

- 6 items were deleted due to CVI values below the threshold or conceptual overlap.

Following these revisions, the final instrument consisted of 55 validated items that satisfied both the quantitative CVI criteria and qualitative expert judgment. This process ensured the instrument's content validity, precision, and alignment with the underlying theoretical constructs (Ayre & Scally, 2014; Polit, Beck, & Owen, 2007).

### **3.7.2 Pilot Study**

The aim of the pilot study was to assess the validity and reliability of the proposed and revised survey tool before proceeding to a comprehensive investigation. The items used to evaluate the specified constructs in this study were sourced from existing literature on attitudes, purchase intentions, and purchasing behavior concerning e-pharmacy to order medicines online. A pilot study was conducted to identify any anomalies and to evaluate various scale properties. A sample of 45 participants was chosen from NCR, India. In total, 65 individuals were approached for data collection, and 45 responses that were accurately completed by participants were included in the pilot study. To ensure equal representation, the pilot sample was evenly distributed across different groups, including Gender, Age, Income and Education. For selecting samples for the pilot study, Connelly's (2008) recommendations were followed, suggesting that the sample should be 10% of the projected sample size, which is 40 respondents. The subsequent sections address the overall reliability of the preliminary research findings through various revisions. The data collected during the pilot study underwent statistical testing to evaluate different scale attributes. The statistical tools used for data analysis at this stage included SPSS.

#### **3.7.2.1. Assessment of Scale Properties (Preliminary Phase)**

Assessing the characteristics of a scale is crucial during both the preliminary and primary phases of research. Before gathering data, it is essential to verify the reliability and validity of the selected tool on a smaller scale. This preliminary evaluation serves as a checkpoint, ensuring that the instrument consistently measures what it is intended to assess in the research process.

### 3.7.2.1.1. Reliability

In the pilot study, the questionnaire's reliability was assessed through three main approaches: Overall Cronbach Alpha, Item Total Statistics, and Construct Reliability. These methods each provide a distinct viewpoint for evaluating the questionnaire's consistency and strength.

#### ***Overall Cronbach Alpha:***

The pilot study reported a Cronbach Alpha value of 0.899, analyzed using SPSS. This value significantly exceeds the threshold typically considered acceptable in social science research, as suggested by Hair et al. (1998).

#### ***Item-total Statistics:***

This approach assessed how each item performed in relation to the entire scale. It analyzed whether the reliability of the scale improved or declined when a particular item was omitted. Items that, when excluded, significantly enhance the scale's reliability may be considered for modification or elimination. This method ensured that every item contributed positively to the overall reliability of the questionnaire. As noted by Ferketich (1991), a scale is deemed effective if the corrected item-total correlations range from 0.30 to 0.70. The table below shows the correlation coefficients after removing items to improve the scale's reliability.

**Table 3.2.** Item- Total statistics

| Construct              | Item Label | Correlation Coefficient |
|------------------------|------------|-------------------------|
| Performance Expectancy | PE1        | 0.328                   |
|                        | PE2        | 0.322                   |
|                        | PE3        | 0.352                   |
|                        | PE4        | 0.374                   |
|                        | PE5        | 0.323                   |
| Effort Expectancy      | EE1        | 0.568                   |
|                        | EE2        | 0.306                   |
|                        | EE3        | 0.377                   |
|                        | EE4        | 0.300                   |

|                         |     |       |
|-------------------------|-----|-------|
| Facilitating Conditions | FC1 | 0.518 |
|                         | FC2 | 0.374 |
|                         | FC3 | 0.306 |
|                         | FC4 | 0.332 |
| Social Influence        | SI1 | 0.315 |
|                         | SI2 | 0.358 |
|                         | SI3 | 0.357 |
|                         | SI4 | 0.300 |
|                         | SI5 | 0.373 |
| Hedonic Motivation      | HM1 | 0.514 |
|                         | HM2 | 0.408 |
|                         | HM3 | 0.320 |
|                         | HM4 | 0.514 |
| Price Value             | PV1 | 0.575 |
|                         | PV2 | 0.379 |
|                         | PV3 | 0.468 |
|                         | PV4 | 0.427 |
| Perceive Trust          | PT1 | 0.361 |
|                         | PT2 | 0.301 |
|                         | PT3 | 0.347 |
|                         | PT4 | 0.327 |
|                         | PT5 | 0.318 |
| Perceived Risk          | PR1 | 0.362 |
|                         | PR2 | 0.356 |
|                         | PR3 | 0.320 |
|                         | PR4 | 0.438 |
| Personal Innovativeness | PI1 | 0.515 |
|                         | PI2 | 0.508 |
|                         | PI3 | 0.539 |
|                         | PI4 | 0.338 |

|                 |      |       |
|-----------------|------|-------|
| Health Literacy | HL1  | 0.493 |
|                 | HL2  | 0.307 |
|                 | HL3  | 0.372 |
|                 | HL4  | 0.425 |
| Adoption        | AD1  | 0.480 |
|                 | AD2  | 0.376 |
|                 | AD3  | 0.322 |
|                 | AD4  | 0.546 |
| Acceptance      | ACC1 | 0.330 |
|                 | ACC2 | 0.312 |
|                 | ACC3 | 0.396 |
|                 | ACC4 | 0.306 |
| Usage           | USE1 | 0.366 |
|                 | USE2 | 0.300 |
|                 | USE3 | 0.395 |
|                 | USE4 | 0.402 |

**Source:** Author Calculations

All items presented in the table 3.2 fall within the threshold range set by Ferketich (1991), indicating their reliability. This underscores the scale's robustness and consistency, aligning well with the research objectives.

### ***Construct level Reliability***

A research instrument (structured questionnaire) was developed to examine the linkage of the predictors with the outcome. The measure of Cronbach  $\alpha$  was assessed to confirm the dataset's dependability and internal consistency. In this regard, the reliability estimation process revolves around summing numerous items to arrive at the total reliability score. The scale shows that the items are consistent, reflecting their characteristics by measuring few aspects of the dimension essential in this type of scale. Specifically, the reliability coefficients fall in the range between 0 and 1 and a value of 0.7 is accepted for statistically establishing internal consistency of the scale. The refined pilot dataset (N = 45) demonstrated satisfactory reliability across all subscales, with Cronbach's alpha values

ranging from 0.70 to 0.83, indicating acceptable to good internal consistency (Nunnally & Bernstein, 1994; DeVellis & Thorpe, 2017).

**Table 3.3.** Cronbach's alfa values for the items

| Item Name               | Cronbach's Alpha | No. of Items |
|-------------------------|------------------|--------------|
| Acceptance              | .773             | 4            |
| Adoption                | .792             | 4            |
| Effort Expectancy       | .700             | 4            |
| Performance Expectancy  | .824             | 5            |
| Hedonic Motivation      | .785             | 4            |
| Facilitating Conditions | .804             | 4            |
| Social Influence        | .794             | 5            |
| Perceived Trust         | .815             | 5            |
| Perceived Risk          | .758             | 4            |
| Price Value             | .775             | 4            |
| Personal Innovativeness | .825             | 4            |
| Health Literacy         | .745             | 4            |
| Usage                   | .800             | 4            |

**Source:** Author Calculations

### **3.8 Sampling Procedure**

Sampling refers to the selection of a subset from a larger population, enabling researchers to draw inferences about the entire group. A population is defined as a collection of individuals who share common traits or characteristics. Identifying an appropriate sample that accurately represents the entire population is a critical aspect of conducting research. Additionally, determining the target group, selecting the sampling technique, and deciding on the sample size are essential components of a research study (Zikmund et al., 2013). The following points elucidate the sampling procedure employed in the current study.

#### **3.8.1 Targeted Population**

In determining the target population, several factors must be taken into account, as it is crucial for achieving the study's objectives. In the current study, the entire population of e-pharmacy users who utilize e-pharmacies to order medications constitutes the study's universe. From this group, e-pharmacy users located in the Delhi-NCR region were identified as the target population. Furthermore, those e-pharmacy users who have ordered medicines via e-pharmacy within the past year were selected as the sampling units.

#### **3.8.2 Sampling Design and Techniques**

The sampling process helps the researcher to gather insights and draw meaningful conclusions regarding the overall population by assessing a small portion of the population. Subsequently, the relevance of sample selection depends on its similarity with the population in terms of vital characteristics. Specifically, the ability of the sample to effectively represent the vital features of the population determines its appropriateness for the specific research. Due to limited resources, the present study adopted the non-probability approach to collect the relevant samples.

To draw relevant samples, this study used the methods of convenience and purposive sampling for data collection. In the convenience sampling, the target population's members fulfilling specific useful requirements (Dörnyei, 2007). In addition, purposive sampling involves the researcher's discretion to choose variables for the sample population according to their knowledge of the context. This process can help to eliminate responses that are irrelevant considering the nature and the context of this study. The proposed sample size was 400. Both purposive and convenience sampling are non-probability sampling

techniques used in this research for selecting the sample that will represent the entire population.

### 3.8.3 Sample Size

Selecting the number of observations to be taken from the population to carry out the research is referred to as sample size. The nature of the investigation affects the size of the sample. A small sample size is required for experimental and qualitative studies, but a larger sample is recommended for confirmatory and conclusive studies. Further, there are variations in terms of the selection of sample size for quantitative studies. The selected sample size involves the number of participants or subjects selected from a population. Also, it becomes vital to evaluate the statistical correctness as well as relevance of empirical results to ensure replicability. Sample size determination essentially requires the assessment of both qualitative and empirical elements. Scholars have varied opinions regarding the adequate sample size. For instance, Hair et al (2010) recommends 10-15 participants should be considered for each scale item. Specifically, it implies for a study involving 10 items, the researcher requires a sample size of 100 or 150 to implement advanced statistical techniques. On the other hand, Nunnally (1978) recommends the number of participants should be ten times the number of measurement items. This research implemented the formula to determine sample size, as suggested by Malhotra and Dash for arriving, for arriving at the final sample size (2013, p. 365):

$$N = \frac{Z^2 * P (1-P)}{E^2} \dots\dots\dots (1) \text{ (Sample size determination for infinite population)}$$

Where  $N$  indicates the sample size for infinite population,  $N$  shows the sample size for finite population;  $Z$  exhibits the confidence level at 95%.  $P$  indicates the estimated prevalence of a trend in the population, and  $E$  stands for the margin of error at 5%. In this research, we consider 95 percent confidence level at which the  $Z$  value stands at 1.96 as per the standard normal distribution table.  $P$  means prevalence of usage factor, that was estimated to be 50%. A margin of error of +/- 5 % is assumed for this study.

$$(\text{Infinite population}) = \frac{(1.96)^2 * 0.5 (0.5)}{(0.05)^2} = \frac{3.8416 * 0.25}{0.0025} = \frac{0.9604}{0.0025} = 384.16$$

Sample size also differs according to the nature of the software package. Because of the latter's estimation methodology, it is widely accepted that “partial least squares structural equation modeling (PLS-SEM)” programs like Smart-PLS work perfectly with small sample size, whereas covariance-based structural equation modeling (CB-SEM) programs like AMOS works best with large sample size (Hair et al., 2017; Ringle et al., 2020). The ten times rule suggested by Barclay et al. (1995) is the most popular technique to choose sample size when using PLS (Hair et al., 2017). However, this technique is criticized by several researchers (Marcoulides and Chin, 2013; Ringle et al., 2020). ‘Inverse square root’ and ‘Gamma exponential methods’ were proposed by Kock and Hadaya (2018) as two new methods for determining the minimal sample size required for PLS-SEM path models. Based on the inverse square root, the minimal sample size would be 160. This sample size is reduced to 146 if researchers use the gamma exponential approach. There are plenty of ways to determine the sample size for the research.

Based on the sample size estimation, the study needs a minimum of 385 samples as a standard benchmark (Hair et al., 2011) to validate the hypothesized model. However, the advantage of having larger sample is that it can reduce the sampling error and hence the response biases. Overall, 935 *questionnaires* were distributed among the potential respondents viz. e-pharmacy users in the National Capital Region (NCR) of India, out of which we received 443 valid survey responses were received. Hence, the chances of sampling error and bias are reduced owing to large sample size.

### 3.9 Method of Instrument Administration

Researchers employ various techniques for administering questionnaires, each with its own advantages and disadvantages. These techniques include direct administration or hand distribution, mail surveys, and electronic surveys. Although direct administration is often seen as costly, it benefits from a high response rate due to the survey administrator's additional efforts. Conversely, mail surveys tend to be less expensive but typically suffer

from low response rates (Fraenkel & Wallen, 1993). Similarly, electronic surveys are also noted for their low response rates, yet they are valued for encouraging respondents to share sensitive information (Bowling, 2005).

The study employed an online self-administered questionnaire to collect data on technology adoption intentions toward e-pharmacy platforms. Online administration was chosen because it aligns with the digital nature of the construct under study, allowing respondents who already engage with online health or pharmaceutical services to participate in a familiar environment. Web-based surveys offer multiple advantages, including rapid data collection, automatic data entry, lower administrative cost, and broader geographic reach compared to traditional paper-based or interviewer-administered modes (Evans & Mathur, 2018). In addition, online questionnaires facilitate the use of adaptive skip logic, real-time completion tracking, and device-responsive formats that improve data quality and reduce missing values (Fan & Yan, 2010).

From a methodological standpoint, the online mode was particularly suitable for technology adoption research, as internet-based participation minimizes mode incongruence between the measurement tool and the behavior being examined, namely, users' interaction with digital health platforms like e-pharmacy (Venkatesh et al., 2012). Studies of e-health and e-pharmacy adoption have successfully used online surveys to capture behavioral intention and perceived usefulness constructs within the UTAUT2 framework (Al-Haddad & Kotnour, 2015; Alwahaishi & Snášel, 2013). Approval and informed-consent procedures were embedded digitally at the start of the questionnaire, following recommendations for online health research (Eysenbach, 2004).

The administration was asynchronous and voluntary: invitations were distributed through e-mail and social-media channels with reminders over a two-week period, a procedure shown to enhance participation in web-based health research (Cunningham et al., 2015; Suppan et al., 2024). The final response rate of approximately 30–45% is consistent with published averages for web-based surveys in health-information-technology contexts (Cook et al., 2000; Shih & Fan, 2008; Sinclair et al., 2012). Thus, online administration was methodologically and substantively justified for reaching digitally engaged respondents and efficiently capturing perceptions relevant to technology adoption.

Moreover, ethical considerations were carefully observed throughout the data collection process to ensure the integrity, confidentiality, and voluntary nature of participant involvement. Prior to administering the survey questionnaire, respondents were informed about the purpose and academic nature of the study, and their participation was sought only after obtaining informed consent. Participants were assured that their responses would be used exclusively for research purposes and would remain anonymous and confidential. Respondents were given the freedom to withdraw from the survey at any stage without any obligation or consequence. Additionally, adequate care was taken to ensure that the questionnaire did not contain misleading, intrusive, or harmful content that could adversely affect participants. The collected data were securely handled and used solely for academic analysis in accordance with standard research ethics and data privacy principles.

### **3.10 Data Analysis**

Development and administration of survey instrument was succeeded with data collection and data analysis. The data collection process involved a survey that utilized a questionnaire as the main tool, and the data was later coded using Smart PLS 4.0. Information about the respondents' demographics, including gender, age, education, and income, was displayed in terms of frequency and percentage. Prior to performing the PLS analysis with Smart PLS, the constructs of the research model were subjected to tests for convergent and discriminant validity. Convergent validity indicated a strong correlation of among items within the same construct. To evaluate convergent validity, Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) values were used. This study considered normality test unnecessary as non-parametric tests were utilized. Condition of normality i.e. data exhibits a normal distribution is applicable for parametric test solely (Jupp, 2006; Faizi & Alvi, 2023).

To achieve the primary objective of identifying and analyzing the determinants influencing customer adoption, acceptance and usage of e-pharmacy, this study employed Partial Least Squares Structural Equation Modeling (PLS-SEM) as the principal analytical technique. The model estimation was conducted using SmartPLS 4.0, enabling a comprehensive assessment of the proposed conceptual framework and its associated hypotheses. PLS-SEM was selected for its robustness in handling non-normal data distributions and

versatility across diverse measurement scales (Guo & Barnes, 2011), making it particularly suitable for behavioral and technology adoption research. Moreover, its ability to examine complex, multi-construct relationships (Hajli, 2014) made it an ideal tool for evaluating the interdependencies among constructs such as performance expectancy, effort expectancy, perceived trust, and facilitating conditions. A significance level of  $p < 0.05$  was established as the threshold for statistical significance. Through the application of PLS-SEM, the study achieved a nuanced understanding of the structural relationships between the independent and dependent variables, offering a rigorous and integrative analytical framework that aligned closely with the study's objectives and research questions on technology adoption in e-health and e-pharmacy contexts.

In addition to testing the main structural relationships, SmartPLS 4.0 was utilized to examine the moderating effects of demographic variables such as age, gender, income, and education on e-pharmacy adoption, acceptance and usage behavior. The software's advanced moderation modeling capabilities, including multi-group analysis (MGA) and interaction term generation, allow for precise estimation of how demographic factors influence the strength or direction of relationships among latent constructs. Partial Least Squares Structural Equation Modeling (PLS-SEM) was particularly suited for this analysis because of its ability to model latent variable interactions without imposing strict normality or large-sample assumptions (Hair et al., 2021). Unlike covariance-based SEM, which often requires normally distributed data and larger sample sizes, PLS-SEM provides greater flexibility in handling complex models and smaller samples, making it ideal for exploratory and predictive research in digital health and e-pharmacy adoption contexts. The use of SmartPLS 4 further enabled visual inspection of moderation paths, bootstrapped significance testing, and effect size assessment, offering a robust and transparent approach to evaluating the moderating influence of demographic characteristics on the proposed adoption model.

To further enhance the interpretive and managerial relevance of the proposed empirical model of e-pharmacy adoption, acceptance and usage, this study utilized the Importance–Performance Map Analysis (IPMA) feature available in SmartPLS 4.0. The IPMA extends the results of the Partial Least Squares Structural Equation Modeling (PLS-SEM) by not

only assessing the relative importance (total effects) of latent variables on the dependent construct but also evaluating their performance (average latent variable scores) (Ringle & Sarstedt, 2016). This dual assessment provides richer insights into which determinants, such as “performance expectancy, effort expectancy, facilitating conditions, hedonic motivation, social influence, price value, perceived risk, perceived trust, personal innovativeness, or health literacy”, exert the greatest influence on users’ intention to adopt e-pharmacy services and how well these factors currently perform among respondents.

### **3.10.1 Statistical Tools and Techniques**

In this study, the following inferential statistical tools and techniques have been deployed:

#### **3.10.1.1 Cross Tab in SPSS**

In quantitative research methodologies, cross-tabulation is used to check the relationship between demographic characteristics (such as age, gender, education, income) for customers. Cross tab was checked in SPSS. It was also used for reverse coding and to check the reliability of pilot testing. The influence of all the variables in the presence of control variable using linear regression was also performed in SPSS.

#### **3.10.1.2 Structural equation modeling (SEM)**

Structural Equation Modelling (SEM) is a statistical technique that integrates two main elements: regression and factor analysis. These elements are frequently depicted in diagrams to aid in the conceptualization of theories. SEM primarily utilizes Covariance-based SEM (CB-SEM) and Partial Least Squares SEM (PLS-SEM). These approaches are particularly adept at predicting intricate models that involve numerous constructs, measurement items, and structural paths. CB-SEM is best suited for estimating the observed covariance matrix, whereas PLS-SEM is typically employed to explain variances in endogenous constructs (Hair et al., 2014).

The present study applies Partial Least Squares Structural Equation Modeling (PLS-SEM) techniques to empirically establish the linkage between the study constructs: “Effort Expectancy (EE), Performance Expectancy (PE), Social Influence (SI), Facilitating Conditions (FC), Hedonic Motivation (HM), Health Literacy (HL), Personal Innovativeness (PI), Price Value (PV), Perceived Trust (PT), Perceived Risk (PR),

Adoption (Ad), Acceptance (ACC) and Usage (USE)”. The hypothesized model was examined through a series of standardized multiple regression equations. This research has used PLS-SEM over conventional regression analysis, due to the limitation that multivariate techniques such as regression can examine a single association at one point of time. However, application of this technique was carried out to examine the overall theory of research taking all possible information into account.

PLS-SEM integrates aspects of exploratory factor analysis and path modeling to assess the predictive relationships between the constructs in a theoretical model. These theories are dependent on the analysis of the direct and indirect effects from predictor to the outcome link (Hair et al., 2014). PLS-SEM is employed to determine the extent to which data supports the proposed hypotheses of a theoretical model. The use of PLS-SEM has been suggested for testing theory and hypotheses (Tabachnick and Fidell, 2006). PLS-SEM analysis involves two stages- establishing the validity and reliability of measurement model and evaluating the model-fit of path model. A valid measurement model is then carried to the next stage of proving the proposed relationship using CFA process.

The model reliability and validity were measured by estimating the values of convergent as well as discriminant validity. Convergent validity is defined by the shared variance of variables collectively explaining a single construct. To assess convergent validity, the composite reliability (CR) and average variance extracted (AVE) values must meet the threshold criteria. Discriminant validity refers to how well a particular construct is differentiated from other constructs. It is established by comparing the shared variances between constructs with the diagonal values, which are the square root of the AVE for each respective construct, in the measurement model.

The structural model depicts the relationship degree and nature among the independent and dependent variables. Ho (2006) suggests dependency and correlation exist as a connection between the factors included in the model. PLS-SEM focuses on maximizing the explained variance of the dependent constructs, thereby predicting the overall model with substantial accuracy rather than testing individual relationships in isolation. Hence, the acceptance or rejection of the research model depends on the goodness-of-fit indicators, which inspects the degree of relevant relationships of the variables. In the hypothesized research model, it

is necessary that the observed covariance should match with the calculated variance to determine the fitness of the model (Ho, 2006).

Goodness-of-fit indices measures how well the actual covariance matrix associates to the expected model. The reproduction of the observed data in mere approximation leads to the estimate called as fit indices. These indices include chi-square value ( $\chi^2$ ) which reflects the square of the differences of the observed and calculated values in the covariance matrix. The model fit is considered far better when the values are nearer to zero and the matrix has a lesser spread between them.

#### **3.10.1.2.1 Assumptions of PLS-SEM**

The application of Partial Least Squares Structural Equation Modeling (PLS-SEM) in this study is grounded on three key considerations: data requirements, model properties, and model evaluation (Hair et al., 2017; 2019). In terms of data requirements, PLS-SEM is highly flexible, it requires a relatively small sample size following the “10-times rule,” imposes no assumption of data normality, and is robust to missing values and diverse measurement scales, including metric, ordinal, and binary indicators. Regarding model properties, PLS-SEM is applicable to both reflective and formative constructs, accommodates single-item factors, and is suitable for recursive structural models that clearly define relationships between independent and dependent variables. Finally, model evaluation in PLS-SEM involves assessing the measurement model (validity and reliability), and the structural model (path significance,  $R^2$ , effect size  $f^2$ , predictive relevance  $Q^2$ , and multicollinearity). It also supports higher-order effects such as mediation and moderation analyses through bootstrapping and multi-group analysis (PLS-MGA). Although PLS-SEM lacks a global goodness-of-fit index, its focus on predictive capability and model robustness makes it an appropriate analytical approach for exploring complex, multivariate relationships in technology adoption research.

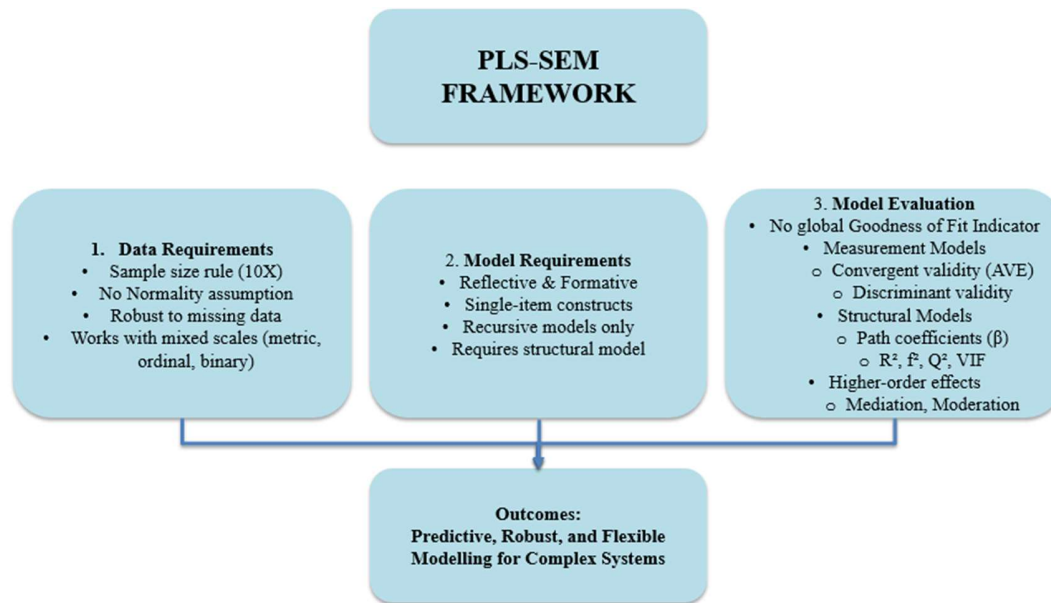


**Figure 3.2:** PLS-SEM Framework

**Source:** Authors Compilation

### 3.10.1.3 Moderation

A moderator, or moderating variable, is a third variable that influences the strength or direction of the relationship between an exogenous (independent) and an endogenous (dependent) construct (Dawson, 2013). In simpler terms, the moderator determines “when” or “under what conditions” an independent variable affects a dependent variable. Technically, moderation occurs when the effect of an independent variable (X) on a dependent variable (Y) change as a function of another variable (M)—the moderator. Thus, the moderator can either strengthen, weaken, or reverse the relationship between X and Y.

Moderation analysis in structural equation modeling (SEM) involves two essential steps:

1. Identification of moderation – establishing whether a moderating effect exists in the model.
2. Evaluation of strength and direction – assessing how strongly and in what manner the moderator influences the relationship.

In SmartPLS, moderation can be tested using the interaction effect approach, which examines how the interaction term between the predictor and the moderator affects the

dependent variable. This method estimates the specific moderating influence on a particular structural path. In contrast, multi-group analysis (MGA) can be used to evaluate whether the structural relationships differ significantly between predefined groups (for example, low income vs. high income group). MGA provides insights into how the overall model behaves across subgroups, helping determine whether moderation exists at a broader, group-based level.

Before performing multi-group comparisons, it is essential to assess Measurement Invariance of Composite Models (MICOM) to ensure that the constructs are measured equivalently across groups. MICOM, introduced by Henseler et al. (2016), involves a three-step procedure:

1. Configural invariance – verifying that the same indicators and model specifications are applied across groups.
2. Compositional invariance – testing whether the composite scores are similarly formed across groups.
3. Equality of composite means and variances – confirming that group differences are not due to measurement artifacts but reflect genuine structural variations.

Establishing measurement invariance through MICOM is crucial before interpreting moderation or MGA results. Without invariance, observed differences in path coefficients might stem from measurement bias rather than true moderating effects.

Thus, moderation analysis in SmartPLS provides a nuanced understanding of conditional relationships between constructs, while MICOM ensures that any differences observed across groups are statistically valid and theoretically meaningful.

#### **3.10.1.4 Importance–Performance Map Analysis**

Considered as an advanced extension of the PLS-SEM, Importance–Performance Map Analysis (IPMA) is especially designed to enhance the practical & managerial relevance of statistical results by assessing not only total effects i.e. importance of predictor constructs on target dependent variable but also their performance, measured as average latent variable scores. (Hair et al., 2017, Ringle et al., 2020).

Total effects i.e. importance is the sum of the direct and indirect effects of independent variables on the dependent variable. It is based on the total path coefficient ( $\beta$ ), which represents the effect size of the construct on the target variable.

$$Importance = \Sigma(Direct\ Effect + Indirect\ Effect)$$

Performance evaluates how well each predictor construct is performing based on respondents' scores. Performance is computed as the average latent variable score (scaled between 0 and 100) for each construct. SmartPLS calculates latent variable scores using the outer measurement model and then transforms them to the 0-100 scale.

$$Performance = \left( \frac{Mean\ Latent\ Variable\ Score - Lowest\ possible\ score}{Range\ of\ Scale} \right) \times 100$$

Smart PLS software run the IPMA with the following requirements fulfilled (Hair et al., 2017; Henseler et al., 2015):

- All indicators must be on metric data
- All indicators coding must have same positive scale direction
- Indicator reliability, convergent validity and discriminant validity must be valid and positive

IPMA generates a two-dimensional matrix that places predictor constructs according to their relative importance and current performance levels, allowing researchers to visually detect which constructs should be prioritized for intervention.

As this studies, one of the objectives is to propose empirical model for e-pharmacy adoption, acceptance, and usage for end users in NCR, India, this technique contributes substantially to bridging academic insights and real-world decision-making by identifying which determinants should be prioritized to enhance adoption, acceptance and sustained usage of e-pharmacies.

### **3.11 Conclusion**

The present chapter has explained the research design and methodology adopted for achieving the research objectives of this study. This chapter has discussed research methodology in detail including explanation and rationale for cross-sectional research design of the study, scaling technique, questionnaire development, sampling design, data collection and analysis techniques followed by the present study. The primary set of data was gathered from 443 customers of e-pharmacy, who ordered medicines using e-pharmacies in last one year, in the National Capital Region (NCR) of India. To meet the purpose of data collection, the methods of convenience and purposive sampling were adopted in this research. The subsequent chapter of this thesis emphasizes on data analysis, interpreting the outcome, and pertinent findings in detail.

## **Chapter-4**

### **Data Analysis and Findings**

This chapter presents the empirical results that were drawn based on the information and responses collected from the survey participants. According to the gathered responses, the initial step involved examining the dataset using measures of descriptive statistics. This step helps in understanding the nature and characteristics of the respondent perceptions. Further, the hypothesized model comprising the study constructs was evaluated using the statistical technique i.e. structural equation modelling (SEM). These tools and techniques were implemented to validate the inter-relationships between the study constructs- “Effort Expectancy (EE), Performance Expectancy (PE), Social Influence (SI), Facilitating Conditions (FC), Hedonic Motivation (HM), Health Literacy (HL), Personal Innovativeness (PI), Price Value (PV), Perceived Trust (PT), Perceived Risk (PR), Adoption (Ad), Acceptance (ACC), and Usage (USE)”. When the outcomes and conclusions are contrasted with earlier research in the same field, there is compelling evidence to support the novel contribution of this study to the body of knowledge in the field.

#### **4.1 Preliminary Analysis**

The preliminary analysis of the data comprises of the descriptive statistics. Data screening was carried out to check for missing data, unusual observations and non-normal item (potential outliers). The normality of the dataset was assessed through skewness and kurtosis (Hair et al., 2011). Further, the mean and standard deviations were measured to understand the data patterns (Saunders et al., 2012).

##### **4.1.1 Response Rate Analysis**

In the present study, a total of 935 questionnaires were distributed, out of which 459 were returned, and 16 were excluded due to homogeneity of the responses. In survey research, items with very low variability indicate poor discrimination among respondents. A minimum standard deviation (SD) of 0.50 is recommended for Likert-scale items to ensure adequate response dispersion and analytical validity (Hair et al., 2019; Field, 2018). Items with SD values below 0.30–0.40 should generally be reviewed or excluded from further

analysis (Gliem & Gliem, 2003). This yielded an effective response rate of 47%. This reflects an acceptable level of participation among respondents. According to Sekaran and Bougie (2010), a response rate of around 30% is considered satisfactory for survey-based studies, indicating that the response obtained in this research was substantially above the minimum acceptable threshold. Moreover, the achieved rate notably exceeds the typical 40–50% response rate commonly reported in social science research context (Baruch & Holtom, 2008; Lund, 2023). Such a high rate may be attributed to the study’s online administration approach, personalized follow-up reminders, and the growing familiarity of Indian respondents with digital survey platforms, especially in technology and health-related research domains.

In the present study, all fields in the survey instruments were marked as mandatory hence no missing values were found.

**Table 4.1:** Response Rate Analysis

| Questionnaires | Frequency | Percentage |
|----------------|-----------|------------|
| Distributed    | 935       | 100        |
| Received       | 459       | 49         |
| Excluded       | 16        | 2          |
| Retained       | 443       | 47         |

**Source:** Survey Analysis

#### **4.1.2 Descriptive statistics**

The primary data gathered from the respondents undergo an elementary transformation. In this regard, the sample responses were analyzed using central tendency measures, which is known as descriptive statistics (Given, 2008). The primary aim behind using descriptive statistics relates to reduction in the amount of data to summarized analytics. Zikmund et al. (2010) opined that categorizing data into central tendency and dispersion leads to summarizing discrete data into meaningful numbers. The researchers can count the number of repetitions of the sample responses in favor or against the statement asked in the questionnaire. These frequency distributions are useful for converting the numbers into

graphical representations such as histograms, plots and charts. Therefore, the frequency distribution provides an overall idea regarding the data pattern and trends.

#### **4.1.2.1 Central Tendency**

Measures of central tendency are fundamental statistical tools used to summarize a dataset by identifying its central or typical value. The three most common measures are the mean, median, and mode, each providing a different perspective on the data distribution. The mean, or arithmetic average, is sensitive to extreme values, making it suitable for normally distributed data but less reliable in skewed distributions. The median, representing the middle value, is more robust to outliers and skewed data, while the mode identifies the most frequently occurring value and is particularly useful for categorical variables. Selecting the appropriate measure of central tendency depends on the level of measurement, distribution characteristics, and the presence of outliers in the data (Gravetter & Wallnau, 2017; Field, 2018).

#### **4.1.2.2 Standard deviation**

The standard deviation (SD) is a widely used measure of statistical dispersion that indicates the average amount by which individual observations deviate from the mean of a distribution. Unlike the mean, which summarizes the central tendency, the SD provides insight into the spread and variability of responses, thereby enhancing the interpretation of the data. A smaller SD suggests that the data points are clustered closely around the mean, reflecting greater consistency, while a larger SD indicates more variability and dispersion in the dataset (Field, 2018). In psychological and social sciences research, reporting both the mean and SD is considered best practice, as it allows for a more comprehensive understanding of participant responses and facilitates comparison across groups and studies (Gravetter & Wallnau, 2017). Thus, alongside measures of central tendency, the SD is essential for conveying the reliability and stability of observed scores.

#### **4.1.2.3 Skewness and Kurtosis**

These statistical measures provide information about dataset distribution characteristics and normality. Skewness quantifies distribution symmetry, indicating whether data leans left or right of the mean. A zero skewness indicates perfect symmetry, with equal-length tails. Negative skewness shows significantly smaller values than mean, while positive

skewness indicates larger values. A skewness between -0.5 and +0.5 suggests approximate symmetry (Khan et al., 2021). Kurtosis measures distribution flatness, showing peak sharpness. Zero kurtosis indicates normal peak height, negative values show flat peaks (platykurtic), and positive values indicate sharp peaks (leptokurtic). A kurtosis between -1 and +1 suggests near-normal peak height.

**Table: 4.2:** Descriptive Statistics

| <b>Name</b> | <b>No.</b> | <b>Mean</b> | <b>Median</b> | <b>Scale<br/>min</b> | <b>Scale<br/>max</b> | <b>Standard<br/>deviation</b> | <b>Excess<br/>kurtosis</b> | <b>Skewness</b> |
|-------------|------------|-------------|---------------|----------------------|----------------------|-------------------------------|----------------------------|-----------------|
| AD1         | 1          | 3.465       | 4             | 1                    | 5                    | 1.319                         | -0.839                     | -0.558          |
| AD2         | 2          | 3.499       | 4             | 1                    | 5                    | 1.218                         | -0.604                     | -0.551          |
| AD3         | 3          | 3.515       | 4             | 1                    | 5                    | 1.284                         | -0.723                     | -0.597          |
| AD4         | 4          | 3.438       | 4             | 1                    | 5                    | 1.288                         | -0.766                     | -0.552          |
| PI1         | 5          | 3.442       | 4             | 1                    | 5                    | 1.297                         | -0.8                       | -0.552          |
| PI2         | 6          | 3.384       | 4             | 1                    | 5                    | 1.216                         | -0.741                     | -0.412          |
| PI3         | 7          | 3.404       | 4             | 1                    | 5                    | 1.199                         | -0.77                      | -0.415          |
| PI4         | 8          | 3.431       | 4             | 1                    | 5                    | 1.256                         | -0.78                      | -0.506          |
| PR1         | 9          | 3.251       | 4             | 1                    | 5                    | 1.333                         | -1.135                     | -0.334          |
| PR2         | 10         | 3.153       | 3             | 1                    | 5                    | 1.251                         | -1.058                     | -0.251          |
| PR3         | 11         | 3.181       | 3             | 1                    | 5                    | 1.337                         | -1.199                     | -0.237          |
| PR4         | 12         | 3.187       | 3             | 1                    | 5                    | 1.274                         | -1.069                     | -0.197          |
| ACC1        | 13         | 3.26        | 3             | 1                    | 5                    | 1.218                         | -1.014                     | -0.206          |
| ACC2        | 14         | 3.19        | 3             | 1                    | 5                    | 1.254                         | -1.117                     | -0.197          |
| ACC3        | 15         | 3.196       | 3             | 1                    | 5                    | 1.189                         | -1.01                      | -0.166          |
| ACC4        | 16         | 3.266       | 3             | 1                    | 5                    | 1.247                         | -1.075                     | -0.199          |
| USE1        | 17         | 3.282       | 3             | 1                    | 5                    | 1.287                         | -0.993                     | -0.321          |
| USE2        | 18         | 3.266       | 3             | 1                    | 5                    | 1.243                         | -0.997                     | -0.268          |
| USE3        | 19         | 3.318       | 4             | 1                    | 5                    | 1.268                         | -0.982                     | -0.341          |
| USE4        | 20         | 3.314       | 4             | 1                    | 5                    | 1.309                         | -1.059                     | -0.31           |
| PT1         | 21         | 3.393       | 4             | 1                    | 5                    | 1.318                         | -1.014                     | -0.419          |

|     |    |       |   |   |   |       |        |        |
|-----|----|-------|---|---|---|-------|--------|--------|
| PT2 | 22 | 3.357 | 4 | 1 | 5 | 1.322 | -1.029 | -0.383 |
| PT3 | 23 | 3.298 | 4 | 1 | 5 | 1.339 | -1.138 | -0.296 |
| PT4 | 24 | 3.363 | 4 | 1 | 5 | 1.314 | -0.983 | -0.387 |
| PT5 | 25 | 3.321 | 4 | 1 | 5 | 1.266 | -0.997 | -0.312 |
| SI1 | 26 | 3.524 | 4 | 1 | 5 | 1.275 | -0.747 | -0.6   |
| SI2 | 27 | 3.508 | 4 | 1 | 5 | 1.27  | -0.774 | -0.562 |
| SI3 | 28 | 3.458 | 4 | 1 | 5 | 1.198 | -0.734 | -0.506 |
| SI4 | 29 | 3.476 | 4 | 1 | 5 | 1.243 | -0.792 | -0.515 |
| SI5 | 30 | 3.35  | 4 | 1 | 5 | 1.288 | -0.974 | -0.394 |
| PE1 | 31 | 3.625 | 4 | 1 | 5 | 1.262 | -0.596 | -0.713 |
| PE2 | 32 | 3.546 | 4 | 1 | 5 | 1.226 | -0.709 | -0.572 |
| PE3 | 33 | 3.582 | 4 | 1 | 5 | 1.198 | -0.591 | -0.598 |
| PE4 | 34 | 3.585 | 4 | 1 | 5 | 1.242 | -0.764 | -0.599 |
| PE5 | 35 | 3.379 | 4 | 1 | 5 | 1.246 | -0.918 | -0.397 |
| HM1 | 36 | 3.684 | 4 | 1 | 5 | 1.215 | -0.347 | -0.763 |
| HM2 | 37 | 3.567 | 4 | 1 | 5 | 1.227 | -0.682 | -0.57  |
| HM3 | 38 | 3.677 | 4 | 1 | 5 | 1.263 | -0.469 | -0.777 |
| HM4 | 39 | 3.549 | 4 | 1 | 5 | 1.266 | -0.723 | -0.605 |
| EE1 | 40 | 3.596 | 4 | 1 | 5 | 1.263 | -0.613 | -0.689 |
| EE2 | 41 | 3.562 | 4 | 1 | 5 | 1.263 | -0.663 | -0.636 |
| EE3 | 42 | 3.528 | 4 | 1 | 5 | 1.214 | -0.602 | -0.602 |
| EE4 | 43 | 3.54  | 4 | 1 | 5 | 1.273 | -0.708 | -0.615 |
| FC1 | 44 | 3.501 | 4 | 1 | 5 | 1.309 | -0.877 | -0.56  |
| FC2 | 45 | 3.438 | 4 | 1 | 5 | 1.22  | -0.749 | -0.488 |
| FC3 | 46 | 3.436 | 4 | 1 | 5 | 1.247 | -0.836 | -0.484 |
| FC4 | 47 | 3.47  | 4 | 1 | 5 | 1.191 | -0.625 | -0.527 |
| HL1 | 48 | 3.4   | 4 | 1 | 5 | 1.327 | -0.937 | -0.489 |
| HL2 | 49 | 3.415 | 4 | 1 | 5 | 1.321 | -1.029 | -0.437 |
| HL3 | 50 | 3.433 | 4 | 1 | 5 | 1.261 | -0.822 | -0.499 |
| HL4 | 51 | 3.454 | 4 | 1 | 5 | 1.378 | -1.025 | -0.5   |

|     |    |       |   |   |   |       |        |        |
|-----|----|-------|---|---|---|-------|--------|--------|
| PV1 | 52 | 3.467 | 4 | 1 | 5 | 1.294 | -0.872 | -0.517 |
| PV2 | 53 | 3.506 | 4 | 1 | 5 | 1.261 | -0.846 | -0.517 |
| PV3 | 54 | 3.44  | 4 | 1 | 5 | 1.285 | -0.878 | -0.511 |
| PV4 | 55 | 3.438 | 4 | 1 | 5 | 1.34  | -0.97  | -0.486 |

**Source:** Survey Data Analysis

#### **4.1.3 Respondents Demographic Analysis**

The sample demographic features given in Table 4.3 form an important base pertaining to the scope of the consumer behavior patterns investigated in this research. Out of 443 respondents, there was a small skew towards males, as 242 of them were males, giving a percentage of 55. The number of female respondents stood at 201, which was 45 percent of the total. This gap is important when looking at the issue of technology adoption as factors aligned with gender differences may have an impact on preferences, risk perceptions, and the likelihood of digital interactions. The smartphone-saturated sample may suggest lower levels of comfort with digital technology in the case of having or the availability of resources like smartphones along with Internet access, which may affect adoption, acceptance, and usage behavior of the technology in question.

Like other aspects, education level of the participants serves a distinct importance in describing the technology adoption and technology engagement of an individual concerning health technology interface. The largest proportion of the sample, 291 participants, or 66% were Masters or above, while 132 participants (30%) had graduate degrees. Only 20 participants (5%) were undergraduates. This suggests that the sample predominantly comprises people who are educated and who would likely know how to use a computer, understand online health materials, and make health decisions. Such a profile amplifies the relevance of constructs such as perceived trust, perceived risk, performance expectancy, and health literacy that are often affected by an individual's education in the system. It is known that most of the consumers especially in the digital options of health services intend to perceive these services as relevant because they have formulated the idea that education corresponds with value, hence, according to the outcome of the study, able educated people tend to be more pilot users of technology and more willing to actively use new technologies emerging around them.

Age is also an important demographic factor for this particular research. Most respondents were young to middle-aged adults, with a sample of 414 (93%) aged below 20 to 40 years. In addition, there were 22 participants (5%) who were 41 to 60 years old, while 7 respondents (2%) were older than 60 years. This demographic breakdown is particularly relevant regarding the adoption of e-pharmacies as younger people are more likely to be tech-savvy and willing to try new things including mobile health applications, teleconsultations, and smart health gadgets. Such preferences are consistent with the concepts of “effort expectancy, facilitating conditions, hedonic motivation, and social influence”. Younger people are also more influenced by peers and growing social trends, which is likely to enhance the rate at which new health technologies are adopted within this age group. The distribution of income within the sample shows that it is mostly constituted by people from the lower to middle class. The majority of respondents, 69.65% (313 individuals), reported earning up to 10 lakhs annually, while 18% (78 respondents) earned between 11-20 lakhs and 12% (52 individuals) earned more than 20 lakhs per year. Income level significantly impacts the assessment of value, affordance, risk, and price perception. For instance, lower income groups understand that even the slightest cost attached to new health technology adoption entails a hefty spend, making it difficult for them to adopt. In contrast, middle-income groups are more likely to adopt technologies if they perceive strong value in return, weighing affordability against realized benefits. The small share of higher-income participants seems to support the notion that without being explicitly tailored to demonstrate outstanding value or exclusivity, premium-priced digital health solutions are unlikely to appeal to a wide audience. Moreover, the prevalence of younger adults (aged 20-40) suggests that this cohort is predominantly leading the charge of the digital transformation. These individuals are likely to be shifting under the influence of lifestyle, convenience, and other experiential factors, which correspond with hedonic motivation and personal innovation theory of this study. Furthermore, they tend to use social validation and peer influence to a greater extent, which will affect their decision to use or not to use a digital health platform. Their adequately high digital fluency makes it possible that aspects like user interface design, functionality, and ease of access may be critical determinants of adoption and continued use. In addition, the described profile backs the claim that participants possess not only technological competence but also the

reasoning skills to critically analyze digital health services. Graduates and postgraduates are more likely to meticulously review the privacy policy, evaluate the platform's credibility, and interrogate the data's purpose which relates to perceived trust and perceived risk. Their feedback offers deeper and more accurate insights into the understanding and utilization of responsive digital health services. To summarize, this sample's demographic traits such as gender, education, age, and income, assist in contextualizing the results and interpreting the study's structural model. The work sheds light on the interaction between various consumer segments and digital health technologies by integrating demographic profiles with behavioral constructs. This allows for greater precision and efficiency when crafting, advertising, and expanding health innovations in the digital realm such as e-pharmacy.

**Table 4.3:** Demographic Characteristic of the Sample

| <b>Variable</b>           | <b>Scale</b>            | <b>Number</b> | <b>Percentage</b> |
|---------------------------|-------------------------|---------------|-------------------|
| Gender                    | Male                    | 242           | 55                |
|                           | Female                  | 201           | 45                |
| Educational qualification | Undergraduates          | 20            | 5                 |
|                           | Graduates               | 132           | 30                |
|                           | Postgraduates and above | 219           | 66                |
| Age group                 | Below 20 years          | 20            | 5                 |
|                           | 21-30 years             | 327           | 74                |
|                           | 31-40 years             | 67            | 15                |
|                           | 41-50 years             | 15            | 3                 |

|              |                |     |    |
|--------------|----------------|-----|----|
|              | 51-60 years    | 7   | 2  |
|              | Above 60 years | 7   | 2  |
| Income level | Upto 3 lakhs   | 30  | 7  |
|              | 3-5 lakhs      | 87  | 20 |
|              | 6-10 lakhs     | 196 | 44 |
|              | 11-20 lakhs    | 78  | 18 |
|              | Above 20 lakhs | 52  | 12 |

**Source:** Survey Data Analysis

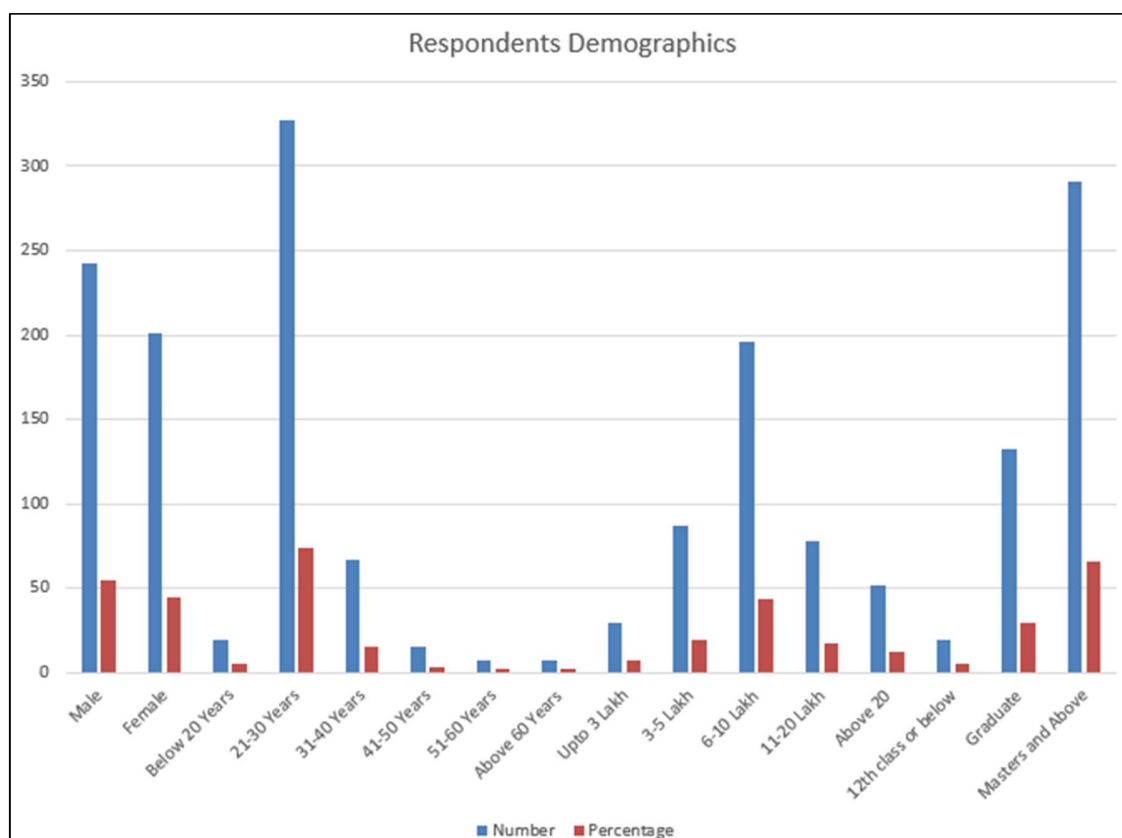


**Figure 4.1:** Respondents Demographics

**Source:** Survey Data Analysis

## **4.2 PLS-SEM Result**

As noted from the methodology section, the analytical approach for testing the specific hypotheses of this study was conducted using Partial Least Squares Structural Equation Modeling (PLS SEM) with Smart PLS version 4.0. It should be noted that the application of PLS-SEM has the requirement of following a two-step process, which is the assessment of the measurement and structural models (Hair et al 2013; 2016). Measurement model evaluation is a prerequisite for the analysis of the structural model. This indicates that the measurement model analysis is frequently employed to assess the validity and reliability of the data (Hair et al., 2011). In the same way, structural model analysis is performed to test the hypotheses of the study after this has been achieved. The results from these analyses are contained in the following subsections.

### **4.2.1 PLS-SEM Measurement Model**

The initial phase of assessing PLS-SEM outcomes requires a thorough evaluation of the measurement model, which examines the associations between latent constructs and their observed indicators. The aim of this step is to determine the reliability and validity of the outer model. According to Hair et al. (2019), specific elements should be reported when evaluating measurement models. As all constructs in the present study are reflective, the analysis focused on examining outer loadings, convergent validity, and discriminant validity prior to testing the structural model.

The table 4.4 below presents measurement model findings pertaining the study's constructs, providing critical details into their reliabilities and validities with respect to the outer loadings, Cronbach's alpha value, rho\_a, composite reliability, and average variance extracted (AVE). These metrics validate the internal consistency, convergent validity, and reliability of the components configured to examine consumer behavior in relation to e-pharmacy adoption.

**Table 4.4:** Construct Reliability and Validity of the Measurement Model

| <b>Construct</b>        | <b>Item</b> | <b>Outer loadings</b> | <b>Cronbach's alpha</b> | <b>rho_a</b> | <b>Composite reliability</b> | <b>AVE</b> |
|-------------------------|-------------|-----------------------|-------------------------|--------------|------------------------------|------------|
| Acceptance              | ACC1 <- ACC | 0.856                 | 0.862                   | 0.863        | 0.907                        | 0.709      |
|                         | ACC2 <- ACC | 0.800                 |                         |              |                              |            |
|                         | ACC3 <- ACC | 0.841                 |                         |              |                              |            |
|                         | ACC4 <- ACC | 0.869                 |                         |              |                              |            |
| Adoption                | AD1 <- Ad   | 0.873                 | 0.881                   | 0.881        | 0.918                        | 0.737      |
|                         | AD2 <- Ad   | 0.830                 |                         |              |                              |            |
|                         | AD3 <- Ad   | 0.852                 |                         |              |                              |            |
|                         | AD4 <- Ad   | 0.877                 |                         |              |                              |            |
| Effort Expectancy       | EE1 <- EE   | 0.873                 | 0.873                   | 0.874        | 0.913                        | 0.724      |
|                         | EE2 <- EE   | 0.855                 |                         |              |                              |            |
|                         | EE3 <- EE   | 0.808                 |                         |              |                              |            |
|                         | EE4 <- EE   | 0.867                 |                         |              |                              |            |
| Hedonic Motivation      | HM1 <- HM   | 0.876                 | 0.889                   | 0.890        | 0.923                        | 0.750      |
|                         | HM2 <- HM   | 0.865                 |                         |              |                              |            |
|                         | HM3 <- HM   | 0.858                 |                         |              |                              |            |
|                         | HM4 <- HM   | 0.866                 |                         |              |                              |            |
| Health Literacy         | HL1 <- HL   | 0.890                 | 0.892                   | 0.894        | 0.925                        | 0.755      |
|                         | HL2 <- HL   | 0.892                 |                         |              |                              |            |
|                         | HL3 <- HL   | 0.822                 |                         |              |                              |            |
|                         | HL4 <- HL   | 0.870                 |                         |              |                              |            |
| Facilitating Conditions | FC1 <- FC   | 0.845                 | 0.842                   | 0.844        | 0.894                        | 0.678      |
|                         | FC2 <- FC   | 0.816                 |                         |              |                              |            |
|                         | FC3 <- FC   | 0.798                 |                         |              |                              |            |

|                         |           |       |       |       |       |       |
|-------------------------|-----------|-------|-------|-------|-------|-------|
|                         | FC4 <- FC | 0.835 |       |       |       |       |
| Performance Expectancy  | PE1 <- PE | 0.855 | 0.839 | 0.846 | 0.887 | 0.611 |
|                         | PE2 <- PE | 0.780 |       |       |       |       |
|                         | PE3 <- PE | 0.804 |       |       |       |       |
|                         | PE4 <- PE | 0.755 |       |       |       |       |
|                         | PE5 <- PE | 0.706 |       |       |       |       |
| Personal Innovativeness | PI1 <- PI | 0.866 | 0.870 | 0.871 | 0.911 | 0.719 |
|                         | PI2 <- PI | 0.815 |       |       |       |       |
|                         | PI3 <- PI | 0.841 |       |       |       |       |
|                         | PI4 <- PI | 0.869 |       |       |       |       |
| Perceived Risk          | PR1 <- PR | 0.899 | 0.908 | 0.909 | 0.936 | 0.785 |
|                         | PR2 <- PR | 0.888 |       |       |       |       |
|                         | PR3 <- PR | 0.883 |       |       |       |       |
|                         | PR4 <- PR | 0.872 |       |       |       |       |
| Perceived Trust         | PT1 <- PT | 0.819 | 0.853 | 0.853 | 0.896 | 0.635 |
|                         | PT2 <- PT | 0.829 |       |       |       |       |
|                         | PT3 <- PT | 0.837 |       |       |       |       |
|                         | PT4 <- PT | 0.837 |       |       |       |       |
|                         | PT5 <- PT | 0.646 |       |       |       |       |
| Price Value             | PV1 <- PV | 0.918 | 0.915 | 0.915 | 0.940 | 0.797 |
|                         | PV2 <- PV | 0.900 |       |       |       |       |
|                         | PV3 <- PV | 0.903 |       |       |       |       |
|                         | PV4 <- PV | 0.850 |       |       |       |       |
| Social Influence        | SI1 <- SI | 0.842 | 0.870 | 0.871 | 0.907 | 0.660 |
|                         | SI2 <- SI | 0.824 |       |       |       |       |

|       |             |       |       |       |       |       |
|-------|-------------|-------|-------|-------|-------|-------|
|       | SI3 <- SI   | 0.841 |       |       |       |       |
|       | SI4 <- SI   | 0.822 |       |       |       |       |
|       | SI5 <- SI   | 0.729 |       |       |       |       |
| Usage | USE1 <- USE | 0.876 | 0.885 | 0.885 | 0.921 | 0.744 |
|       | USE2 <- USE | 0.861 |       |       |       |       |
|       | USE3 <- USE | 0.850 |       |       |       |       |
|       | USE4 <- USE | 0.862 |       |       |       |       |

**Source:** Author Calculations

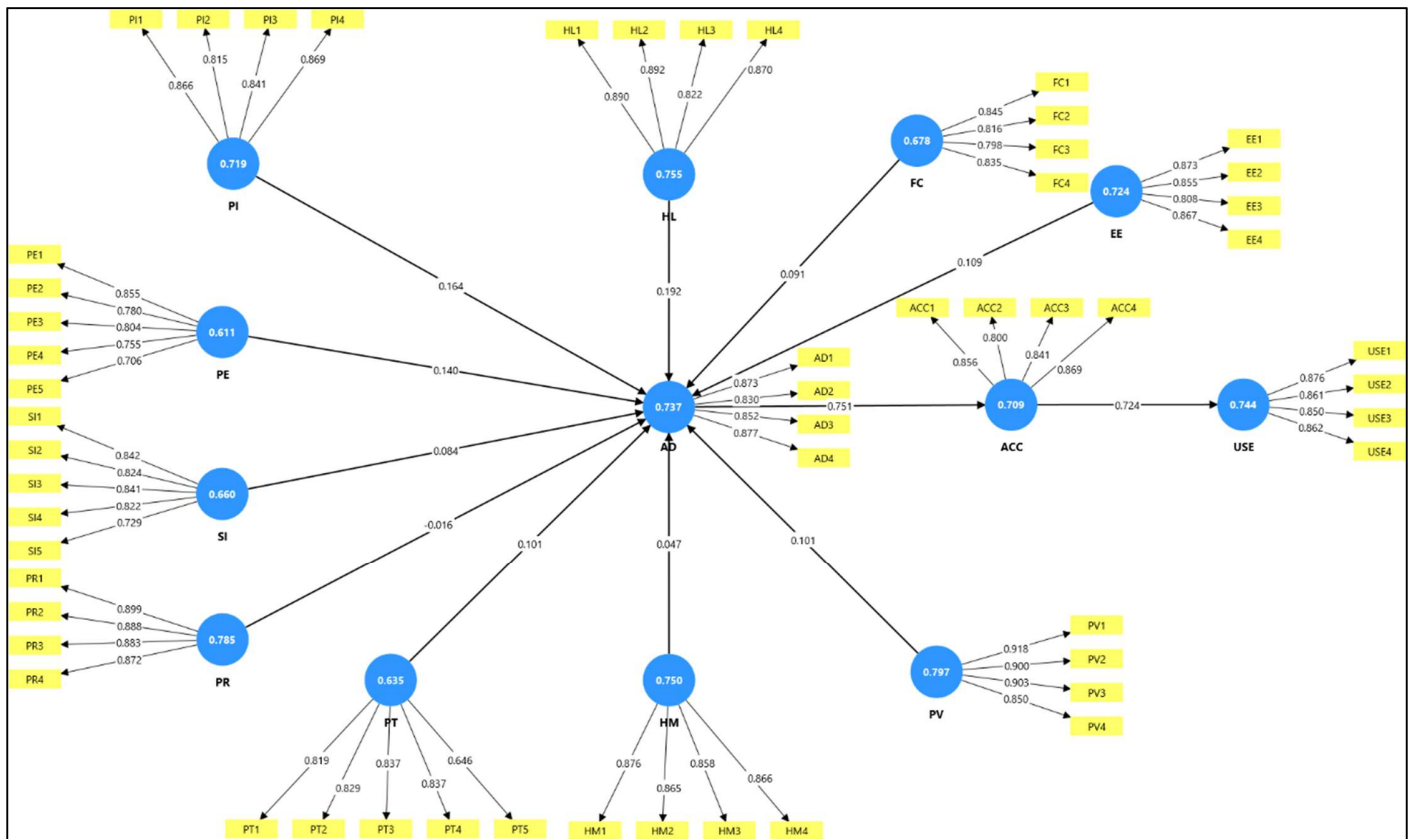


**Figure 4.2:** Measurement Model

**Source:** Author Compilation/SMART-PLS

#### **4.2.1.1 Indicator Reliability, Internal Consistency Reliability and Convergent Validity**

Indicator Reliability is defined as the accuracy and consistency of a specific measurement item within a defined limit. In any research work, especially within the scope of SEM and factor analysis, reliability indicators are checked to confirm that every item is aligned with the construct and the data captured is valid. In most cases, the reliability of indicators is checked through outer loadings and the higher the loading, the more reliable the indicator is. An outer loading of 0.70 is acceptable as that indicates a minimum of 50% of the variance of the indicator is dependent on the construct. Any items associated with low loadings will have to be revised so that the measurement model reliability is improved.

Internal Consistency Reliability focuses on how all items or indicators of a construct uniformly measure a single concept. It evaluates whether the responses to various parts of a scale are interrelated and represent the construct reliably. Greater internal consistency suggests that the items are cohesive and that reliable and stable measurements are produced. Cronbach's Alpha is a common measure of internal consistency. Values above 0.70 are considered acceptable and imply adequate reliability. In structural equation modeling, another measure is Composite Reliability (CR) which provides a better estimate of reliability by considering the actual factor loadings of the indicators. It is important to ensure internal consistency reliability because doing so improves the integrity of the measurement model, minimizes the error of measurement, and ensures the data capture the intended constructs. Researchers are able to interpret the relations of the constructs which are analyzed, for example, in regression or structural equation modeling, after presuming high reliability the measurement.

Convergent Validity is defined as the extent to which two or more indicators of the same construct agree and confirm that they measure the same underlying construct. It ensures that the items designed to measure a particular construct are measuring the same construct and are correlated. In quantitative research, the average variance extracted, or AVE, is frequently used to assess convergent validity. AVE values of 0.50 or greater signify that more than half of the variance, in both the indicators and construct, is explained therefore,

the construct is well defined. In addition, high outer loadings, that are usually 0.70 and above, on the corresponding construct also support convergent validity.

In the context of the present study, the Acceptance construct (ACC), derived from four items (ACC1-ACC4), recorded high outer loadings of 0.800-0.869. Also, for ACC, Cronbach's alpha is 0.862, which shows the internal consistency to be very good. Moreover, composite reliability is 0.907 and the corresponding AVE is 0.709. These values surpass 0.7 for reliability and 0.5 for AVE, confirming the construct's reliability and convergent validity. Likewise, the Adoption construct (Ad) demonstrated outer loadings between 0.830 and 0.877 across its four items. The items' reliability in measuring the underlying concept of adoption is supported by a Cronbach's alpha of 0.881, composite reliability of 0.918, and a corresponding AVE of 0.737. Effort Expectancy (EE) is assessed by four items and their respective loadings range between 0.808 and 0.873. Its reliability is affirmed by a Cronbach's alpha of 0.873 and composite reliability of 0.913. The AVE was found to be 0.724, which indicates that a considerable amount of variance was captured by the construct, thus supporting convergent validity. The construct Hedonic Motivation (HM) also showed a high outer loading (0.858 to 0.876) and the reliability measures surpassed the required thresholds, Cronbach's alpha of 0.889 and composite reliability of 0.923. Moreover, an AVE of 0.750 adds further validity to HM in terms of reflecting motivations for consumer engagement. Health Literacy (HL) was measured with four items and it showed outer loadings ranging from 0.822 to 0.892. The internal consistency, composite reliability, and AVE were equally excellent with results of  $\alpha = 0.892$ , 0.925 and 0.755 respectively which confirms the construct's strength. Facilitating Conditions (FC) also showed reasonable reliability, with a Cronbach's alpha of 0.842 and composite reliability of 0.894. All the outer loadings for its items were above 0.798 and the AVE of 0.678, which reflects the extent to which the items share variance. The construct Performance Expectancy (PE) has five items with loadings ranging from 0.706 to 0.855. Even though the loading on PE5 is relatively lower at 0.706, the construct overall has satisfactory reliability as Cronbach's alpha is 0.839, composite reliability is 0.887, and AVE is 0.611. Personal Innovativeness (PI), with four items, demonstrated loadings from 0.815 to 0.869, yielding a Cronbach's alpha of 0.870 and composite reliability of 0.911. The AVE of 0.719 is indicative of high convergent validity. Perceived Risk (PR) showed

very high loadings ranging from 0.872 to 0.899 which, along with an  $\alpha$  of 0.908 and composite reliability of 0.936, demonstrate excellent internal consistency, with AVE at 0.785. Together, these values suggest that consumers have an internalized coherent perception of risk associated with the given product or service. Perceived Trust (PT) had five items of which PT5 had relatively lower loading of 0.646 but acceptable at 95% confidence interval [0.584, 0.704]. Furthermore, the construct's reliability is still good with Cronbach's alpha of 0.853, composite reliability of 0.896, and AVE of 0.635. The Price Value (PV) measure achieved exceedingly high loadings between 0.850 and 0.918 using four items which led to a Cronbach's alpha of 0.915, composite reliability of 0.940, and AVE of 0.797. This means that consumers perceive price and benefit balance very positively. Social Influence (SI) had five items and maintained loadings above 0.729 which provided an  $\alpha = 0.870$ , composite reliability 0.907, and AVE equaled 0.660, signifying that peers or society play an important role on the consumer's behavior towards the adoption phase. Lastly, Usage (USE) performed with four items and attained loadings between 0.850 and 0.876. Its internal consistency and reliability were measured yielding a Cronbach's alpha of 0.885, composite reliability 0.921 and AVE equaled 0.744. These results suggest that respondents have a common perception on the active engagement behavior which is termed usage. All constructs showed strong psychometric properties because their outer loadings were above 0.7, which suggests high indicator reliability. Each construct's Cronbach's alpha was greater than 0.7, confirming internal consistency. The composite reliability values, which ranged from 0.887 to 0.940, supported the reliability of the constructs. AVE values also supported the reliability of the constructs as they all exceeded 0.6. These results support the structural model, meaning the data can be trusted to reliably and validly test the hypotheses posed.

#### **4.2.1.2 Discriminant Validity**

Discriminant validity represents a crucial element of construct validation, ensuring that measurement items accurately distinguish between conceptually different constructs (Fornell & Larcker, 1981). It reflects the extent to which theoretically distinct variables are empirically unique, such that valid measures of separate constructs do not exhibit excessively high intercorrelations. According to Rasoolimanesh (2022), discriminant validity can be evaluated using the Heterotrait–Monotrait ratio (HTMT) approach, where

the HTMT value should remain below the accepted threshold of 0.85 or 0.90 (Henseler et al., 2015; Sarstedt, 2019). However, Hair et al. (2022) suggested that in certain research context HTMT ratio can go upto 0.95 and is acceptable. In line with these guidelines, this study assessed discriminant validity employing both the Fornell–Larcker criterion (Fornell & Larcker, 1981) and the HTMT ratio (Henseler et al., 2015) to confirm that all constructs were empirically distinct.

#### 4.2.1.2.1 Fornell - Larcker Criterion

The Fornell–Larcker criterion of discriminant validity in table 4.5 is one of the most popular techniques used in PLS-SEM and is determined by comparing “the square root of the Average Variance Extracted (AVE)” for each construct (shown on the diagonal, bold or first column per construct) with correlations of that construct with other constructs (off-diagonal values). For discriminant validity to hold, the diagonal value (square root of AVE) should be greater than all correlations in its respective row and column. Table 4.5 shows that all constructs in this study achieved discriminant validity based on this criterion. This reflects that the constructs are distinct from each other in the measurement model.

**Table 4.5:** Discriminant Validity Analysis: Fornell-Larcker Criterion Matrix

|     | ACC          | AD           | EE           | FC           | HL           | HM           | PE           | PI           | PR           | PT           | PV           | SI           | USE          |
|-----|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| ACC | <b>0.842</b> |              |              |              |              |              |              |              |              |              |              |              |              |
| AD  | 0.751        | <b>0.858</b> |              |              |              |              |              |              |              |              |              |              |              |
| EE  | 0.693        | 0.762        | <b>0.851</b> |              |              |              |              |              |              |              |              |              |              |
| FC  | 0.714        | 0.756        | 0.716        | <b>0.824</b> |              |              |              |              |              |              |              |              |              |
| HL  | 0.714        | 0.791        | 0.723        | 0.707        | <b>0.869</b> |              |              |              |              |              |              |              |              |
| HM  | 0.641        | 0.697        | 0.637        | 0.679        | 0.714        | <b>0.866</b> |              |              |              |              |              |              |              |
| PE  | 0.736        | 0.793        | 0.757        | 0.759        | 0.768        | 0.714        | <b>0.801</b> |              |              |              |              |              |              |
| PI  | 0.720        | 0.794        | 0.764        | 0.756        | 0.748        | 0.658        | 0.775        | <b>0.848</b> |              |              |              |              |              |
| PR  | 0.632        | 0.601        | 0.538        | 0.596        | 0.638        | 0.564        | 0.623        | 0.596        | <b>0.886</b> |              |              |              |              |
| PT  | 0.685        | 0.732        | 0.664        | 0.694        | 0.701        | 0.630        | 0.713        | 0.714        | 0.600        | <b>0.797</b> |              |              |              |
| PV  | 0.617        | 0.718        | 0.684        | 0.664        | 0.686        | 0.608        | 0.676        | 0.714        | 0.578        | 0.641        | <b>0.893</b> |              |              |
| SI  | 0.694        | 0.754        | 0.717        | 0.727        | 0.740        | 0.690        | 0.749        | 0.724        | 0.618        | 0.707        | 0.649        | <b>0.813</b> |              |
| USE | 0.724        | 0.716        | 0.670        | 0.690        | 0.723        | 0.651        | 0.720        | 0.733        | 0.602        | 0.657        | 0.638        | 0.657        | <b>0.862</b> |

**Source:** Author Calculations/SMART-PLS

#### 4.2.1.2.2 Heterotrait-Monotrait ratio (HTMT)

The Heterotrait-Monotrait Ratio (HTMT) is a statistical measure used in structural equation modelling (SEM) to assess the discriminant validity of latent constructs in a measurement model (Henseler et al., 2015). In conclusion, based on the Heterotrait-Monotrait ratio (HTMT) values provided for each construct in relation to others, every single construct demonstrates strong discriminant validity. As can be seen in table 4.6, all the HTMT values are well below the recommended thresholds of 0.85 or 0.9 and liberally suggested threshold of 0.95. This helped to bring out the distinction between the constructs and suggested that they measure distinct phenomenon.

**Table 4.6:** Discriminant Validity Analysis: Heterotrait-Monotrait ratio (HTMT)

|     | ACC   | AD    | EE    | HM    | HL    | FC    | PE    | PI    | PR    | PT    | PV    | SI    | USE |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----|
| ACC | 0.862 |       |       |       |       |       |       |       |       |       |       |       |     |
| AD  | 0.799 | 0.869 |       |       |       |       |       |       |       |       |       |       |     |
| EE  | 0.838 | 0.876 | 0.835 |       |       |       |       |       |       |       |       |       |     |
| FC  | 0.813 | 0.891 | 0.818 | 0.815 |       |       |       |       |       |       |       |       |     |
| HL  | 0.732 | 0.786 | 0.724 | 0.785 | 0.801 |       |       |       |       |       |       |       |     |
| HM  | 0.865 | 0.919 | 0.884 | 0.900 | 0.886 | 0.823 |       |       |       |       |       |       |     |
| PE  | 0.832 | 0.907 | 0.876 | 0.883 | 0.848 | 0.749 | 0.907 |       |       |       |       |       |     |
| PI  | 0.714 | 0.672 | 0.604 | 0.680 | 0.708 | 0.627 | 0.712 | 0.671 |       |       |       |       |     |
| PR  | 0.794 | 0.838 | 0.765 | 0.814 | 0.797 | 0.720 | 0.837 | 0.825 | 0.680 |       |       |       |     |
| PT  | 0.695 | 0.800 | 0.766 | 0.756 | 0.759 | 0.674 | 0.770 | 0.800 | 0.634 | 0.722 |       |       |     |
| PV  | 0.801 | 0.860 | 0.823 | 0.847 | 0.839 | 0.784 | 0.875 | 0.833 | 0.695 | 0.814 | 0.727 |       |     |
| SI  | 0.829 | 0.811 | 0.762 | 0.799 | 0.813 | 0.734 | 0.835 | 0.835 | 0.671 | 0.751 | 0.708 | 0.749 |     |
| USE |       |       |       |       |       |       |       |       |       |       |       |       |     |

**Source:** Author Calculations/SMART-PLS

#### **4.2.2 PLS-SEM Structural Model**

PLS-SEM Structural Model Results utilize Partial Least Squares Structural Equation Modeling (PLS-SEM) to evaluate and visualize the relationships among constructs in a given research model. This study specifically assesses the relationships of the hypothesized paths to their influence and value in contributing to the model, thus providing a glimpse of how independent constructs impact dependents at a variable level. Further, the derived insights from the structural model results are essential for determining the validity of proposed hypotheses and for providing insights into the relationships among the studied variables.

Within PLS-SEM, the construct relationships are evaluated primarily through path coefficients which indicate and quantify the effect. Path coefficients are further assessed with t-statistics and p-values (often derived from bootstrapping) to determine their significance. A path coefficient equal to, or greater than, zero indicates a dependent and independent relationship, while a coefficient lower than zero indicates the opposite. A p-value of less than 0.05 indicates significance and thus supports the hypothesized relationship. To assess the model's explanatory power, the coefficient of determination ( $R^2$ ) is leveraged to quantify the dependent variable's variance as a result of the independent constructs. Higher values of  $R^2$  indicates stronger explanatory capability. Additionally, effect size ( $f^2$ ) assesses the influence independent variables have individually on a dependent variable to determine which of the predictors are of more substantial influence.

##### **4.2.2.1 Assessment of Collinearity (VIF)**

The Variance Inflation Factor (VIF) is a statistical tool employed to evaluate multi-collinearity within regression analysis. Multi-collinearity arises when independent variables within a regression model exhibit strong correlations, potentially resulting in unstable coefficient estimates and challenges in interpreting the impact of individual predictors (Hair et al., 2011). The VIF serves to measure the extent to which multi-collinearity elevates the variance of estimated regression coefficients. PLS-SEM, for full collinearity assessment, assess the variance inflation factor (VIF) values for independent and dependent constructs. It is widely accepted that if the VIF scores are less than a

conservative cut-off point, this indicates that common method bias (CMB) is not too pronounced of an issue. Nonetheless, it should be remembered that VIF assesses multicollinearity, which is not the same as CMB. The VIF values presented in table 4.7 are used as multicollinearity checks for the predictor variables and for diagnosing common method bias (CMB) issues. With respect to structural equation modelling, and specifically using PLS-SEM, the VIF values are scrutinized for any possibility of a predictive variable having too high correlation with its co-predictor variables which can undermine the credibility of path estimates. The ideal VIF value is below 3, though values between 3 and 5 can be deemed acceptable to a certain degree (Hair et al., 2011). In this analysis, the VIF values are between 1.000 to 4.037 fall within the recommended threshold limits.

**Table 4.7:** VIF Assessment for Structural Model Constructs

| Hypotheses | VIF   |
|------------|-------|
| ACC → USE  | 1.000 |
| Ad → ACC   | 1.000 |
| EE → Ad    | 3.258 |
| HM → Ad    | 2.571 |
| HL → Ad    | 3.607 |
| FC → Ad    | 3.282 |
| PE → Ad    | 4.037 |
| PI → Ad    | 3.841 |
| PR → Ad    | 1.995 |
| PT → Ad    | 2.746 |
| PV → Ad    | 2.532 |
| SI → Ad    | 3.298 |

**Source:** Author Calculations/SMART-PLS

#### **4.2.2.2 Assessment of R-Squared ( $R^2$ )**

The R-square ( $R^2$ ) values obtained from the structural model as given in table 4.8 give a vital insight into how well the proposed independent variables account for the changes in the dependent variables. These values reflect how much a model can be trusted in its predictions and its explanations. In behavioral studies, particularly regarding the study of technology adoption, R-square values indicate the adequacy of the model to replicate consumers' behavioral patterns. In this case, three key constructs Adoption (Ad), Acceptance (ACC), and Usage (USE) were analyzed for R-square and adjusted R-square values concerning the strength of the structural model with regard to e-pharmacy services in National Capital Region (NCR) of India.

The model with the highest R-square value of 0.778 is the one with construct Adoption (Ad), meaning that 77.8% of consumer's adoption variance of e-pharmacy services is modelled with this value. This is high in social science research and suggests that the "Effort Expectancy, Performance Expectancy, Social Influence, Facilitating Conditions, Hedonic Motivation, Health Literacy, Price Value, Perceived Trust, Perceived Risk, and Personal Innovativeness" included in the model predicts most of the time accurately, adoption behavior due to the comprehensive nature of these factors. This implies it's easier to conceptualize these factors as motives to adoption if the system is viewed as useful and user friendly, the consumer is socially influenced, has support structure, and in cases where they feel self-motivated or motivated due to health awareness. In such cases the consumers are more likely to adopt e-pharmacy platforms. The model's adjusted R-square value of 0.772 denotes that the reliability of the model remains even when adding more explanatory variables or factors, supporting the idea that the model is indeed not saturated.

Continuing on, the Acceptance (ACC) construct displays an R-square of 0.565 which indicates that 56.5% of variability in acceptance is due to prior adoption behavior of the consumers. This amount of explanation is moderate to high, meaning that consumers who have adopted an e-pharmacy platform are likely to develop a positive perception towards its continuance usage. The gap between adoption and acceptance depicts the require the need of emphasis put on the experiences and impressions for the consumers to create perception and satisfaction. It could be posited that when consumers begin to use the

system, their acceptance is positively reinforced by factors such as usability, reliability, convenience, and customer support. An adjusted R-square of 0.564 suggests marginal reduction, once more illustrating the model's integrity after adjustment, thus showing strong, meaningful relationship.

The Usage (USE) construct indicates actual engagement or use of e-pharmacy platforms, and its R-square is 0.524. This suggests that 52.4% of the variation in consumers' usage behavior is determined by their level of acceptance. This explanation elucidates an important observation: acceptance serves as a bridge in continuum between the intention and actual sustained engagement with the system. Put differently, if consumers do not accept or trust the e-pharmacy platform, they are unlikely to use it consistently. This is especially relevant in the context of health services because continuous interaction is essential to derive sustained value. Once more, the adjusted R-square of 0.523 supports this contention, indicating a bounded model devoid of over exaggeration purely due to the number of parameters.

Compared to the set standards, these R-square values confirm the structural model's robustness. As presented by Chin (1998),  $R^2$  values equaling or exceeding 0.67 are abundant, roughly 0.33 is moderate, and 0.19 or below is deemed as weak. In this case, the Adoption construct is clearly substantial but Acceptance and Usage fall into the moderate and substantial category which also means that the model is grounded and statistically reasonable. The model provides an explanation for a considerable portion of the consumer's decision-making process concerning the adoption and utilization of e-pharmacy systems.

To summarize, the R-square assessment substantiates the framework of the study while highlighting the importance of the chosen predictors. The predictors, especially noted during the adoption phase, showcased high explanatory power suggesting that e-pharmacy platforms should prioritize user-interface design, trust-enhancing educational materials, motivation-oriented attributes, and effortless navigation. Further, effective adoption strategies can boost acceptance and routine engagement with the platform. These findings are important for decision-makers, digital health innovation specialists, and healthcare

practitioners seeking to improve e-pharmacy adoption and user loyalty in developing economies like India.

**Table 4.8:** R<sup>2</sup> Values of Constructs

| Constructs | R-square | R-square adjusted |
|------------|----------|-------------------|
| ACC        | 0.565    | 0.564             |
| Ad         | 0.778    | 0.772             |
| USE        | 0.524    | 0.523             |

**Source:** Author Calculations/SMART-PLS

#### 4.2.2.3 Assessment of Hypotheses for the Direct Effect

The structural model analysis as shown in table 4.9 reveals the impact of Adoption (Ad) and Acceptance (ACC) on the actual Usage (USE) of e-pharmacy platforms. Path coefficients from Adoption to Acceptance ( $\beta = 0.751$ ,  $p < 0.001$ ) and from Acceptance to Usage ( $\beta = 0.724$ ,  $p < 0.001$ ) illustrate that the users' cognitive appraisal towards utilizing e-pharmacy services greatly influences their intention to use these services on a continuous basis. These results show that marketing strategies during the adoption phase could increase perceived acceptance and motivated sustained use of these systems by users.

Among the earlier stated factors constituting Adoption (Ad), Health Literacy (HL) and Personal Innovativeness (PI) prove to be strong determinants. These findings demonstrate that better understanding and awareness of healthcare and digital healthcare tools leads to greater adoption of e-pharmacy services (Health Literacy  $\beta = 0.192$ ,  $p = 0.000$ ). Furthermore, patients with a higher tendency to use modern technologies are more likely to interact with digital pharmacy services (Personal Innovativeness  $\beta = 0.164$ ,  $p = 0.002$ ). This adds to the body of evidence supporting integrated educational campaigns and innovation-fueled user profiling to encourage the use of technology in healthcare.

The impact of Performance Expectancy (PE) ( $\beta = 0.140$ ,  $p = 0.003$ ), Facilitating Conditions (FC) ( $\beta = 0.091$ ,  $p = 0.035$ ), Effort Expectancy (EE) ( $\beta = 0.109$ ,  $p = 0.011$ ), and Social

Influence (SI) ( $\beta = 0.084$ ,  $p = 0.034$ ) are also pivotal in regards to technology adoption behavior. These underline the influence of infrastructure assistance, the user's perceived ease of operation, perceived usefulness and the influence of others on the user's choice. Especially in areas with discrepancies in digital health literacy, making systems user friendly, along with ensuring technical help or peer referrals can greatly enhance e-pharmacy adoption. These results confirm the findings of the Unified Theory of Acceptance and Use of Technology (UTAUT) which considers performance expectancy, effort expectancy and facilitating conditions as primary determinants of adoption behavior.

Remarkably, Hedonic Motivation (HM) and Perceived Risk (PR) did not exert statistically significant effects on Adoption. The non-significant relationship of Hedonic Motivation ( $\beta = 0.047$ ,  $p = 0.158$ ) indicates that the enjoyment or pleasure associated with the use of e-pharmacy platforms does not seem to be a primary motivator for adoption. This might be because of the utilitarian nature concerning healthcare services where functionality, reliability, and trustworthiness are placed above entertainment. Furthermore, Perceived Risk ( $\beta = -0.016$ ,  $p = 0.574$ ) not impacting Adoption suggests that users either trust the security countermeasures set in place or do not have full knowledge of the risks. This marks an interesting difference from other digital adoption scenarios where risk perception is more prevalent.

The earlier analysis reveals Perceived Trust (PT) and Price Value (PV) have a positive effect on Adoption, showing users view e-pharmacy platforms in terms of trustworthiness and cost-effectiveness. Digital health providers are trusted and supported by attractive pricing or discounts, which further encourages adoption. Developers and managers of these pharmacy platforms can enhance the users perceived value by providing secure payment options and transparent data handling, along with competitive pricing. Additionally, healthcare marketers aiming to elevate trust and value-oriented messaging will combine these findings with strategical insights aimed at fostering trust to improve adoption rates and shift marketing focus.

The high path coefficients and T-statistics support relative closeness in connectivity among constructs and suggest observing consumer readiness, engagement drivers, and brand equity determinants in digital healthcare through a single encompassing framework. This

reveals a more relational, robust, and strategic approach. These findings require addressing imaginatively trust and innovativeness, alongside social influence and support, wholly redefining user experience.

**Table 4.9:** Hypotheses Testing

| <b>Hypothesis Relationship</b> | <b>B</b> | <b>Standard deviation (STDEV)</b> | <b>T statistics</b> | <b>Class Interval</b> | <b>P values</b> | <b>Decision</b> |
|--------------------------------|----------|-----------------------------------|---------------------|-----------------------|-----------------|-----------------|
| ACC→USE                        | 0.724    | 0.027                             | 26.704              | [0.665;0.772]         | 0.000           | Supported       |
| Ad→ACC                         | 0.751    | 0.023                             | 32.387              | [0.700;0.792]         | 0.000           | Supported       |
| EE→Ad                          | 0.109    | 0.043                             | 2.549               | [0.028;0.197]         | 0.011           | Supported       |
| HM→Ad                          | 0.047    | 0.033                             | 1.413               | [-0.015;0.115]        | 0.158           | Not Supported   |
| HL→Ad                          | 0.192    | 0.046                             | 4.196               | [0.103;0.283]         | 0.000           | Supported       |
| FC→Ad                          | 0.091    | 0.043                             | 2.105               | [0.007;0.178]         | 0.035           | Supported       |
| PE→Ad                          | 0.140    | 0.046                             | 3.015               | [0.051;0.237]         | 0.003           | Supported       |
| PI→Ad                          | 0.164    | 0.052                             | 3.149               | [0.065;0.269]         | 0.002           | Supported       |
| PR→Ad                          | -0.016   | 0.029                             | 0.562               | [-0.075;0.042]        | 0.574           | Not Supported   |
| PT→Ad                          | 0.101    | 0.038                             | 2.644               | [0.029;0.117]         | 0.008           | Supported       |
| PV→Ad                          | 0.101    | 0.038                             | 2.641               | [0.030;0.181]         | 0.008           | Supported       |
| SI→Ad                          | 0.084    | 0.040                             | 2.126               | [0.011;0.167]         | 0.034           | Supported       |

**Source:** Author Calculations/SMART-PLS

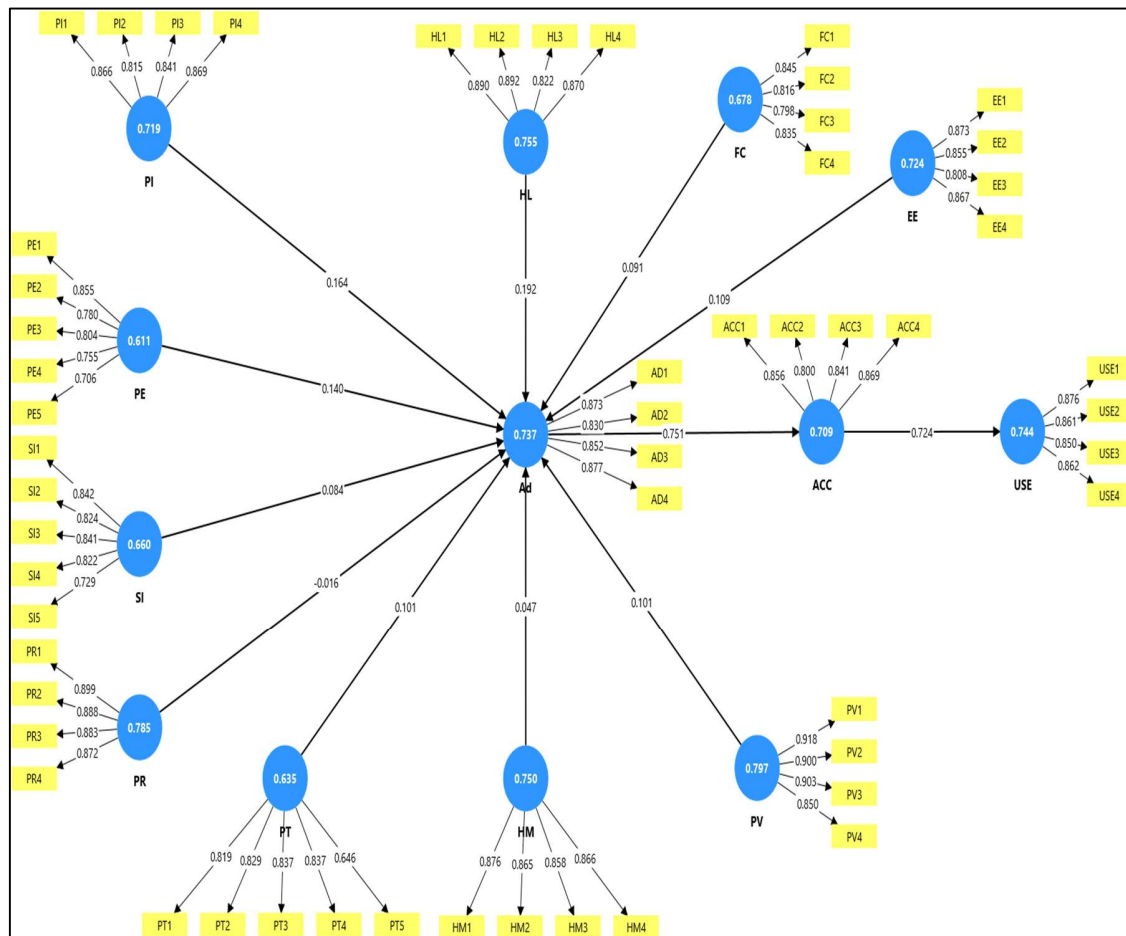


**Figure 4.3:** Structural Model with Path Coefficients

Source: Author Compilation /SMART-PLS

#### 4.2.2.4 Assessment of the Effect Size ( $f^2$ )

The effect size, or  $f$  squared analysis in table 4.10, helps understand the significance and strength of different usage e-pharmacy predictors and consumer behaviors in the National Capital Region. Cohen's  $f$ -square is the metric that determines the degree of contribution of a single independent variable to the variance of a dependent variable, considering other variables being accounted for in the model. Cohen defined benchmarks for his model, where  $f$  squared above 0.35 indicates large effect, around 0.15 moderate effect, 0.02 small effect, and below 0.02 negligible (Cohen, 1988).

Regarding the behavioral outcomes, the greatest impact within the model appears to be in the sequential links of Adoption, Acceptance, and Usage. Adoption has a tremendous

impact on Acceptance, with an  $f^2$  measuring 1.297, which is a large effect by any standard. This indicates that at the very least consumers who make an initial adoption decision towards e-pharmacy services during the adoption stage subsequently tend to have a stronger attitude and acceptance of these services positively. This acceptance is critical as it is the important precursor for continued use. On the other hand, Acceptance has similarly great impact on actual Usage, with an  $f^2$  value of 1.101, reinforcing the fact that how much e-pharmacy is accepted, absorbed, and viewed as going is deeply relates to the extent of interactions with the service. These results underline the need to shift the focus toward formulating strategies that deepen acceptance beyond initial adoption to guarantee sustained usage.

When analyzing the direct precursors to Adoption, the effect sizes are substantially lower but still provide useful information. Of these, Health Literacy (HL) seems to be the most potent predictor, having an  $f^2$  of 0.046. This remains a small effect size, however, it indicates that consumers who have higher understanding and knowledge about health information are more likely to embrace e-pharmacy services. This is to be expected because users of e-pharmacy services are often required to make educated choices about medications, dosages, and other relevant health issues, thus literacy is necessary to reduce and eliminate doubt while enhancing trust.

Personal Innovativeness (PI) has an  $f^2$  of 0.031, meaning that it also has a small but relevant impact regarding Adoption. This implies that a person who is more willing to try out new technologies or services in general is also slightly more likely to test e-pharmacy services. This can be very useful when trying to identify certain groups within the market in order to direct marketing campaigns towards the first adopters or more technologically inclined customers in order to speed up diffusion.

Using e-pharmacies enhances a customer's convenience and health management. Therefore, the effect size of Performance Expectancy (PE) is equal to 0.022, indicating a small yet positive influence on adoption decisions. This is an indication that the marketing techniques of e-pharmacy should focus on providing benefits and practical advantages based on the results yielded. More people will be willing to use these services.

Trust in the e-pharmacy provider, perceived affordability, and ease of use positively influence consumers' willingness to adopt these services; however, the effect sizes are small, ranging from 0.016 to 0.018. While these factors may be deemed inadequate when viewed individually, when approached together, they become of immense significance. The combined form can adequately support adoption given that these frameworks are sufficiently addressed. Perceived Trust (PT) and Effort Expectancy (EE) also fall into this category.

Conversely, Facilitating Conditions (FC) and Perceived Risk (PR) have effect sizes of 0.004 and 0.001, respectively, which are negligible. This means that the availability of resources or technical support (FC) and concerns about negative outcome expectations (PR) do not encourage or deter consumers' adoption of e-pharmacy within this scope. These concerns may be overshadowed by trust and health literacy, which subdued worries associated with online services. Acceptable levels of risk may be attributed to the heightened consumer trust in online transactions and regulations within the region.

Social Influence (SI) and Hedonic Motivation (HM) also display small effect sizes of 0.010 and 0.011, respectively, or a limited but positive impact on adoption. This means that these factors, while having some impact, do not drive e-pharmacy service adoption. In this case, it could be due to the perceived utilitarian nature of healthcare products as compared to other consumer goods.

To summarize, the effect size analysis revealed that the need to explain e-pharmacy steps usage behavior, particularly the transition from Adoption to Acceptance and Usage seems to stand out as the most important. Even though single predictors of adoption are noted, their influence seems to be limited, implying that the adoption-phase is very likely to be a sub-process in a complex system blend of numerous small influences rather than one or two dominating factors, an intricate system with many interacting parts. This underscores the importance of comprehensive approaches to modifying trust, health literacy, perceived usefulness, and innovativeness that could lead to enhanced adoption of e-pharmacy services. In addition, the overall weaker influence of perceived risk and facilitating conditions suggests that consumers' confidence, as well as the region's infrastructure, is under-constructive advanced stage in the National Capital Region.

**Table 4.10:**  $f^2$  Effect Sizes of Key Predictors

| Hypotheses | f-square |
|------------|----------|
| ACC -> USE | 1.101    |
| Ad -> ACC  | 1.297    |
| EE -> Ad   | 0.016    |
| FC -> Ad   | 0.004    |
| HL -> Ad   | 0.046    |
| HM -> Ad   | 0.011    |
| PE -> Ad   | 0.022    |
| PI -> Ad   | 0.031    |
| PR -> Ad   | 0.001    |
| PT -> Ad   | 0.017    |
| PV -> Ad   | 0.018    |
| SI -> Ad   | 0.010    |

**Source:** Author Calculations/SMART-PLS

#### 4.2.2.5 Goodness of Model fit

The overall model fit of the structural model was assessed using key indices such as SRMR, d\_ULS, d\_G, Chi-square, and NFI. The SRMR value for the saturated model was 0.043, while for the estimated model it was 0.085. An SRMR value below 0.08 or 0.1 is generally considered indicative of a good model fit (Hu & Bentler, 1999; Henseler, Hubona, & Ray, 2016; Kock, 2020). Therefore, the saturated model demonstrates an excellent fit, whereas the estimated model, although slightly above the ideal threshold, remains within the acceptable range for PLS-SEM (Kock, 2020, Hair et al., 2021). The d\_ULS and d\_G values for the saturated model were 2.828 and 1.138 respectively, while for the estimated model they were 11.125 and 1.283. These indices measure the discrepancy between the empirical and model-implied correlation matrices, with smaller values indicating better fit (Dijkstra & Henseler, 2015). Since both models present low values, the structural model can be

considered to have a reasonable level of correspondence between the observed and predicted correlations. The Normed Fit Index (NFI) values were 0.858 for the saturated model and 0.846 for the estimated model. The NFI assesses the model's relative fit by comparing the proposed model to a null model, where values above 0.80 indicate acceptable fit, and values above 0.90 indicate good fit (Bentler & Bonett, 1980; Hair et al., 2019). Thus, the present model displays an acceptable incremental fit, though marginally below the optimal threshold of 0.90. The chi-square values for the saturated and estimated models were 2790.338 and 3015.257 respectively. While chi-square is sensitive to sample size and model complexity, higher values are not uncommon in large or complex PLS models (Henseler et al., 2014). Taken together, the indices indicate that the proposed structural model achieves an acceptable overall fit, making it appropriate for further structural analysis and interpretation of path relationships (Hair et al., 2021).

**Table 4.11: Results of Model Fitness**

| <b>Key Attributes</b> | <b>Saturated model</b> | <b>Estimated model</b> |
|-----------------------|------------------------|------------------------|
| <b>SRMR</b>           | 0.043                  | 0.085                  |
| <b>d_ULS</b>          | 2.828                  | 11.125                 |
| <b>d_G</b>            | 1.138                  | 1.283                  |
| <b>Chi-square</b>     | 2790.338               | 3015.257               |
| <b>NFI</b>            | 0.858                  | 0.846                  |

**Source:** Author Calculations/SMART-PLS

#### **4.2.2.6 PLS Predict**

The predictive relevance of the model was examined using the PLS-Predict procedure in SmartPLS. This procedure generates case-level predictions for each indicator and compares the predictive performance of the PLS model against a benchmark linear model (LM) (Shmueli et al., 2019; Hair et al., 2021). The key criteria evaluated include  $Q^2_{\text{predict}}$  values, root mean squared error (RMSE) comparison between PLS-SEM and LM models, and the difference (PLS-LM RMSE).

All indicators under the constructs ACC (e.g., ACC1–ACC4) and AD (AD1–AD4) demonstrate positive  $Q^2_{\text{predict}}$  values ranging from 0.414 to 0.598, exceeding the zero threshold and indicating that the model possesses predictive relevance (Hair et al., 2019; Shmueli et al., 2016). Specifically,  $Q^2_{\text{predict}}$  values greater than 0 suggest that the PLS-SEM model predicts the indicators better than merely using their means, implying that the model has substantial out-of-sample predictive ability. Among these, AD1 shows the highest  $Q^2_{\text{predict}}$  value (0.598), reflecting the strongest predictive accuracy, followed by AD4 (0.565) and ACC4 (0.463).

The RMSE comparison between the PLS-SEM and the linear model benchmarks reveals that, for most indicators, the PLS-SEM RMSE values are lower than those of the linear model (LM RMSE). Negative PLS–LM RMSE differences indicate that the PLS model achieves smaller prediction errors and thus higher predictive accuracy (Shmueli et al., 2019). In this analysis, nearly all indicators show negative PLS–LM RMSE differences (e.g., ACC1 =  $-0.053$ , AD3 =  $-0.056$ ), confirming that the PLS model outperforms the naive linear benchmark.

Based on the guidelines by Hair et al. (2021), models can be categorized as having low, medium, or high predictive power depending on the magnitude of  $Q^2_{\text{predict}}$  and the consistency of negative RMSE differences across indicators. Accordingly, the constructs ACC and AD display high predictive power, as reflected by their relatively high  $Q^2_{\text{predict}}$  values ( $> 0.35$ ) and negative RMSE differences across all indicators. Conversely, the construct USE (USE1) records a  $Q^2_{\text{predict}}$  of 0.399 but a small positive PLS–LM RMSE difference (0.011), indicating low predictive power and suggesting that the PLS model performs only marginally better or even slightly worse than the linear benchmark for that indicator.

Taken together, these results demonstrate that the PLS-SEM model exhibits strong out-of-sample predictive performance for the majority of indicators, particularly for the ACC and AD constructs. This finding confirms that the proposed model is not only statistically sound but also capable of predicting new observations with high accuracy, underscoring its practical relevance in the studied context (Shmueli et al., 2019; Hair et al., 2021).

**Table 4.12:** Results of PLS Predict Analysis

| Construct  | Indicators | Q <sup>2</sup> predict | PLS-SEM_RMSE | LM_RMSE | PLS-LM RMSE | Predictive Relevance  |
|------------|------------|------------------------|--------------|---------|-------------|-----------------------|
| Acceptance | ACC1       | 0.434                  | 0.919        | 0.972   | -0.053      | High Predictive Power |
| Acceptance | ACC2       | 0.414                  | 0.963        | 1.009   | -0.046      |                       |
| Acceptance | ACC3       | 0.448                  | 0.885        | 0.914   | -0.029      |                       |
| Acceptance | ACC4       | 0.463                  | 0.916        | 0.957   | -0.041      |                       |
| Adoption   | AD1        | 0.598                  | 0.838        | 0.886   | -0.048      | High Predictive Power |
| Adoption   | AD2        | 0.529                  | 0.838        | 0.893   | -0.055      |                       |
| Adoption   | AD3        | 0.557                  | 0.857        | 0.913   | -0.056      |                       |
| Adoption   | AD4        | 0.565                  | 0.852        | 0.889   | -0.037      |                       |
| Usage      | USE1       | 0.399                  | 1            | 0.989   | 0.011       | Low Predictive Power  |
| Usage      | USE2       | 0.406                  | 0.960        | 0.943   | 0.017       |                       |
| Usage      | USE3       | 0.374                  | 1.006        | 1.011   | -0.005      |                       |
| Usage      | USE4       | 0.403                  | 1.005        | 1.011   | 0.004       |                       |

**Source:** Author Calculations/SMART-PLS

#### 4.3 Partial Least Squares Multi-Group Analysis through Measurement Invariance of Composites (MICOM) and Multi-Group Analysis (MGA)

Prior to executing the Multi-Group Analysis (MGA), the Measurement Invariance of Composites (MICOM) procedure was conducted, following the guidelines proposed by Henseler et al. (2016). Establishing measurement invariance is a critical prerequisite, as it ensures that the constructs being measured retain consistent meaning and interpretation across different subgroups. According to Hair et al. (2019), the MICOM approach evaluates whether the observed group differences in structural paths reflect true variations rather than disparities in measurement structure.

The MICOM process involves three sequential assessments:

1. Configural invariance, which ensures identical data preparation, algorithm selection, and model specifications for all groups;

2. Compositional invariance, which verifies that the composite scores for each construct are equally formed across groups; and
3. Equality of means and variances, which examines whether group differences in the constructs' mean values and variances are statistically significant.

When compositional invariance is achieved, at least partial measurement invariance is considered to be established. This allows for meaningful comparisons between structural path coefficients across groups, even if full invariance (i.e., equal means and variances) is not obtained (Ali et al., 2022). The establishment of measurement invariance validates the appropriateness of MGA for moderation and group-difference testing.

#### **4.3.1 Assessment of Gender**

The MICOM analysis confirms that all constructs exhibit full measurement invariance across the analyzed groups. This indicates that the model measures the constructs equivalently across demographic or contextual subgroups, allowing valid cross-group comparisons of structural relationships. As such, subsequent Multi-Group Analysis (MGA) can be confidently applied to test for potential group differences in structural path coefficients.

##### **4.3.1.1 Measurement Invariance Assessment (MICOM) for Gender**

The MICOM procedure was performed to examine measurement invariance between male and female respondents. The results confirmed full measurement invariance across all constructs (ACC, AD, EE, FC, HL, HM, PE, PI, PR, PT, PV, SI, and USE). Configural invariance was established since identical algorithms and parameter settings were applied to both groups. Compositional invariance was confirmed with all correlations between composite scores being equal to or approximately 1.0, and their confidence intervals including 1. Moreover, the equality of composite means and variances was supported, as their respective confidence intervals contained zero, indicating no significant mean or variance differences between groups. Thus, full measurement invariance was established, ensuring that gender-based group comparisons are statistically valid.

#### **4.3.1.2 Multi-Group Analysis (MGA) for Gender**

After confirming full measurement invariance, a Multi-Group Analysis (MGA) was conducted to assess structural path differences between male and female groups. PLS MGA results reveals that gender is not a moderator across all the construct relationships except  $PV \rightarrow AD$  ( $(\beta \text{ Diff}) \text{ Male-Female} = 0.175, p = 0.20$ ) in the study. This implies that males are more sensitive toward price value of adopting e-pharmacy to order medicines. The results revealed that most relationships did not differ significantly, suggesting model consistency across genders. However, the beta difference between male and female across the construct relationships are analysed one by one. For Male e-pharmacy user's paths,  $ACC \rightarrow USE$  ( $\beta = 0.709$ ),  $AD \rightarrow ACC$  ( $\beta = 0.721$ ),  $HL \rightarrow AD$  ( $\beta = 0.191$ ),  $PT \rightarrow AD$  ( $\beta = 0.152$ ), and  $PV \rightarrow AD$  ( $\beta = 0.176$ ) are significant while for female e-pharmacy users paths,  $ACC \rightarrow USE$  ( $\beta = 0.744$ ),  $AD \rightarrow ACC$  ( $\beta = 0.791$ ),  $HL \rightarrow AD$  ( $\beta = 0.194$ ),  $HM \rightarrow AD$  ( $\beta = 0.090$ ),  $PE \rightarrow AD$  ( $\beta = 0.155$ ), and  $PI \rightarrow AD$  ( $\beta = 0.279$ ) are significant indicating partial structural variations influenced by gender. Despite these differences, the majority of paths remained stable across groups, suggesting that gender exerts a limited moderating effect on the structural relationships within the model.

#### **4.3.2. Assessment of Age**

The MICOM analysis confirms that all constructs demonstrate full measurement invariance across different age groups. This ensures that respondents across various age categories interpret and respond to the measurement items consistently, indicating that the underlying constructs retain their conceptual meaning across age cohorts. As a result, cross-group comparisons regarding structural paths are statistically valid. Consequently, Multi-Group Analysis (MGA) can be reliably performed to explore whether structural relationships vary significantly across age groups.

##### **4.3.2.1 Measurement Invariance Assessment (MICOM) for Age**

The MICOM procedure was conducted to evaluate measurement invariance between respondents below 30 years and above 30 years. The results confirmed full measurement invariance across all constructs (ACC, AD, EE, FC, HL, HM, PE, PI, PR, PT, PV, SI, and

USE). Configural invariance was established as identical algorithms and data treatment were applied for both groups. Compositional invariance was achieved, with all correlations between composite scores being equal to or close to 1.0, and confidence intervals including 1. Furthermore, equality of composite means and variances was supported since their confidence intervals included zero, confirming no significant mean or variance differences between age groups. Hence, full measurement invariance was achieved, validating the comparability of path coefficients across groups.

#### **4.3.2.2 Multi-Group Analysis (MGA) for Age**

Following the establishment of full measurement invariance, a Multi-Group Analysis (MGA) was performed to test the structural path differences between below 30 and above 30 age groups. The results indicated that most relationships did not significantly differ across age groups, suggesting model stability and reveals that age is not a moderator across all the construct relationships in the study. The results are further confirmed by permutation test ( $P < 0.05$ ) and parametric tests ( $P < 0.05$ ). However, notable variations and beta difference between below 30 and above 30 across the construct relationships are analysed one by one. For below 30 e-pharmacy user's paths:  $ACC \rightarrow USE$  ( $\beta = 0.717$ ),  $AD \rightarrow ACC$  ( $\beta = 0.765$ ),  $EE \rightarrow AD$  ( $\beta = 0.104$ ),  $HL \rightarrow AD$  ( $\beta = 0.183$ ),  $PE \rightarrow AD$  ( $\beta = 0.180$ ),  $PI \rightarrow AD$  ( $\beta = 0.192$ ),  $PT \rightarrow AD$  ( $\beta = 0.104$ ), and  $PV \rightarrow AD$  ( $\beta = 0.087$ ), are significant while for above 30 age group e-pharmacy user's paths:  $ACC \rightarrow USE$  ( $\beta = 0.756$ ),  $AD \rightarrow ACC$  ( $\beta = 0.707$ ), and  $SI \rightarrow AD$  ( $\beta = 0.233$ ) are significant indicating partial structural differences influenced by age. Despite these variations, the majority of relationships were statistically consistent, and there is no significant difference between the two groups across the construct relationships. Conversely, for below 30 and above 30 years age group, individually the results are significant.

#### **4.3.3 Assessment of Income**

The MICOM analysis reveals full measurement invariance across income groups, confirming that the measurement model operates equivalently across respondents with varying income levels. This implies that differences in income do not influence how

participants comprehend or evaluate the constructs under study. Therefore, any observed differences in structural path coefficients can be attributed to meaningful behavioral distinctions rather than measurement bias. With this invariance established, MGA can be confidently executed to assess structural path variations across income categories.

#### **4.3.3.1 Measurement Invariance Assessment (MICOM) for Income**

The MICOM procedure was conducted to evaluate measurement invariance between respondents earning up to ₹10 lakh and those earning above ₹10 lakh annually. The results confirmed full measurement invariance across all constructs (ACC, AD, EE, FC, HL, HM, PE, PI, PR, PT, PV, SI, and USE). Configural invariance was established through the use of identical algorithmic settings and data treatment across both income groups. Compositional invariance was confirmed, as all composite correlations were approximately 1.0 and their confidence intervals included 1. Additionally, equality of means and variances was supported, with all confidence intervals containing zero, indicating no significant differences between the groups. Therefore, full measurement invariance was established, validating subsequent group comparisons.

#### **4.8.3.2 Multi-Group Analysis (MGA) for Income**

Following the establishment of full measurement invariance, a Multi-Group Analysis (MGA) was performed to test the structural path differences between groups earning upto ₹10 lakh annually and those earning above ₹10 lakh annually. The results indicated that most relationships did not significantly differ across income groups, suggesting model stability and reveals that income is not a moderator across all the construct relationships in the study. The results are further confirmed by permutation test ( $P < 0.05$ ) and parametric tests ( $P < 0.05$ ). However, notable variations and beta difference between group earning upto ₹10 lakh annually and earning above ₹10 lakh annually across the construct relationships are analysed one by one. For earning upto ₹10 lakh annually e-pharmacy user's paths:  $ACC \rightarrow USE$  ( $\beta = 0.723$ ),  $AD \rightarrow ACC$  ( $\beta = 0.757$ ),  $HL \rightarrow AD$  ( $\beta = 0.156$ ),  $PE \rightarrow AD$  ( $\beta = 0.182$ ),  $PI \rightarrow AD$  ( $\beta = 0.163$ ),  $PT \rightarrow AD$  ( $\beta = 0.121$ ), and  $PV \rightarrow AD$  ( $\beta = 0.102$ ), are significant while for earning above ₹10 lakh annually group e-pharmacy user's paths:  $ACC \rightarrow USE$  ( $\beta = 0.744$ ),  $AD \rightarrow ACC$  ( $\beta = 0.741$ ),  $EE \rightarrow AD$  ( $\beta = 0.184$ ) and  $HL$

→ AD ( $\beta = 0.2242$ ) are significant indicating partial structural differences influenced by age. Despite these variations, the majority of relationships were statistically consistent, and there is no significant difference between the two groups across the construct relationships. Conversely, for earning upto ₹10 lakh annually and those earning above ₹10 lakh annually, individually the results are significant.

#### **4.3.4 Assessment of Education**

The MICOM assessment demonstrates that full measurement invariance is achieved across education levels, indicating that respondents with different academic backgrounds interpret the constructs uniformly. This consistency affirms that educational differences do not distort the measurement structure or item interpretation. Accordingly, comparisons of structural relationships across educational groups are methodologically sound. With invariance confirmed, MGA can be suitably applied to investigate whether structural relationships differ across levels of education.

##### **4.3.4.1 Measurement Invariance of Composite Models (MICOM) for Education**

The MICOM procedure was carried out to evaluate the measurement invariance of constructs across different education levels. Table 4.10 presents the MICOM results. The assessment confirmed configural invariance for all constructs, indicating that identical data treatment and algorithmic procedures were applied across educational groups. However, compositional invariance was not achieved for several constructs, including ACC, PI, and PR, as their permutation correlations were not fully aligned with the original correlations within the 5% confidence interval.

Furthermore, the results of mean and variance equality assessments revealed inconsistencies, as multiple constructs failed to demonstrate statistical equivalence across groups. Consequently, full measurement invariance was not established, and only a few constructs (AD, HM, PE, PR, PV, and USE) showed evidence of partial invariance.

Since the condition of at least partial measurement invariance serves as a prerequisite for conducting the PLS-MGA, the absence of sufficient invariance across constructs implies that the latent variable composites may not represent identical conceptual meanings across educational groups. Hence, the multi-group analysis (MGA) was not performed for

education, as any comparison of structural path differences would not yield valid inferences.

**Table 4.13: MICOM Analysis (Gender)**

| Measuring Invariance in Composites (MICOM)                            |                           | ACC            | AD             | EE             | FC             | HL             | HM             | PE             | PI             | PR             | PT             | PV             | SI             | USE            |
|-----------------------------------------------------------------------|---------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| <b>Configural Invariance</b><br>(Application of Identical Algorithms) |                           | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            |
| <b>Compositional Invariance</b><br>(Correlation = 1)                  | C=1                       | 1              | 1              | 1              | 0.999          | 1              | 1              | 0.999          | 1              | 1              | 0.999          | 1              | 1              | 1              |
|                                                                       | Confidence Interval (CIs) | [0.999;1]      | [1.000;1]      | [0.999;1]      | [0.999;1]      | [1.000;1]      | [0.999;1]      | [0.998;1]      | [1.000;1]      | [0.999;1]      | [0.998;1]      | [1.000;1]      | [0.999;1]      | [0.999;1]      |
| <b>Investigating Partial Measurement Invariance</b>                   |                           | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            |
| <b>Equal Mean Assessments</b>                                         | Mean Differences          | -0.024         | 0.067          | 0.138          | 0.016          | 0.048          | 0.122          | -0.034         | 0.069          | 0.066          | 0.104          | 0.147          | -0.022         | 0.021          |
|                                                                       | Confidence Interval (CIs) | [-0.186;0.184] | [-0.188;0.186] | [-0.182;0.186] | [-0.184;0.185] | [-0.182;0.185] | [-0.183;0.188] | [-0.176;0.197] | [-0.193;0.197] | [-0.187;0.185] | [-0.181;0.195] | [-0.192;0.186] | [-0.186;0.187] | [-0.196;0.181] |
|                                                                       | Equal                     | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            |
| <b>Equal Variance Assessments</b>                                     | Variance Difference       | 0.02           | -0.039         | -0.165         | -0.054         | -0.041         | -0.084         | -0.111         | -0.069         | -0.039         | -0.047         | -0.054         | -0.095         | -0.1           |
|                                                                       | Confidence Interval (CIs) | [-0.172;0.171] | [-0.175;0.194] | [-0.221;0.225] | [-0.207;0.200] | [-0.172;0.168] | [-0.215;0.214] | [-0.228;0.227] | [-0.180;0.194] | [-0.129;0.140] | [-0.177;0.176] | [-0.182;0.196] | [-0.196;0.210] | [-0.163;0.158] |
|                                                                       | Equal                     | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            |
| <b>Full Measurement Invariance Established</b>                        |                           | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            |

**Source:** Author Calculations/SMART-PLS

**Table 4.14: PLS MGA Results (Gender)**

| Relationships      | PLS – MGA              |          | Parametric Test |          | Welch- Satterthwaite |          | Males   |          |          | Females |          |          | Significance<br>Male/Female | Permutation<br>P-values<br>(MICOM) |
|--------------------|------------------------|----------|-----------------|----------|----------------------|----------|---------|----------|----------|---------|----------|----------|-----------------------------|------------------------------------|
|                    | ( $\beta$ Diff)<br>M-F | P-values | T values        | P-values | T values             | P-values | $\beta$ | T values | P-values | $\beta$ | T values | P-values |                             |                                    |
| ACC -> USE         | -0.035                 | 0.512    | 0.645           | 0.519    | 0.656                | 0.513    | 0.709   | 18.028   | 0.000**  | 0.744   | 20.457   | 0.000**  | Yes/Yes                     | 0.690                              |
| AD -> ACC          | -0.070                 | 0.118    | 1.492           | 0.136    | 1.541                | 0.125    | 0.721   | 19.849   | 0.000**  | 0.791   | 28.670   | 0.000**  | Yes/Yes                     | 0.453                              |
| EE -> AD           | 0.016                  | 0.838    | 0.187           | 0.852    | 0.191                | 0.848    | 0.105   | 1.657    | 0.097    | 0.089   | 1.677    | 0.094    | No/No                       | 0.487                              |
| FC -> AD           | 0.054                  | 0.541    | 0.605           | 0.545    | 0.605                | 0.546    | 0.115   | 1.912    | 0.056    | 0.061   | 0.916    | 0.360    | No/No                       | 0.288                              |
| HL -> AD           | -0.003                 | 0.962    | 0.036           | 0.971    | 0.037                | 0.970    | 0.191   | 2.892    | 0.004**  | 0.194   | 3.767    | 0.000**  | Yes/Yes                     | 0.975                              |
| HM -> AD           | -0.100                 | 0.130    | 1.467           | 0.143    | 1.500                | 0.135    | -0.010  | 0.192    | 0.848    | 0.090   | 2.070    | 0.039**  | No/Yes                      | 0.128                              |
| PE -> AD           | -0.029                 | 0.754    | 0.296           | 0.768    | 0.307                | 0.759    | 0.126   | 1.617    | 0.106    | 0.155   | 2.754    | 0.006**  | No/Yes                      | 0.318                              |
| PI -> AD           | -0.178                 | 0.098    | 1.623           | 0.105    | 1.614                | 0.108    | 0.101   | 1.408    | 0.159    | 0.279   | 3.339    | 0.001**  | No/Yes                      | 0.268                              |
| PR -> AD           | -0.093                 | 0.087    | 1.669           | 0.096    | 1.712                | 0.088    | -0.061  | 1.445    | 0.148    | 0.033   | 0.933    | 0.351    | No/No                       | 0.492                              |
| PT -> AD           | 0.111                  | 0.135    | 1.476           | 0.141    | 1.495                | 0.136    | 0.152   | 2.826    | 0.005**  | 0.041   | 0.807    | 0.420    | Yes/No                      | 0.176                              |
| <b>PV -&gt; AD</b> | 0.175                  | 0.020**  | 2.197           | 0.029**  | 2.261                | 0.025**  | 0.176   | 2.913    | 0.004**  | 0.002   | 0.038    | 0.969    | Yes/No                      | 0.623                              |
| SI -> AD           | -0.006                 | 0.937    | 0.079           | 0.937    | 0.080                | 0.936    | 0.087   | 1.471    | 0.141    | 0.094   | 1.687    | 0.092    | No/No                       | 0.576                              |

**Source(s):** Author Calculations/SMART-PLS

**Table 4.15: MICOM Analysis (AGE)**

| Measuring Invariance in Composites (MICOM)                            |                           | ACC            | AD             | EE             | FC             | HL             | HM             | PE             | PI             | PR             | PT             | PV             | SI             | USE            |
|-----------------------------------------------------------------------|---------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| <b>Configural Invariance</b><br>(Application of Identical Algorithms) |                           | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            |
| <b>Compositional Invariance</b><br>(Correlation = 1)                  | C=1                       | 1.000          | 1.000          | 1.000          | 0.999          | 1.000          | 1.000          | 0.999          | 1.000          | 0.999          | 1.000          | 1.000          | 1.000          | 1.000          |
|                                                                       | Confidence Interval (CIs) | [0.999;1]      | [1.000;1]      | [0.999;1]      | [0.998;1]      | [0.999;1]      | [0.999;1]      | [0.998;1]      | [0.999;1]      | [0.999;1]      | [0.997;1]      | [0.999;1]      | [0.998;1]      | [0.999;1]      |
| <b>Investigating Partial Measurement Invariance</b>                   |                           | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            |
| <b>Equal Mean Assessments</b>                                         | Mean Differences          | 0.124          | 0.116          | 0.126          | 0.104          | 0.062          | 0.100          | 0.093          | 0.125          | 0.013          | 0.158          | 0.011          | 0.104          | -0.005         |
|                                                                       | Confidence Interval (CIs) | [-0.221;0.233] | [-0.216;0.245] | [-0.220;0.240] | [-0.222;0.243] | [-0.201;0.225] | [-0.222;0.232] | [-0.211;0.243] | [-0.201;0.244] | [-0.222;0.234] | [-0.213;0.250] | [-0.212;0.242] | [-0.208;0.219] | [-0.221;0.226] |
|                                                                       | Equal                     | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            |
| <b>Equal Variance Assessments</b>                                     | Variance Difference       | -0.110         | -0.127         | -0.100         | 0.068          | -0.120         | -0.227         | 0.036          | -0.148         | 0.022          | -0.208         | -0.043         | -0.191         | -0.056         |
|                                                                       | Confidence Interval (CIs) | [-0.176;0.226] | [-0.194;0.233] | [-0.249;0.287] | [-0.209;0.263] | [-0.188;0.224] | [-0.237;0.289] | [-0.252;0.278] | [-0.197;0.253] | [-0.145;0.187] | [-0.191;0.239] | [-0.196;0.256] | [-0.214;0.264] | [-0.166;0.196] |
|                                                                       | Equal                     | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            |
| <b>Full Measurement Invariance Established</b>                        |                           | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            |

**Source(s):** Author Calculations/SMART-PLS

**Table 4.16: PLS MGA Results (Age)**

| Relationships | PLS – MGA                      |          | Parametric Test |          | Welch- Satterthwaite |          | Below30 |          |          | Above 30 |          |          | Significance<br>B30-A30 | Permutation<br>P-values<br>(MICOM) |
|---------------|--------------------------------|----------|-----------------|----------|----------------------|----------|---------|----------|----------|----------|----------|----------|-------------------------|------------------------------------|
|               |                                |          | T values        | P-values | T values             | P-values | $\beta$ | T values | P-values | $\beta$  | T values | P-values |                         |                                    |
|               | ( $\beta$ Diff)<br>B30-<br>A30 | P-values |                 |          |                      |          |         |          |          |          |          |          |                         |                                    |
| ACC -> USE    | -0.039                         | 0.527    | 0.600           | 0.549    | 0.607                | 0.545    | 0.717   | 23.392   | 0.000**  | 0.756    | 13.185   | 0.000**  | Yes/Yes                 | 0.881                              |
| AD -> ACC     | 0.057                          | 0.331    | 1.022           | 0.307    | 0.977                | 0.331    | 0.765   | 29.826   | 0.000**  | 0.707    | 13.354   | 0.000**  | Yes/Yes                 | 0.174                              |
| EE -> AD      | -0.059                         | 0.589    | 0.561           | 0.575    | 0.522                | 0.603    | 0.104   | 2.194    | 0.028**  | 0.163    | 1.583    | 0.113    | Yes/No                  | 0.449                              |
| FC -> AD      | -0.003                         | 0.963    | 0.023           | 0.981    | 0.025                | 0.980    | 0.090   | 1.716    | 0.086    | 0.092    | 1.055    | 0.291    | No/No                   | 0.136                              |
| HL -> AD      | -0.024                         | 0.892    | 0.215           | 0.830    | 0.168                | 0.867    | 0.183   | 4.090    | 0.000**  | 0.206    | 1.539    | 0.124    | Yes/No                  | 0.702                              |
| HM -> AD      | -0.008                         | 0.962    | 0.099           | 0.921    | 0.093                | 0.926    | 0.041   | 1.071    | 0.284    | 0.049    | 0.608    | 0.544    | No/No                   | 0.571                              |
| PE -> AD      | 0.177                          | 0.124    | 1.499           | 0.135    | 1.533                | 0.128    | 0.180   | 3.244    | 0.001**  | 0.003    | 0.029    | 0.977    | Yes/No                  | 0.621                              |
| PI -> AD      | 0.115                          | 0.370    | 0.892           | 0.373    | 0.877                | 0.382    | 0.192   | 3.220    | 0.001**  | 0.077    | 0.658    | 0.510    | Yes/No                  | 0.282                              |
| PR -> AD      | 0.031                          | 0.669    | 0.435           | 0.664    | 0.422                | 0.674    | 0.001   | 0.018    | 0.986    | -0.030   | 0.460    | 0.646    | No/No                   | 0.094                              |
| PT -> AD      | 0.019                          | 0.857    | 0.203           | 0.839    | 0.169                | 0.866    | 0.104   | 2.609    | 0.009**  | 0.085    | 0.798    | 0.425    | Yes/No                  | 0.747                              |
| PV -> AD      | -0.015                         | 0.873    | 0.164           | 0.869    | 0.150                | 0.881    | 0.087   | 2.074    | 0.038**  | 0.102    | 1.081    | 0.280    | Yes/No                  | 0.848                              |
| SI -> AD      | -0.191                         | 0.088    | 1.948           | 0.052    | 1.651                | 0.102    | 0.042   | 0.996    | 0.319    | 0.233    | 2.151    | 0.032**  | No/Yes                  | 0.582                              |

**Source(s):** Author Calculations/SMART-PLS

**Table 4.17: MICOM Analysis (Income)**

| Measuring Invariance in Composites (MICOM)                            |                           | ACC            | AD             | EE             | FC             | HL             | HM             | PE             | PI             | PR             | PT             | PV             | SI             | USE            |
|-----------------------------------------------------------------------|---------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| <b>Configural Invariance</b><br>(Application of Identical Algorithms) |                           | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            |
| <b>Compositional Invariance</b><br>(Correlation = 1)                  | C=1                       | 1.000          | 1.000          | 0.999          | 0.999          | 1.000          | 1.000          | 1.000          | 0.999          | 1.000          | 1.000          | 1.000          | 1.000          | 0.999          |
|                                                                       | Confidence Interval (CIs) | [0.999;1]      | [1.000;1]      | [0.999;1]      | [0.999;1]      | [0.999;1]      | [0.999;1]      | [0.998;1]      | [0.999;1]      | [0.999;1]      | [0.998;1]      | [1.000;1]      | [0.999;1]      | [0.999;1]      |
| <b>Investigating Partial Measurement Invariance</b>                   |                           | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            |
| <b>Equal Mean Assessments</b>                                         | Mean Differences          | 0.087          | 0.060          | 0.008          | 0.045          | -0.059         | -0.023         | 0.077          | 0.0300         | 0.088          | 0.037          | -0.135         | -0.016         | -0.106         |
|                                                                       | Confidence Interval (CIs) | [-0.210;0.200] | [-0.215;0.201] | [-0.226;0.195] | [-0.214;0.206] | [-0.214;0.190] | [-0.226;0.198] | [-0.214;0.209] | [-0.222;0.219] | [-0.225;0.207] | [-0.227;0.191] | [-0.213;0.212] | [-0.215;0.212] | [-0.220;0.211] |
|                                                                       | Equal                     | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            |
| <b>Equal Variance Assessments</b>                                     | Variance Difference       | 0.022          | -0.068         | -0.018         | 0.170          | 0.000          | -0.129         | -0.030         | -0.118         | -0.023         | 0.044          | 0.033          | -0.200         | -0.009         |
|                                                                       | Confidence Interval (CIs) | [-0.174;0.215] | [-0.192;0.250] | [-0.237;0.283] | [-0.202;0.256] | [-0.172;0.208] | [-0.229;0.259] | [-0.222;0.267] | [-0.181;0.239] | [-0.132;0.160] | [-0.168;0.231] | [-0.183;0.222] | [-0.206;0.247] | [-0.157;0.182] |
|                                                                       | Equal                     | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            |
| <b>Full Measurement Invariance Established</b>                        |                           | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            |

**Source(s):** Author Calculations/SMART-PLS

**Table 4.18 PLS MGA Results (Income)**

| Relationships | PLS – MGA       |          | Parametric Test |          | Welch- Satterthwaite |          | Up to 10 Lakh |          |          | Above 10 Lakh |          |          | Significance<br>Up to<br>10L/Above 10L | Permutation<br>P-values<br>(MICOM) |
|---------------|-----------------|----------|-----------------|----------|----------------------|----------|---------------|----------|----------|---------------|----------|----------|----------------------------------------|------------------------------------|
|               | ( $\beta$ Diff) | P-values | T values        | P-values | T values             | P-values | $\beta$       | T values | P-values | $\beta$       | T values | P-values |                                        |                                    |
| ACC -> USE    | -0.021          | 0.688    | 0.367           | 0.714    | 0.384                | 0.702    | 0.723         | 22.236   | 0.000**  | 0.744         | 16.457   | 0.000**  | Yes/Yes                                | 0.590                              |
| AD -> ACC     | 0.016           | 0.789    | 0.312           | 0.756    | 0.301                | 0.764    | 0.757         | 28.059   | 0.000**  | 0.741         | 16.299   | 0.000**  | Yes/Yes                                | 0.762                              |
| EE -> AD      | -0.103          | 0.270    | 1.081           | 0.280    | 1.095                | 0.275    | 0.081         | 1.545    | 0.122    | 0.184         | 2.334    | 0.020**  | No/Yes                                 | 0.071                              |
| FC -> AD      | 0.005           | 0.970    | 0.047           | 0.962    | 0.050                | 0.960    | 0.100         | 1.810    | 0.070    | 0.095         | 1.285    | 0.199    | No/No                                  | 0.392                              |
| HL -> AD      | -0.087          | 0.509    | 0.814           | 0.416    | 0.682                | 0.496    | 0.156         | 3.217    | 0.001**  | 0.242         | 2.053    | 0.040**  | Yes/Yes                                | 0.239                              |
| HM -> AD      | -0.025          | 0.746    | 0.332           | 0.740    | 0.335                | 0.738    | 0.032         | 0.776    | 0.438    | 0.057         | 0.910    | 0.363    | No/No                                  | 0.542                              |
| PE -> AD      | 0.170           | 0.070    | 1.604           | 0.109    | 1.786                | 0.076    | 0.182         | 2.974    | 0.003**  | 0.012         | 0.169    | 0.866    | Yes/No                                 | 0.754                              |
| PI -> AD      | -0.018          | 0.872    | 0.155           | 0.877    | 0.155                | 0.877    | 0.163         | 2.596    | 0.009**  | 0.181         | 1.856    | 0.063    | Yes/No                                 | 0.068                              |
| PR -> AD      | 0.072           | 0.219    | 1.125           | 0.261    | 1.218                | 0.225    | 0.014         | 0.374    | 0.709    | -0.059        | 1.248    | 0.212    | No/No                                  | 0.571                              |
| PT -> AD      | 0.102           | 0.270    | 1.211           | 0.227    | 1.102                | 0.272    | 0.121         | 2.868    | 0.004**  | 0.019         | 0.232    | 0.817    | Yes/No                                 | 0.772                              |
| PV -> AD      | -0.009          | 0.937    | 0.101           | 0.919    | 0.091                | 0.927    | 0.102         | 2.346    | 0.019**  | 0.110         | 1.270    | 0.204    | Yes/No                                 | 0.512                              |
| SI -> AD      | -0.076          | 0.409    | 0.876           | 0.382    | 0.827                | 0.410    | 0.070         | 1.548    | 0.122    | 0.146         | 1.810    | 0.070    | No/No                                  | 0.624                              |

**Source(s):** Author Calculations/SMART-PLS

**Table 4.19: MICOM Analysis (Education)**

| Measuring Invariance in Composites (MICOM)                            |                           | ACC            | AD             | EE             | FC             | HL             | HM             | PE             | PI             | PR             | PT             | PV             | SI             | USE            |
|-----------------------------------------------------------------------|---------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| <b>Configural Invariance</b><br>(Application of Identical Algorithms) |                           | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            |
| <b>Compositional Invariance</b><br>(Correlation = 1)                  | C=1                       | 0.999          | 1.000          | 1.000          | 1.000          | 1.000          | 1.000          | 0.999          | 0.999          | 1.000          | 1.000          | 1.000          | 1.000          | 1.000          |
|                                                                       | Confidence Interval (CIs) | [0.999;1]      | [1.000;1]      | [0.999;1]      | [0.999;1]      | [0.9994;1]     | [0.999;1]      | [0.998;1]      | [0.999;1]      | [0.998;1]      | [0.998;1]      | [1.000;1]      | [0.999;1]      | [0.999;1]      |
| <b>Investigating Partial Measurement Invariance</b>                   |                           | No             | Yes            | Yes            | Yes            | Yes            | Yes            | Yes            | No             | Yes            | Yes            | Yes            | Yes            | Yes            |
| <b>Equal Mean Assessments</b>                                         | Mean Differences          | 0.205          | 0.139          | 0.295          | 0.214          | 0.167          | 0.096          | 0.137          | 0.234          | 0.050          | 0.135          | 0.159          | 0.152          | 0.193          |
|                                                                       | Confidence Interval (CIs) | [-0.199;0.188] | [-0.195;0.198] | [-0.196;0.194] | [-0.207;0.191] | [-0.182;0.196] | [-0.207;0.190] | [-0.200;0.195] | [-0.197;0.185] | [-0.192;0.193] | [-0.212;0.205] | [-0.202;0.196] | [-0.217;0.195] | [-0.196;0.202] |
|                                                                       | Equal                     | No             | Yes            | No             | No             | Yes            | Yes            | Yes            | No             | Yes            | Yes            | Yes            | Yes            | Yes            |
| <b>Equal Variance Assessments</b>                                     | Variance Difference       | -0.089         | -0.142         | -0.44          | -0.146         | -0.262         | -0.266         | -0.170         | -0.319         | -0.155         | -0.248         | -0.140         | -0.303         | -0.119         |
|                                                                       | Confidence Interval (CIs) | [-0.185;0.175] | [-0.220;0.177] | [-0.230;0.209] | [-0.245;0.204] | [-0.189;0.173] | [-0.249;0.217] | [-0.244;0.215] | [-0.206;0.188] | [-0.156;0.133] | [-0.206;0.168] | [-0.197;0.180] | [-0.237;0.201] | [-0.168;0.159] |
|                                                                       | Equal                     | Yes            | Yes            | No             | Yes            | No             | No             | Yes            | Yes            | Yes            | No             | Yes            | No             | Yes            |
| <b>Full Measurement Invariance Established</b>                        |                           | No             | Yes            | No             | No             | No             | No             | Yes            | No             | Yes            | No             | Yes            | No             | Yes            |

**Source(s):** Author Calculations/SMART-PLS

#### **4.4 Assessment of IPMA**

The Importance–Performance Map Analysis (IPMA) was conducted to extend the PLS-SEM results by evaluating both the total effects (importance) of each construct on the outcome variable and the performance scores. This approach offers deeper strategic insights by identifying constructs that not only influence the outcome but also require managerial priority for improvement.

As illustrated in the IPMA plot and table, Acceptance (ACC) demonstrates the highest importance (0.724), indicating that it is the most critical determinant in shaping the outcome variable. Although its performance score is moderate (55.698), the high importance suggests that strengthening factors associated with acceptance can significantly enhance overall outcomes. Similarly, Adoption (AD) exhibits strong importance (0.544) with relatively higher performance (61.982), positioning it as the second most influential construct requiring continued managerial emphasis.

Other constructs, such as Effort Expectancy (EE) (0.059), Facilitating Conditions (FC) (0.050), Perceived Value (PV) (0.055), and Performance Expectancy (PE) (0.076), reflect moderate importance with balanced performance levels above the overall average, indicating satisfactory functionality but still deserving strategic reinforcement. Hedonic Motivation (HM) records the lowest importance (0.025), suggesting that emotional enjoyment has minimal influence in this context.

Perceived Risk (PR) is the only construct showing a negative importance value (–0.009), implying that it does not contribute positively and may even inhibit the outcome. Although its performance level (54.818) is slightly below average, given its negative importance, investing additional resources in this area may not yield meaningful improvements.

Overall, the IPMA results highlight Acceptance (ACC) and Adoption (AD) as priority areas for intervention, given their high strategic significance and scope for performance enhancement. Improving these constructs can substantially strengthen the outcome

variable and support more effective implementation outcomes. The findings thus provide valuable insight into where stakeholders should allocate attention and resources to maximize impact.

**Table 4.20: IPMA Results**

**Source:** Author Calculations/SMART-PLS

| <b>Items</b>   | <b>Performance</b> | <b>Importance (Total Effect)</b> |
|----------------|--------------------|----------------------------------|
| <b>ACC</b>     | 55.698             | 0.724                            |
| <b>AD</b>      | 61.982             | 0.544                            |
| <b>EE</b>      | 63.907             | 0.059                            |
| <b>FC</b>      | 61.532             | 0.05                             |
| <b>HL</b>      | 60.635             | 0.104                            |
| <b>HM</b>      | 65.517             | 0.025                            |
| <b>PE</b>      | 63.709             | 0.076                            |
| <b>PI</b>      | 60.382             | 0.089                            |
| <b>PR</b>      | 54.818             | -0.009                           |
| <b>PT</b>      | 58.607             | 0.055                            |
| <b>PV</b>      | 61.582             | 0.055                            |
| <b>SI</b>      | 61.581             | 0.046                            |
| <b>Average</b> | 60.829             | 0.151                            |

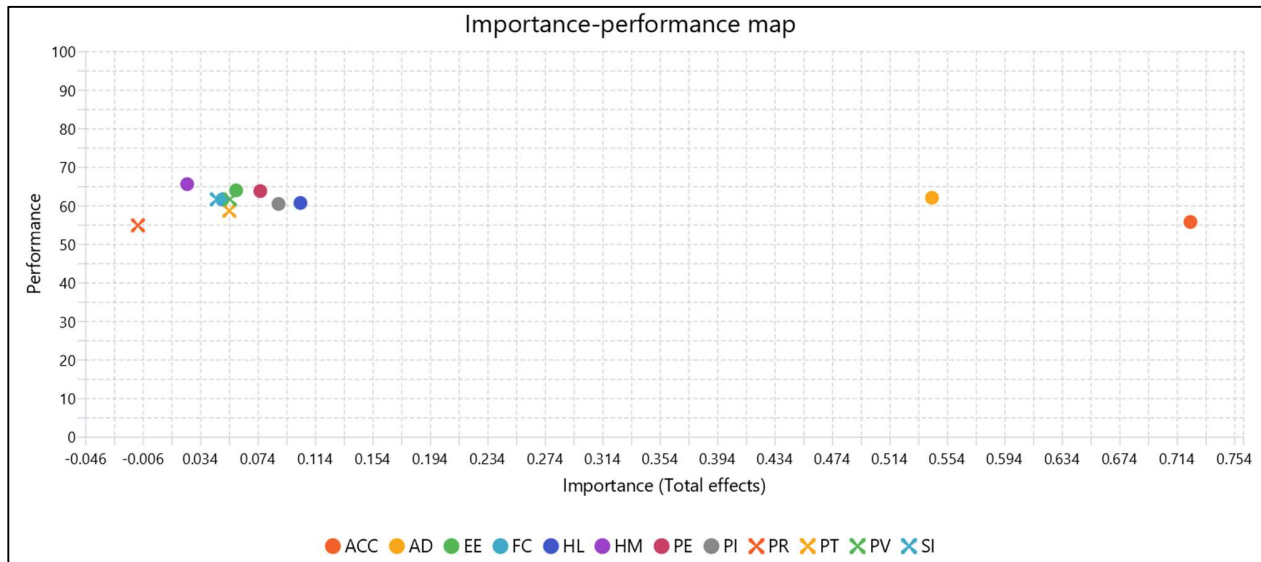


**Figure 4.5: IPMA**

**Source:** Author Compilation/SMART-PLS

#### 4.5 Conclusion

This research set out to explore the complex interplay between consumer readiness, engagement drivers, technology adoption, acceptance, actual usage behavior, and brand equity determinants in the digital ecosystem, particularly within the context of health information technology like e-pharmacy in emerging markets like India. By synthesizing constructs from the “Unified Theory of Acceptance and Use of Technology-2” (UTAUT2) along with additional dimensions such as Health Literacy (HL), Perceived Trust (PT), Perceived Risk (PR), and Personal Innovativeness (PI), the study aimed to construct an integrated framework capable of capturing the multifaceted nature of digital adoption behavior. This approach acknowledges that user behavior is influenced not only by system attributes but also by psychological, emotional, and contextual factors.

The assessment of the measurement model was a crucial initial step to ensure the validity and reliability of the constructs. The Confirmatory Factor Analysis (CFA) confirmed that

all indicators loaded significantly on their respective latent variables, with loading values exceeding the recommended threshold of 0.70. This indicates strong item reliability. Moreover, Average Variance Extracted (AVE) values for all constructs surpassed the benchmark of 0.50, providing evidence for convergent validity, demonstrating that the indicators effectively reflect their underlying constructs. Discriminant validity, evaluated using the Fornell-Larcker Criterion, showed that the square root of AVE for each construct was greater than its correlation with other constructs and HTMT ratio falls within the recommended and suggested limits. This result confirms that the constructs are conceptually distinct, allowing for accurate interpretation of the causal pathways in the structural model.

The structural model analysis revealed several significant findings that provide theoretical and managerial implications. The  $R^2$  values for key endogenous constructs, Adoption ( $Ad = 0.778$ ), Acceptance ( $ACC = 0.565$ ), and Usage ( $USE = 0.524$ ) indicates that the model explains a substantial proportion of variance in user behavior. This is particularly noteworthy in technology adoption research, where a high  $R^2$  reflects the robustness of the theoretical framework and its applicability in practical settings. These values suggest that users' readiness and psychological drivers significantly influence their journey from initial exposure to sustained usage. The high  $R^2$  value for Adoption indicates that consumers' initial decision to adopt digital solutions is heavily influenced by antecedent factors, which were comprehensively addressed in this model.

Analysis of path coefficients found that all antecedents to adoption i.e. performance expectancy (PE), effort expectancy (EE), facilitating conditions (FC), social influence (SI), price value (PV), perceived trust (PT), health literacy (HL), and personal innovativeness (PI), except perceived risk (PR) and hedonic motivation, significantly influence the e-pharmacy adoption. Adoption, in turn, found to be an influencing factor in acceptance of e-pharmacy and acceptance found to be leading to usage of e-pharmacy.

In relation PV, these result reinforces the low willingness of relative users to spend in relation to technology in developing countries, where cost considerations and economic utility are crucial. With regard to Health Literacy (HL), which positively contributed to customer adoption. Health Literacy suggests that users who are exposed to and feel powerful regarding health information are more active in the adoption of digital tools. Hedonic Motivation, which refers to the enjoyment and positive emotions towards the actual action that affect behavior, found to be a non-significant factor in influencing e-pharmacy adoption. These factors suggest that users are rational and looks at functional utility and not emotionally motivated by enjoyment.

An additional defining factor was Perceived Trust (PT), which was fundamentally influential for the prediction of adoption and sustained use. Nowadays, where data privacy and cybersecurity especially concerning digital health and financial services is a hot topic, trust is vital. Trust serves as an anchor to perceived risks, which was found as non-significant in influencing e-pharmacy adoption, and enhances the chances of engagement with the system. Consumers today tend to be more accepting of new technologies and make sustained use of them over time if they consider the platforms reliable and secure.

Analysis of effect size, revealed that the strong effect of adoption on acceptance and acceptance on usage of e-pharmacy, which suggests adoption-acceptance-usage continuum. Effect of predictor factors on adoption though is low but meaningful when looked at in totality. This suggests that no single factor determines the adoption of e-pharmacy. Models out of sample predictive power was assessed using PLS-predict and confirmed that model is robust and statistically sound with high out of sample prediction for 2 out of 3 dependent variable i.e. adoption and acceptance while low prediction power for usage.

Analysis of moderating effect of age, gender, income, education informed that age, gender, and income has non-significant impact on all relationship in the model except for gender on path PV → Adoption. No conclusive evidence could be drawn for impact of education

as moderator due to MICOM failure. In conclusion, the findings offer valuable contributions to both academia and practice. It becomes evident that sustainable user engagement in e-pharmacy is not a one-dimensional effort but a balance of affordability, functionality, emotional connection, trustworthiness, and informational empowerment. In the following chapter, we will discuss how study validates an extended technology adoption model that successfully incorporates both utilitarian and experiential dimensions and discuss how future research could enrich this understanding by employing longitudinal data to examine behavioral shifts over time, by testing the model across different cultural settings.

## **Chapter-5**

### **Conclusion, Implications and Future Scope**

The final chapter of the thesis provides a summarized view of the overall research and points out the key findings derived from the empirical examination of the hypothesized linkages in the proposed model. Further, this chapter presents an elaborate discussion of the implications of the research findings both from theoretical and managerial perspective.

Further, it provides constructive suggestions for effective policy formulation, highlights the limitations and proposes future research avenues. Finally, this chapter ends with concluding remarks for the overall study.

## **5.1 Findings**

### **5.1.1 Summary of the Research**

The increasing integration of technology within healthcare services has led to the emergence of e-pharmacies, offering consumers digital access to essential medicines and healthcare products. This shift has been particularly significant in India, where rising internet penetration, smartphone usage, and the demand for convenience are reshaping consumer behavior. This study investigates the key variables influencing consumer readiness, consumer engagement, adoption, acceptance, and usage of e-pharmacy platforms to order medicines. It also explores how demographic factors such as age, gender, education, and income moderate these relationships.

Guided by theories of technology adoption and consumer behavior, the study incorporates “Effort Expectancy (EE), Performance Expectancy (PE), Social Influence (SI), Facilitating Conditions (FC), Hedonic Motivation (HM), Health Literacy (HL), Price Value (PV), Perceived Trust (PT), Perceived Risk (PR), and Personal Innovativeness (PI)”. All these variables explain the possible perceptions and interactions of individuals with e-pharmacy platforms, thus influencing behavioral outcomes which include Adoption (Ad), Acceptance (ACC), and Usage (USE).

A close-ended questionnaire was shared with people living in the NCR region to collect data from 443 respondents. Descriptive statistics provided useful demographic information. Most of the respondents were males (55%), were Masters and above (66%) and were aged between 20 to 40 years (89%). The majority of respondents were also from the income level of ₹6-10 lakhs per annum (44%). This information indicates that highly educated, young, and moderately earning people are the predominant subscribers to e-pharmacy services in urban India.

PLS-SEM methodology was applied in the quantitative analysis to map the relationships between constructs. Results pointed out that both performance expectancy and effort expectancy greatly and positively influence adoption. Consumers are likely to adopt e-pharmacy services where they have the perception that the platform is easy to use and will assist them in managing their health. These results highlight the need for e-pharmacy service providers to pay attention to the design and ease of use of these platforms, as they greatly affect consumer actions.

The facilitating conditions (FC) factors, including internet accessibility, customer support, and platform services provided, also facilitated the impact on e-pharmacy adoption. Additionally, health literacy found to positively influence consumer participation along with their preparedness. This indicates that the less complicated the consumers' understanding of managing health, more the likelihood of accessing e-pharmacy services.

Perceived trust was noted to be the most important factor regarding e-pharmacy adoption. This illustrates that consumers are concerned with the authenticity of the medicine, security of the data, and goodness of the delivery system. Price value positively impacts adoption, which means that, in the context of e-pharmacy, user highly concern themselves with how affordable the services and products offered are. In addition, respondents who were more personally innovative had higher levels of e-pharmacy adoption. Similarly, social influence and facilitating conditions positively influenced the adoption of e-pharmacies indicating

cognitive factors like peer and family viewpoint as well as access to resources influence the customer decision to adopt e-pharmacies to order medicines online.

On the other hand, perceived risk and hedonic motivation found to have no influence on e-pharmacy adoption telling us that concerns about safety with online transactions, delivery, or fake medication are likely to be nonissue that impede adoption as well as customers don't drive any fun or enjoyment using e-pharmacy to order medicines.

This research also looked into the moderating influences of demographic factors. As previously discussed, gender moderated the effect of price value to adoption of e-pharmacies as men were found to be more sensitive to cost to benefit and thus had a greater impact on perceived acceptance. Age didn't found to be moderator across all the construct relationships in the study, however, price value, perceived trust, personal innovativeness, effort expectancy, performance expectancy and health literacy played a significant role in adoption of e-pharmacies, and in turn acceptance and usage, in younger population. While, in middle to old age population social influence found to be a key determinant in adoption of e-pharmacies to order medicines. The level of income didn't found to be moderator across all the construct relationships in the study. However, income had an influence on how price value, perceived trust, personal innovativeness, performance expectancy, health literacy impacted adoption, and in turn acceptance and usage, in lower income groups as this group tended to be more responsive to offers, discounts, or services that were value-based. Lastly, Education reasoned as moderating influences of health literacy on adoption, however PLS MGA results couldn't be run due to failure of MICOM hence no conclusive evidence could be drawn.

To sum up, this study offers a comprehensive understanding of the underlying circumstances leads to the adoption, acceptance and use of e-pharmacies in NCR, India. It strategically analyzes both the behavioral and demographic factors to aid in the construction of a comprehensively accessible and sustainable e-pharmacy systems. With further use of technology within the medical systems, this research will aid in improving

policy frameworks and practices focused on equal opportunities to crucial health system services especially e-pharmacies.

### **5.1.2 Key Findings of the Research**

This study examined the intricate factors that drive purchase behavior towards the adoption, acceptance, and use of e-pharmacies in India. One of the major observations is that Perceived Trust (PT), Health Literacy (HL), Effort Expectancy (EE), Personal Innovativeness (PI) and Perceived Trust (PT) were found to strongly contribute to positive customer engagement with e-pharmacy. The adoption of e-pharmacies is higher when consumers perceive them to be secure, provide price benefit, and when adequate knowledge exists to navigate their functionalities. These findings suggest that as much as ease of use is required from digital services, so too is trust-building and its mechanisms.

Another important observation includes that of initial adoption of e-pharmacy, which has been shown to relate to acceptance of technology. Acceptance and actual use of a given platform is likely to continue when users feel their input towards productivity is enhanced and the platform is simple to operate. This is consistent with the UTAUT model which shows its applicability in the India context of digitization. Furthermore, Price Value (PV) was found to significantly influence decisions suggesting that in a cost sensitive market like India, price and value ratio is of paramount importance.

The study found that Personal Innovativeness (PI) has a positive impact on adoption and usage behavior. This means customers willing to try out new technologies are more likely to use the digital services. Conversely, Hedonic motivation (HM) and Perceived Risk (PR) found to have no influence on adoption of e-pharmacies to order medicines.

Lastly, the R-square metrics also verified that the model accounted for a relatively high percentage of variance in the primary outcomes: Adoption (0.778), Acceptance (0.565), and Usage (0.524). This substantiates the strength of the proposed conceptual framework and underlines and substantiate the complex character of e-pharmacy customer behavior.

#### **5.1.2.1 General findings: Descriptive statistics**

The e-pharmacy adoption, acceptance and usage perspectives captured from the participants are well illuminated by the descriptive statistical analysis of this study. The demographic details pertaining to the respondents offer a perspective through which the trends regarding e-pharmacy adoption, acceptance and usage in the National Capital Region (NCR) can be understood. The information indicates notable differences by gender, educational qualification, age cohort, and income level which indeed help explain the adoption of e-pharmacy by customers.

Most respondents were male, representing 55%, while female participants comprised 45%. This means that while e-pharmacy usage has increased for all gender categories, it is men who are the most users. On the other hand, the almost 45% share of women is indicative of their heightened digital usage and growing engagement with health technologies like e-pharmacies. Trust, safety, ease of use design elements of the platforms suggests that marketing and design efforts targeting different genders could promote inclusivity and ease gender disparities in e-pharmacy usage.

E-pharmacy adoption can be affected by an individual's level of education. The distribution of respondents indicates that graduates and postgraduates and above (95.49%) represented the most significant portion of the sample, followed by 12<sup>th</sup> class or below (4.51%). This indicates there is a strong correlation between educational attainment and the use of e-pharmacy. Users who are more educated tend to have a higher appreciation for e-pharmacy services, know how to use the internet, and possess adequate digital and health literacy. The low numbers of undergraduates might reflect a lack of independence, doubts on the technology and innovative solutions or a lack of concern for personal health among less educated individuals.

The age group below 20-40 had the greatest proportion of respondents (93.45%) followed by the 41–60 years' group with 4.97%, and only 1.58% were above 60. This suggests that

e-pharmacy adoption is growing among younger consumers who tend to be more tech savvy. The low response rate from older adults' points to an area of concern where greater trust, ease of use, and health literacy materials designed especially for seniors would be required to successfully capture their interest in e-pharmacy. These results may highlight a gap in the existing literature.

Insights regarding the economic standing of respondents proves to be supplemental. The survey data shows as well that 70.65 percent of the respondents reported earning up to ₹10 lakhs annually, 17.61 percent were in the range of ₹11–20 lakh, while 11.74 percent earned above ₹20 lakhs. These statistics indicate that e-pharmacy services tend to be most appealing to lower and middle-income users, which is most probably attributed to the cost saving, discounts, and home delivery features offered. This strong appeal based on affordability is considered a strategic advantage of e-pharmacy models. On the other hand, the sparse usage by upper-income individuals may suggest worries relating to quality, trust in the brand, or a preference for established high-end services in healthcare.

Considering all these factors, the descriptive statistics suggest that the use of e-pharmacy, to order medicines, in NCR is primarily by young educated, and low to middle-income consumers. There is a notable proportion of postgraduate and graduate users which indicates a digitally competent market. The lack of representation from the senior citizens and undergraduates implies a need for targeted education and engagement to facilitate broader acceptance. Additionally, with the absence of all genders, there is a need to develop engagement and design strategies that are tailored to different gender identities, to be more inclusive.

Summarizing the e-pharmacy descriptive data paints a positive picture for the growth of e-pharmacy services in NCR, particularly for those segments of the population who are digitally savvy and sensitive to pricing. For more equitable adoption and acceptance, however, substantial work needs to be done on overcoming digital literacy, trust, and access barriers among older and less-educated citizens. These findings are critical for the

contextualized conclusions that this study attempts to build on, and in the grounding of the inferential analyses to follow.

#### **5.1.2.2 Specific findings: PLS-SEM Analysis**

The SEM analysis provided the primary approach on the computation and validation of the relationships among factors affecting the e-pharmacy adoption, acceptance and usage by the customers. In the model, constructs like Effort Expectancy and Performance Expectancy were incorporated along with Social Influence, Facilitating Conditions, Hedonic Motivation, Health Literacy, Personal Innovativeness, Perceived Trust, Price Value, and Perceived Risk, while Adoption, Acceptance, and Usage were the outcome variables. The purpose of this model was to assess how the readiness and engagement of the consumer and factors drive the consumer to perform behavioral intentions and take real steps in the context of using the service digitally, especially in the case of health technologies like e-pharmacies.

From the SEM analysis, many relationships among constructs were both meaningful and significant. Consumers were more inclined towards adoption when e-pharmacies had a high and positive influence of Effort Expectancy i.e. effort to use e-pharmacies is low. This is consistent with the Technology Acceptance Model (TAM) and UTAUT2, which posits that an attitude toward technology is, among other things, significantly determined by the perception of how easy it is to use it. In the same way, Adoption was explained with a high and positive Performance Expectancy, meaning that customers have used and influenced by benefits provided by the e-pharmacy that improved their healthcare needs pertaining to medicines. Adoption toward e-pharmacy increases significantly when a person thinks that his health, productivity or convenience will be greatly improved.

Social Influence also demonstrated a considerable positive correlation with Adoption. This means that people tend to seek confirmation from their social world, including relatives, friends, and coworkers, before making the decision to adopt new technological

advancements such as e-pharmacy. Recommendations, trends, and shared experiences help shape consumer perceptions, especially in health and wellness circles where credibility and trust are highly valued. Facilitating Conditions had a strong effect on Adoption of e-pharmacy, suggesting that resources, infrastructure, and support are needed for the consumers to move towards adopting a new service like e-pharmacy. This also means that consumers are more inclined to keep using a service if they feel that the technical and organizational context is favorable to their use of the service.

Besides the factors of readiness, the engagement drivers like Hedonic motivation, Health literacy, and Personal innovativeness also received special attention in the analysis. The Adoption phase of e-pharmacy was found to be not significantly influenced by Hedonic Motivation which considers enjoyment, emotional satisfaction, and active participation. Users are likely to adopt and stay engaged with a digital service when it is not only instrumental but also pleasurable and mentally invigorating but in case of technologies like e-pharmacy, dealing with health needs, it was found to be a non-influential factor. Adoption of the e-pharmacy was impacted positively by Health Literacy. This means that those individuals who understand health information, and who may process and make use of the health information, are more willing to adopt e-pharmacies. Their informed status makes them better positioned to evaluate the credibility and relevance of the technological solutions, thereby increasing the chances of adoption. Studies have shown positive impact of Personal Innovativeness on adoption of new technologies and same has been inferred in the present study where Personal Innovativeness found to be key influencer of e-pharmacy adoption.

Perceived Risk, highlighting the negative impact that worries about a breach of privacy, data protection, or other forms of personal information abuse can inflict on consumer behavior. However, current study found Perceived Risk a non-influencing factor on adoption of e-pharmacy showing enhanced belief in the e-pharmacy services in NCR, India. E-pharmacy Adoption was positively affected by Perceived Trust, reinforcing the notion that confidence in the platform, service provider, or technology is critically

important for users to engage with it fully. Users' psychological acceptance improves and enables long-term usage when they consider the service to be secure, transparent, and managed in an ethical manner.

Price Value was also found to be important in driving e-pharmacy Adoption. This signals that consumers are sensitive to costs and assess the balance of the benefits and disadvantages associated with a service. Adoption is higher for services that are regarded to offer good value for money. The analysis of the outcome variables showed that Adoption of e-pharmacy had a considerable and notable effect on Acceptance of e-pharmacy, pointing to a rational sequence after consumers adopt a service, they are psychologically more inclined to accept and use it within the context of their daily life. Likewise, it was shown that Acceptance had a significant impact on Usage, reinforcing the notion that emotional and mental investment sustains ongoing interaction with e-pharmacy.

The explanatory power of the model was considerable. As for Adoption, the R-square was equal to 0.778 which implies that approximately 77.8% of Adoption's variance was explained by Effort Expectancy, Performance Expectancy, Social Influence, Health Literacy, Hedonic Motivation, Facilitating Conditions, Personal Innovativeness, Perceived Risk, Perceived Trust, and Price Value. Also, the R-square for Acceptance turned out to be 0.565, which means that 56.5% of its variance was explained by Adoption. In the case of Usage, the R-square value was 0.524, meaning that 52.4% of the variance in Usage was explained by the Acceptance variable. Such values indicate that the model fit is high, while optimally predicting the behavior outcomes based on the chosen predictors.

The predictive relevance of the model was examined using the PLS-Predict procedure confirms that the PLS model outperforms the naive linear benchmark has high predictive power for Adoption and Acceptance and marginally better than linear model or low predictive power for dependent variable Usage. The results indicate that the proposed model not only effectively accounts for the variance within the sample but also exhibits

strong predictive accuracy outside the sample, highlighting its practical utility in predicting consumer adoption behavior in the realms of e-pharmacy and digital health.

The analysis of effect size ( $f^2$ ) was performed to assess the extent of influence each external construct has on its corresponding internal variables in the proposed model. The effect size ( $f^2$ ) analysis revealed that for direct precursors to Adoption have smaller effect sizes ( $f^2 < 0.10$ ), yet they still offer valuable insights into initial adoption intentions. Concerning behavioral outcomes, the model shows the most significant impact in the sequential connections of Adoption, Acceptance, and Usage. Adoption significantly affects Acceptance ( $f^2 = 1.297$ ), and Acceptance similarly influences actual Usage ( $f^2 = 1.101$ ), underscoring that the degree to which e-pharmacy is accepted, integrated, and perceived as beneficial is closely linked to the level of interaction with the service. These results support the adoption–acceptance–usage continuum, suggesting that while adoption is motivated by perceived usefulness, trust, and other factors, ongoing usage relies on facilitating factors and social reinforcement.

In general, the SEM results support the proposed conceptual model and verify that the digital adoption, particularly regarding health or lifestyle applications in the context of e-pharmacy, is a process that involves many elements working together in both a logical and emotional way. People are affected by not only the technological convenience and usefulness, but also by the social trust, personal innovativeness, and health literacy. Adoption to acceptance and then to continuous usage is something that needs to be understood by e-pharmacy providers as it represents a psychological and behavioral flow. This understanding can help formulate targeted strategies to increase user participation, usability through streamlined design, foster trust by safeguarding data and providing clear policies, and guarantee value-for-money services.

Understanding the most important drivers allow e-pharmacy service providers and marketers to customize their offerings to more closely meet the user's expectations and behavioral patterns. Educational campaigns can focus on the improvement of health

literacy in educative aware regions; however, there need to be infrastructure and customer support improvements to enhance the supporting conditions acceptance to enable the use of systems. Pricing policies can be adjusted to fit the perceived value from the user's standpoint, and trust building through user testimonials, third-party endorsements, and secure data management can reduce concerns regarding risks. In the end, the customer adoption, acceptance through engagement, and sustained usage with loyalty enhancement roadmap in a digitalized world, in the context of e-pharmacy to order medicines, is provided by the SEM analysis.

#### **5.1.2.3 Specific findings: PLS-MGA Analysis**

The Partial Least Squares Multi-Group Analysis (PLS-MGA) was performed to assess whether demographic variables such as age, gender, education, and income moderated the structural relationships within the proposed e-pharmacy adoption, acceptance and usage model. Overall, the results indicated no significant differences ( $p > 0.05$ ) in most path coefficients across demographic subgroups, suggesting that the relationships among key constructs were structurally consistent across groups. However, a significant moderating effect of gender was observed on the Price Value  $\rightarrow$  Adoption Intention path ( $p < 0.05$ ), indicating that price sensitivity influenced adoption intention more strongly among male respondents. This suggests that men placed comparatively greater importance on perceived economic value when deciding to adopt e-pharmacy. Apart from this, the behavioral and cognitive drivers such as performance expectancy, effort expectancy, social influence, facilitating conditions, perceived risk, hedonic motivation, health literacy, personal innovativeness, and perceived trust demonstrated similar effects across all demographic categories. These results align with previous technology adoption studies (e.g., Venkatesh et al., 2012; Hair et al., 2021), which suggest that when technology usage start becoming more widespread and familiar, demographic factors moderating influence on adoption behavior start diminishing.

However, when paths were analyzed at individual demographic group level, significant findings revealed.

In Gender, within the male group, health literacy, perceived trust, and price value were the key predictors of adoption intention, indicating that rational and credibility-based factors predominantly shaped their behavioral decisions. In contrast, for the female group, health literacy, hedonic motivation, performance expectancy, and personal innovativeness significantly influenced adoption, highlighting a greater emotional and experiential orientation toward e-pharmacy use.

When analyzed by age groups, the younger cohort i.e. below 30 years of age exhibited significant effects from effort expectancy, performance expectancy, personal innovativeness, health literacy, perceived trust, and price value on adoption intention, indicating that technology comfort, perceived utility, and confidence in e-pharmacy were key adoption drivers. In contrast, among middle-aged and older respondents i.e. above 30 years of age, social influence emerged as the primary determinant of adoption, suggesting that peer recommendations and social validation play a stronger role in shaping their adoption of e-pharmacy.

For income-based comparisons, the low-middle income group i.e. earning 10 lakhs and below annually, demonstrated significant effects of performance expectancy, personal innovativeness, health literacy, perceived trust, and price value on adoption, emphasizing their reliance on affordability, functionality, and confidence in e-pharmacy. In contrast, the high-income group i.e. earning above 10 lakhs annually showed significant relationships only for effort expectancy and health literacy, indicating that convenience and informational competence are the dominant factors influencing adoption among more affluent respondents.

Importantly, across all demographic subgroups, the Adoption → Acceptance and Acceptance → Usage pathways were consistently significant ( $p < 0.05$ ), confirming the

sequential nature of the e-pharmacy adoption–acceptance–usage. This indicates that once individuals adopt e-pharmacy, their acceptance of e-pharmacy directly translates into continued usage, regardless of demographic differences. Collectively, these results demonstrate that while the overall model remains demographically stable, subtle variations in motivational drivers exist across gender, age, and income, reinforcing the multidimensional nature of e-pharmacy adoption behavior

However, the education-based subgroup analysis could not be conclusively interpreted due to Measurement Invariance of Composite Models (MICOM) failure, which prevented the establishment of partial or full invariance. As a result, PLS-MGA comparisons for educational groups were not performed, and no definitive conclusions were drawn from education demographic category.

Overall, these findings affirm that although the structural model shows strong stability across different demographics, there are differences in specific motivational factors among gender, age, and income groups. The results emphasize that the behavior of adopting e-pharmacy is complex, involving cognitive, emotional, and contextual factors that vary slightly among different segments of the population.

## **5.2 Theoretical Implications**

This research makes a valuable addition to the literature regarding technology adoption by broadening the Unified Theory of Acceptance and Use of Technology (UTAUT2) from a conceptual perspective. It includes factors like health literacy and perceived trust as exogenous constructs adds depth to the traditional UTAUT2 framework. Health literacy, defined as an individual's capacity to find, comprehend, and assess health information online, has emerged as a significant predictor across various demographic groups. This concept enhances the theory by incorporating a cognitive ability aspect, demonstrating that the skill to interpret medical data influences the connection between technological features and behavioral outcomes (Sabbir, Islam & Das, 2021). Similarly, perceived trust enriches theoretical discussions by adding an institutional and relational dimension to technology

acceptance, recognizing that trust in digital intermediaries, data security, and platform authenticity is crucial in the realm of health technology especially e-pharmacies (Alsadoun, Tangiisuran, & Iskandar, 2023; Yin, Li & Qiao, 2016). Put it altogether, these elements ground the theoretical model within the techno-socio-cognitive framework, linking the gap between rational technology assessment and emotional confidence in the adoption of e-pharmacy.

The findings affirm the multidimensional nature of customer motivation, where personal innovativeness, health literacy and price value influence e-pharmacy adoption. Present study highlights role of price value and shows that affordability and perceived economic benefit remain essential even in technology-mediated healthcare. Study shows, personal innovativeness plays a crucial role in the adoption of technology, as it reflects an individual's tendency to independently embrace new technologies. This trait is a strong indicator of their intention and behavior towards adopting e-pharmacy and such innovations (Sabbir, Islam & Das, 2021). These additions improve the model's explanatory power by incorporating health-related attitudes and behaviors, especially in a highly digitized society.

This research empirically supports the notion that technology adoption in healthcare, especially in the context of e-pharmacy, is not a discrete event but a continuum of behavioral progression, moving from initial adoption intention to psychological acceptance and eventually to usage. The consistent significance of the Adoption → Acceptance and Acceptance → Usage pathways across all demographic groups reinforces prior conceptualizations by Venkatesh et al. (2012) that technology use evolves through iterative learning and trust-building cycles. In the e-pharmacy context, this continuum underscores how consumers not only decide to adopt e-pharmacy but also internalize their usefulness, reliability, and convenience over time. Theoretically, this contributes to UTAUT2 by demonstrating that post-adoption behaviors (acceptance and continuous use) are as crucial as initial behavioral intention in shaping e-pharmacy engagement.

Additionally, the research uses demographic moderating factors (such as age, gender, education, and income) that may alter the strength and direction of relationships between major constructs and behavioral outcomes. This multi-tiered theoretical framework enhances understanding of what drives not only the initial decision to adopt e-pharmacy services, but also their acceptance and sustained use.

While PLS-MGA results showed general invariance across demographic groups, meaningful group-level differences enrich the theoretical understanding of contextualized technology adoption. For example, gender-based moderation revealed that women are more responsive to experiential (hedonic, innovativeness) and utility-based (performance expectancy) dimensions, whereas men rely more on trust and value-based (price value) cues. This aligns with socio-psychological theories suggesting that gender shapes evaluative and affective orientations toward technology. In a similar vein, the differences among age groups reveal that younger individuals prioritize ease of use, usefulness, innovation, and trust, whereas older individuals are more influenced by social factors, supporting the idea of socially assisted adoption among those who adopt later. The distinction based on income, where lower-income groups prioritize affordability and trust and higher-income groups focus on ease and literacy, introduces an economic layer to existing technology acceptance theories. Together, these findings expand UTAUT2 by demonstrating how the importance of constructs shifts dynamically across demographic and socioeconomic contexts, indicating that technology adoption in healthcare & pharmaceuticals is both universal and adaptable to specific situations, particularly in developing countries like India.

Methodologically, the study advances theoretical application by validating Partial Least Squares Structural Equation Modeling (PLS-SEM) as a robust analytical approach for complex, multi-construct health technology models. The consistent results across subgroups and the predictive relevance indicated by positive  $Q^2$  values and strong  $f^2$  effect sizes confirm that PLS-SEM provides both theoretical precision and predictive utility in modeling behavioral phenomena in customer adoption & engagement with e-pharmacy.

The study also reinforces the practicality of using PLS-Predict for assessing out-of-sample prediction, highlighting that theoretical models in healthcare adoption should not only fit data but also predict future behavior, a critical step toward theory-driven predictive analytics in digital health research.

A notable theoretical limitation emerged from the Measurement Invariance of Composite Models (MICOM) analysis, where the education-based comparison failed to establish partial or full invariance. This indicates potential differences in how respondents with varying educational backgrounds interpret constructs such as usefulness or trust. Theoretically, this calls for future refinement of construct operationalization to ensure semantic equivalence across educational segments in developing economies like India. This insight contributes to ongoing debates on cross-group construct comparability, encouraging future researchers to adopt invariance testing as a prerequisite for valid demographic moderation in technology adoption research.

In summary, this study advances theory by (a) validating the adoption–acceptance–usage continuum in e-pharmacy, (b) integrating health literacy, personal innovativeness and trust & risk as cognitive and relational extensions to UTAUT2, (c) revealing contextual demographic patterns in technology adoption, acceptance, and usage (d) reinforcing the predictive and explanatory utility of PLS-SEM in digital health research. These theoretical implications not only strengthen the explanatory reach of existing technology acceptance theories but also provide a localized, rational, emotional and context-sensitive model of technology-driven healthcare behavior suitable for emerging market contexts like India.

### **5.3 Managerial Implications**

The findings of this study carry several important managerial and policy-oriented implications for e-pharmacy platforms, online health start-ups, pharmaceutical marketers, and public health decision-makers. As the Indian healthcare ecosystem is going through digital transformation, understanding the nuanced behavioral mechanisms that drive adoption, acceptance, and usage of e-pharmacy services becomes critical. The empirical

results, particularly the validated adoption–acceptance–usage continuum and demographic insights, offer actionable guidance for designing strategies that enhance user engagement, trust, and long-term loyalty.

The pronounced impact of effort expectancy, or ease of use, among younger and affluent demographics highlights the importance of creating e-pharmacy interfaces that are intuitive, seamless, and available in multiple languages (Almeman, 2024). For older individuals or those less familiar with digital technology, incorporating voice-assisted navigation, step-by-step order instructions, and customer service chatbots can help alleviate perceived complexity (Acropolium, 2024; AppSierra, 2024).

Since perceived trust consistently emerged as a strong determinant of adoption across many demographic groups, managerial focus must shift toward transparency and authenticity. E-pharmacy companies should visibly highlight verified pharmacist credentials, digital prescription validation, and data privacy certifications (DSCI/GDPR compliance) to mitigate user concerns about authenticity and data misuse. Moreover, secure payment gateways, real-time order tracking, and pharmaceutical provenance labels can also reassure consumers about product quality and transaction safety (Parikh et al., 2019; Bahamdan & Almanasef, 2024). The study’s results suggest that trust-driven engagement is particularly vital for male and low-income users, who tend to evaluate e-pharmacy services based on reliability and institutional credibility rather than hedonic appeal.

The significant role of enjoyability (hedonic motivation) among female respondents implies that digital engagement should extend beyond transactional interactions. Managers can focus on creating emotionally resonant digital experiences such as gamified health features, wellness challenges, loyalty points, or personalized product recommendations (e.g., vitamins, health kits) (Johnson et al., 2016; Cheng et al., 2019).

The consistent influence of health literacy across all demographics highlights the critical need for educational content strategies. E-pharmacy platforms can integrate simplified

medical descriptions, drug interaction alerts, and visual dosage guides to empower users with actionable health knowledge (Li et al., 2022; Wong et al., 2024).

The gender-based PLS-MGA findings suggest differentiated marketing communication strategies. For female consumers, platforms can emphasize utility-based messaging (e.g., convenience, family health benefits) and hedonic features that enhance emotional satisfaction. For male users, communication can be targeted on trustworthiness, authenticity, and data security, using rational, value based and credibility-driven narratives.

Social influence, as found significant among older age group, can be amplified through family-based purchase options or referral reward systems that encourage collective decision-making (Stamate et al., 2024; Cao et al., 2024).

The price value, particularly its stronger influence among male and low-income respondents, indicates that affordability remains a key adoption driver. Managers can focus on developing the pricing strategies tailored to price-sensitive users (Li et al., 2023). Certain features, as appeared in literature, like tiered pricing, discount subscription models, cashback programs, price comparison transparency within apps can reinforce perceptions of fairness and empower rational purchasing decisions.

The validation of the adoption–acceptance–usage continuum suggests that managerial efforts should not stop at initial adoption but focus on continued behavioral engagement. Building acceptance requires reinforcing trust and perceived usefulness post-adoption through consistent service quality, accurate medical information, and responsive after-sales support. Usage can be deepened by behavioral nudges such as refill reminders, personalized health insights, and AI-driven adherence tracking (Luong et al., 2021; Sumner et al., 2023). These tools not only improve customer retention but also align with broader public health objectives of medication adherence and preventive care. The study's results affirm that continuous perceived value reinforcement is essential for translating adoption into long-term usage.

Additionally, based on the robust statistical foundations of the PLS-SEM model, the IPMA analysis identifies strategic and managerial priorities. Among all constructs, Acceptance (ACC) (importance = 0.724; performance = 55.698) and Adoption (AD) (importance = 0.544; performance = 61.982) emerge as the most critical determinants of the outcome variable i.e. Usage (USE). For the Adoption, high importance and high performance, indicating that users perceive strong functional and economic benefits from e-pharmacy platforms and that these expectations are being effectively met. Managers should therefore sustain and further leverage these strengths by preserving competitive pricing, maintaining fast and reliable delivery systems, and reinforcing the platform's practical value through personalized recommendations and refill automation. For the Acceptance, high importance but low performance, signaling critical areas that are currently limiting users' progression into consistent and habitual Usage. Despite their strong influence on whether users continue using the platform, current performance levels indicate gaps in user confidence, information clarity, and interaction simplicity. Managers should therefore prioritize strategic efforts by strengthening trust-building mechanisms (e.g., verified pharmacists, transparent drug sourcing, strong data protection), enhancing digital health literacy through simplified medical explanations and multilingual content, and improving ease of use via intuitive navigation, clean interface design, and senior-friendly features. Addressing these deficiencies will significantly improve psychological acceptance and foster a smoother transition toward sustained and predictable usage behavior.

Furthermore, Health Literacy (HL) (importance = 0.104) and Perceived Innovativeness (PI) (importance = 0.089) also exhibit noteworthy influence, suggesting that individuals' understanding of sustainability-related knowledge and their willingness to experiment with innovative solutions significantly shape implementation outcomes. Managers can enhance HL area cost-effectively by incorporating simple icons, visual dosage guides, short explainer videos, and multilingual instructions, rather than extensive literacy campaigns. To nurture the latent PI, platforms can introduce small-scale interactive features, such as

personalized dashboards, AI-based suggestions, or optional advanced features, allowing more innovative users to explore deeper functionality without overwhelming others.

Constructs such as Effort Expectancy (EE), Facilitating Conditions (FC), Performance Expectancy (PE), Perceived Trust (PT), Perceived Value (PV), and Social Influence (SI) show moderate importance levels, functioning as enabling mechanisms rather than core drivers. These results suggest that while usability, supportive infrastructure, and social endorsement are important, they primarily enhance rather than determine sustainable behavior. Strengthening these supporting mechanisms can further reinforce acceptance and adoption.

Interestingly, Hedonic Motivation (HM) reflects the lowest importance (0.025), and Perceived Risk (PR) demonstrates a slightly negative importance (−0.009), implying that emotional gratification and perceived risk exert minimal impact. This indicates that stakeholders' decisions are primarily driven by rational, structural, and capability-based factors rather than by affective or fear-based considerations.

#### **5.4 Policy Implication**

The findings of this study offer several critical policy-level insights to strengthen India's evolving digital health ecosystem and support the national agenda under the Ayushman Bharat Digital Mission (ABDM) and the National Digital Health Blueprint (NDHB). The empirical evidence reinforces that successful e-pharmacy adoption requires not only technological readiness but also regulatory, educational, and infrastructural alignment that builds user trust, affordability, and equitable access.

First, the consistent significance of health literacy as a determinant of adoption underscores the need for nationwide digital health education programs. Policymakers can work on to integrate digital and health literacy modules into public health outreach and school curriculum, empowering citizens to interpret online health information accurately (Mancone et al., 2024; Elantheraiyan et al., 2025).

Second, the strong influence of perceived trust and price value calls for standardized e-pharmacy regulatory frameworks that ensure product authenticity, ethical marketing, and transparent pricing. The government should accelerate implementation of the Draft E-Pharmacy Rules (2018) and align them with ABDM's, and other digital health missions, interoperability standards to create a single national registry of verified e-pharmacies. Mandatory display of pharmacist licenses, drug sourcing transparency, and privacy certifications can enhance consumer trust and curb the proliferation of unverified platforms which has been found to a key concern in literature (Parikh et al., 2019; Bahamdan & Almanasef, 2024).

Third, to address economic and social inequities, policymakers can foster public-private partnerships (PPPs) that integrate e-pharmacy services with public health insurance and telemedicine programs. Subsidized medicine delivery for chronic conditions through digital platforms can improve access for low-income populations, aligning with Universal Health Coverage (UHC) goals. Additionally, tax incentives or startup grants for compliant e-pharmacy platforms can encourage innovation and strengthen India's digital health infrastructure (Almeman, A et al., 2024; UHC2030.; Radheshyam et al., 2025).

Finally, the validated adoption-acceptance-usage continuum emphasizes that government initiatives should move beyond technology rollout toward long-term engagement strategies that promote sustained usage of e-pharmacy. Regular monitoring through ABDM dashboards, data-driven behavioral insights, and citizen feedback mechanisms can help policymakers evaluate digital health program performance effectively (Ang, A. (2022, May 31). India's NHA launches ABDM public dashboard. Healthcare IT News.).

In summary, the study highlights that trust, health literacy, affordability, and accessibility are the four pillars upon which e-pharmacy adoption must rest.

## **5.5 Practical Implications**

The results of this research are important in practice for multiple categories which include e-pharmacy businesses, medical practitioners, online marketers, public policy experts, and

software specialists seeking to accelerate the adoption and sustained use of e-pharmacy services. Gaining an understanding of the e-pharmacy adoption determinants in India's digitally evolving healthcare market, especially in urban areas like NCR, is crucial for consumer trust, purchase intention, and sustained engagement.

As identified in the findings, effort expectancy and performance expectancy highlights the importance of developing intuitive, accessible, and user-centric e-pharmacy interfaces. This implies enhanced functional utility and achievement of health goals at the very minimum by using an e-pharmacy. In order to capture customer satisfaction, businesses need to enhance interfaces for efficient user interaction, personalized suggestions along with easy exchanges with healthcare which are necessary for routine monitoring concerning patient's health history. Such services increase the level of service and performance. E-pharmacy applications and websites need to improve their user interface (UI) and user experience (UX) design. Users of all ages and education levels will benefit from a simplistic, intuitive, multi-language layout that requires minimal steps to place an order. Special care should be provided to the elderly and other online transaction novices. Users can suffer from digital fatigue, but specialized features such as voice assistance, easy prescription upload, and effortless payment pathways can promote user adoption (Acropolium, 2024; AppSierra, 2024; Almeman, 2024).

Social influence found to be a key influencer of e-pharmacy adoption. Friends, family members, and online reviews help shape consumer attitudes towards e-pharmacies. Companies can make use of referral programs, influencer marketing, and promotions endorsed by doctors to foster credibility and trust among users. Through partnering with hospitals, clinics, and other trusted medical professionals who can recommend their platforms, e-pharmacy services can gain acceptance and exposure (Al-Shaikh et al., 2023; Willis & Delbaere, 2022).

A striking observation in the study is the facilitating conditions which describe the supportive organizational and technical resources that are readily available. E-pharmacy

users must provide sufficient customer care through telephone, live chat, automated FAQs, and other relevant answer bots which attend to typical common user problems. Users move around with the intent to upload a prescription, choose an appropriate dosage, and order the medication. Education on these matters can resolve the gap between intention and action. Moreover, some local pharmacists might be willing to collaborate for hybrid support models, for example online ordering followed by offline pickup, which may enhance reach and resolve logistical issues (Nissan, 2025; Prasath, 2025).

Perceived trust is other noteworthy insights of the study. It is reasonable for customers to be overly cautious about buying medicines online because of the most daunting issues of authenticity, delivery, and data protection. In order to tackle these issues, e-pharmacies can make and enforce clear procedures to users that will explain these problems clearly. It is critical to verify the suppliers, authenticate the drugs, publish self-reviews in real time, and follow local regulatory requirements like the Indian Telemedicine Guidelines and the e-pharmacy draft rules. Additionally, the implementation of secure payment systems, the encryption of stored data, along with refundable and returned terms will bolster trust further (Parikh et al., 2019; Bahamdan & Almanasef, 2024).

Health literacy emerged as a core determinant of adoption of e-pharmacy, suggesting that initiatives should center around educational enablement. Together with the responsible public health agency, e-pharmacy companies can conduct training sessions that educate residents, notably from less serviced or economically disadvantaged regions, about the safe and proper utilization of e-pharmacy services (DeRemer et al., 2008; Jamir et al., 2013; Faujdar et al., 2022).

The significant influence of price value, particularly among males and low-income users, suggests that affordability and perceived savings are central to encouraging e-pharmacy adoption. E-pharmacy platforms can implement dynamic pricing models, subscription-based medication plans, or reorder discounts to reduce cost barriers. Offering free consultations with verified doctors or bundle pricing for chronic conditions (e.g., diabetes,

hypertension) can enhance perceived value. Strategic alliances with health insurance providers or government programs, e.g. Ayushman Bharat, can also help subsidize costs, promoting equitable digital health access. Such initiatives not only address economic sensitivity but also align business strategy with public health goals (India CX Report '25: E-Pharmacy. (2025, March). India CX Report'25: E-Pharmacy [Report]. KPMG.; “How online-medicine delivery services bring cost-effective care to your doorstep.” (2025, July 18))

The validated adoption to acceptance to usage continuum highlights the importance of nurturing post-adoption behaviors. Practical strategies should focus on maintaining service reliability, user support responsiveness, and feedback-driven improvements. E-pharmacies can implement proactive engagement loops like surveying user satisfaction, addressing complaints promptly, and co-creating service upgrades with customer input. Strengthening post-adoption touchpoints (e.g., after-sale follow-ups or medication guidance messages) reinforces perceived reliability and promotes habitual platform usage (Liu et al., 2019).

How a demographic moderator is studied provides insight on which user groups are more inclined towards the adoption of e-pharmacies. The PLS-MGA subgroup findings reveal that motivational factors differ across gender, age, and income levels, implying the need for segmented and targeted engagement strategies. For female users, who value enjoyability, and usefulness, practical interventions can include personalized wellness offers, and aesthetically engaging e-pharmacy app designs that appeal to emotional and experiential motivations (Almeman, 2024). E-pharmacy strategies to engage with male customers can emphasize trust, price value, credibility, and product authenticity. For younger users, who respond strongly to ease of use, innovativeness, and trust, gamification, for example, reward points, health challenges, and mobile-native design can sustain user engagement with e-pharmacy platforms (Bitrián, Buil, & Catalán, 2021). For older users, where social influence is significant, leveraging peer endorsements, family referral schemes, and pharmacist outreach can help build confidence in e-pharmacy (Mei & Liu, 2024). Among low-income users, communication should stress affordability, discounts,

and free delivery options, while high-income users may respond better to premium service features, such as priority delivery or tele-consult access (Han & Han, 2023). Such differential approaches ensure inclusive engagement.

To summarize the studies practical implications, its core conclusions provide a strategy for reinforcing the e-pharmacy's ecosystem not just in the National Capital Region but beyond as well. By concentrating on the user interface design and mechanisms for building trust, inclusive communication strategies, and vertical policies to support broader adoption, stakeholders will not only improve e-pharmacy adoption, acceptance and usage and healthcare outcomes but contribute to the overall transformation of digital healthcare in India.

### **5.6 Societal Implications**

The societal implications of this study are profound, particularly in the context of improving healthcare accessibility and inclusivity through e-pharmacy adoption. By highlighting the drivers of adoption, acceptance, and usage, the study emphasizes how e-pharmacy platforms can bridge geographical and socio-economic barriers, especially in rural and underserved regions where traditional pharmacies may be scarce. E-pharmacies provide individuals with timely access to essential medicines, diagnostic information, and healthcare guidance, thereby contributing to improved public health outcomes and reduced disparities in medical service availability (Apte et al., 2024).

Moreover, the study points to the role of trust, health literacy, and facilitating conditions as essential elements in encouraging wider e-pharmacy adoption, which in turn enhances overall societal well-being. Improved health literacy not only empowers individuals to make informed healthcare decisions but also reduces dependence on intermediaries, encouraging self-care and responsible usage of medicines (Dinh et al., 2023). At a broader level, the increased use of e-pharmacies fosters the digitization of healthcare services in India, aligning with national goals of Digital India and universal health coverage (Ministry of Health and Family Welfare, Government of India. (2023). National digital health

blueprint: Making India's healthcare future-ready). The societal benefit lies in creating a more equitable and efficient healthcare system, where technology acts as a catalyst for empowerment, inclusion, and long-term sustainability of public health.

The study highlights perceived trust as a fundamental determinant of e-pharmacy adoption, revealing its dual social function: building confidence in digital health services and countering skepticism toward technology-mediated care. Trust, once established, has a multiplier effect, it's not only driving individual adoption but also fostering collective trust in the e-pharmacy, and eventually in digital health ecosystem. As users share positive experiences through social networks, peer reviews, and word-of-mouth, they generate social proof, which normalizes online healthcare interactions (Chen, Liu, & Zhang, 2021). This process is particularly vital for older and less tech-savvy populations who rely on social influence for adoption decisions.

The study's multi-group findings reveal important social dimensions in e-pharmacy adoption. The stronger influence of price value and trust in low-income groups indicates that affordability and perceived safety remain central to promoting inclusive healthcare access. E-pharmacies, by offering lower prices and convenient delivery, can thus serve as social equalizers, enabling economically disadvantaged individuals to manage their health needs independently. Similarly, the greater emphasis on usefulness, innovation, and ease of use among younger users reflects a generational shift toward digital healthcare behaviors, signaling the rise of a more connected, health-aware youth population. Conversely, the finding that social influence shapes adoption among older adults highlights the importance of intergenerational inclusion, ensuring that seniors are supported by family members and caregivers in using e-pharmacy. Together, these insights illustrate that e-pharmacy adoption is not merely a technological transition but a social transformation, bridging divides of gender, age, and income.

By validating the adoption–acceptance–usage continuum, the study contributes to the understanding of how e-pharmacies can enhance continuity of care in public health

systems. Sustained usage of e-pharmacy services implies ongoing access to medication, better adherence to treatment regimens, and reduced risk of therapy interruptions, particularly for patients with chronic diseases (Emadi et al., 2022). During crises such as the COVID-19 pandemic, e-pharmacies played a vital role in ensuring uninterrupted supply chains and minimizing exposure risks (Dcruz et al., 2022). Thus, strengthening e-pharmacy adoption at the societal level can enhance public health resilience, enabling communities to withstand disruptions and maintain continuity in care delivery.

Therefore, by facilitating informed, affordable, and equitable access to healthcare, e-pharmacy platforms contribute to social empowerment at both individual and community levels. The study's evidence therefore supports the notion that digital health adoption is not only a technological evolution but also a social revolution, one that promotes inclusivity, accountability, and shared responsibility in India's healthcare transformation (Rana et al., 2024).

### **5.7 Recommendations**

Based on the empirical findings and their implications like theoretical contributions, managerial and practical implications and practical insights drawn from this study, several recommendations are proposed for policymakers, e-pharmacy managers, healthcare providers, and future researchers. These recommendations aim to strengthen the digital health ecosystem especially in the context of e-pharmacy, improve consumer trust and literacy, and enhance the sustainable adoption and continued usage of e-pharmacy services in India.

The study found perceived trust to be a consistent and significant determinant of e-pharmacy adoption and continued use. Therefore, it is recommended that e-pharmacy platforms and regulatory bodies collaborate to institutionalize trust mechanisms such as: transparent verification of pharmacist credentials and licensing, Implementation of national e-pharmacy standards, public display of drug source authenticity, storage conditions, and

data privacy compliance (e.g., ISO etc), regular audits and consumer reporting channels to ensure ethical and secure operations.

Since health literacy emerged as one of the strongest predictors of e-pharmacy adoption across demographic groups, targeted literacy initiatives are essential. Policymakers, in collaboration with e-pharmacy companies and health NGOs, should launch community-level digital health awareness campaigns focusing on safe online medicine use, integrate health literacy modules into secondary education curriculum and public health outreach programs, encourage platforms to include interactive learning features, such as visual dosage guides, drug-interaction warnings, and video tutorials, offer multilingual content to address literacy gaps in non-English-speaking and rural populations. Improving health literacy will not only enhance e-pharmacy adoption but also promote informed self-care, adherence, and responsible medicine use.

The significance of price value, especially among male and low-income respondents, highlights the importance of affordability and economic inclusivity. To address this, it is recommended that e-pharmacies adopt tiered pricing models, discounted chronic medication plans, and subscription-based refills, form Public-private partnerships (PPPs) to subsidized digital medicine delivery for low-income populations, governments introduce tax incentives for e-pharmacies serving rural or economically disadvantaged regions, integration with digital payment platforms and micro-insurance providers can facilitate smaller, flexible payment options. These interventions will ensure that digital healthcare benefits extend beyond urban and affluent users.

The study's PLS-MGA revealed distinct patterns of adoption across gender, age, and income groups, necessitating segmented engagement strategies. For female users, platforms should emphasize enjoyment, and convenience. For male users, trust-building and price value measures such as discounts, verified pharmacist endorsements and transparent supply chain information are key. For younger users, innovation, personalization, and app gamification features e.g. wellness challenges or loyalty points

can enhance sustained engagement. For older users, platforms should leverage social influence, encouraging family-assisted purchases and promoting pharmacist outreach programs. For low-income users, highlighting affordability, security, and reliability is critical; for high-income users, premium membership features (teleconsultation, quick delivery) can enhance retention. Tailoring strategies to cater the specific demographic needs ensures inclusivity and increases the long-term success of e-pharmacies.

To sustain user engagement along the adoption–acceptance–usage continuum, e-pharmacy platforms should increasingly employ AI-driven personalization and predictive analytics such as AI-based medication recommendation systems, predictive algorithms to generate refill reminders and dosage alerts, chatbots and virtual health assistants to assist patients in medication management and basic symptom triage.

The study validated that acceptance strongly predicts continued usage, emphasizing the need for sustained behavioral reinforcement. Managers should focus on creating habit-forming online experiences such as post-purchase engagement loops through surveys, feedback mechanisms, and proactive health recommendations etc.

To maintain the credibility and sustainability of the e-pharmacy sector, robust regulatory enforcement is vital. Policymakers should focus on finalizing and implementing the Draft E-Pharmacy Rules (2018) with clear standards on online sales, verification, and accountability, setting up a centralized accreditation system for e-pharmacy platforms, ensuring ethical marketing practices and restricting misleading drug promotions, protecting user data under a unified Data Protection Framework.

Finally, it is recommended that e-pharmacy companies align their business models with broader public health priorities. Platforms should support government initiatives such as Ayushman Bharat Digital Mission (ABDM) and National Digital Health Mission (NDHM) by sharing anonymized data for public health analytics, promoting equitable pricing, and participating in awareness programs. Aligning commercial objectives with societal good

will not only strengthen brand reputation for e-pharmacy companies but also contribute to sustainable digital health ecosystems in India.

### **5.8 Limitations and Future Research Directions**

Even though the study contributes significantly in terms of the determinants impacting e-pharmacy adoption, acceptance and usage in the National Capital Region (NCR), it has some shortcomings. Understanding these shortcomings will help frame the findings as well as direct further research to enhance the current effort.

The limitation of this study is its geographical scope. The NCR region is more urban compared to the rest of India which is why the study is more digitally literate and economically developed. Therefore, more rural or semi-urban digital infrastructures and accessible healthcare populations would not be able to generalize these findings. It would be ideal if future research is conducted in more diverse and remote geographical areas including but not limited to Tier II and Tier III rural cities to comprehensively study regional differences in e-pharmacy adoption, acceptance and usage.

The research also relates to the cross-sectional approach of the study. Data was captured at one specific moment in time, which makes it more difficult to show causation among the elements. Insights about the strength and direction of relationships are provided through the structural model, but it does not indicate how those relationships change over time. For future research, longitudinal studies are needed to observe changes in user behavior that result from modifications in technology, regulation, or health emergencies such as pandemics. Additionally, while this study empirically validated the adoption–acceptance–usage continuum, it did not track user engagement or satisfaction post-adoption. Consequently, the study could not evaluate behavioral persistence, habit formation, or discontinuance intention. These post-adoption outcomes are critical for understanding sustained engagement with e-pharmacy platforms. Future research could apply repeated-

measure survey designs or behavioral tracking methods to assess how continued experience strengthens or weakens user commitment and trust over time.

The study also placed significant reliance on self-reported data, which could be prone to biases such as social desirability bias or recall bias. Respondents may have over-reported their level of familiarity or comfort with e-pharmacies, especially in light of the growing digital literacy during and after the COVID-19 pandemic. More advanced research could use behavioral data at the e-pharmacy level such as purchase records, usage rates, and customer feedback for more accurate assessments of consumer behavior.

The study employed a non-probability purposive sampling technique, targeting individuals who are familiar and use e-pharmacy. While this method ensured relevance and adequate response rates, it limits the representativeness. As a result, findings will not capture the perspectives of individuals with no exposure to e-pharmacies. Future studies could employ stratified or probability sampling to achieve a more balanced representation e-pharmacy users as well non-users across gender, region, education, and income levels.

As much as this study captured performance expectancy, effort expectancy, trust, risk, health literacy, and even demographic moderating variables, there remains other noteworthy constructs not factored in. Further research could incorporate additional factors to enhance the existing model which will result in a better understanding of consumer decision-making processes in context of e-pharmacy. In addition, technology anxiety, digital confidence, and other personally defining traits of a user lie unexplored within the scope of psychographic variables, which the study overlooked. These attributes, when included in later works, have the potential to reveal the reasons surrounding the acceptance and rejection of e-pharmacy in the healthcare sector.

One of the methodological constraints encountered in this study was the Measurement Invariance of Composite Models (MICOM) failure in the education-based group comparison. This limitation prevented the establishment of partial or full compositional

invariance, thus restricting valid subgroup comparisons for education levels. Without establishing invariance, differences in path coefficients across groups could be attributed to measurement artifacts rather than genuine behavioral variation. Future researchers should ensure pre-testing and refinement of construct wording to enhance semantic equivalence across educational subgroups.

The study also overlooked the distinction between aggregator platforms and licensed e-pharmacies connected to physical outlets. As these business models vary in quality of service and customer support, future studies should explore how the adoption determinants differ across these service types.

Lastly, the dynamics of online healthcare are constantly in flux due to ever-advancing technology, regulation, and consumer expectation. Adopting a more open-ended framework appears to be the most suitable course of action for future research, which will require to periodically revise models of adoption to assess the ever-evolving landscape of integrating AI, teleconsultations, and policies governing e-health in India. As government policies on e-pharmacy will become more defined, the role of compliance with regulations and consumer protection may require further scrutiny.

To sum it up, this study adds value to the body of knowledge concerning the adoption of digital technologies in healthcare especially e-pharmacies, but it clearly offers more opportunities for further investigation. Thus, collecting data from a wider sample, changing to a longitudinal study design, adding qualitative data, and including more relevant frameworks would provide better insights to professionals and scholars aiming to encourage sustainable e-pharmacy use in India and other countries.

## **5.9 Conclusion**

This study provides a comprehensive understanding of the behavioral, technological, and psychological determinants influencing the adoption, acceptance, and usage of e-pharmacy in an emerging market context. The empirical evidence supports the proposed adoption–

acceptance–usage continuum, illustrating that users transition through distinct behavioral stages as they integrate e-pharmacy into their healthcare routines. The strong and significant paths ( $Ad \rightarrow ACC$  and  $ACC \rightarrow USE$ ) confirm that consistent usage is contingent upon a preceding stage of acceptance, rather than a direct outcome of adoption alone. The findings confirm that traditional UTAUT2 constructs, including performance expectancy, effort expectancy, social influence, facilitating conditions, and price value, retain their explanatory power in predicting e-pharmacy adoption. Among these, effort expectancy (EE), facilitating conditions (FC), and price value (PV) emerged as significant predictors, reinforcing that perceived usefulness, accessibility, and affordability collectively influence consumers' willingness to adopt digital pharmaceutical services.

Extending the theoretical model, the study highlights the critical role of perceived trust (PT) as a strong positive predictor of adoption, emphasizing that transparency, authenticity, and regulatory compliance are indispensable for building user confidence. In contrast, perceived risk (PR), though conceptually important, was found to be statistically insignificant, indicating that trust mechanisms and improved digital literacy may have mitigated users' concerns regarding data privacy or counterfeit products. Similarly, hedonic motivation (HM) did not significantly predict adoption, suggesting that the use of e-pharmacy platforms is driven more by utility and reliability than by enjoyment or entertainment value. The inclusion of health literacy (HL) and personal innovativeness (PI) offers novel insights into individual-level variability in e-health, especially in e-pharmacy context, engagement. Both constructs showed significant positive effects on adoption, highlighting that users who are better informed and more open to innovation are more likely to embrace e-pharmacy. These findings advocate for targeted interventions aimed at enhancing digital and health literacy, especially among younger and lower-income populations, to promote inclusive access to e-pharmacy services. From a demographic standpoint, variations across age, gender, and income further refine understanding of user behavior. Younger, and higher-income consumers demonstrated higher health literacy and effort expectancy levels, while older or less affluent users exhibited lower trust, social

influence and higher price sensitivity, signaling the need for customized awareness campaigns and inclusive design strategies. Theoretically, this study makes a significant contribution by extending the UTAUT2 framework to incorporate trust, risk, innovativeness, and health literacy, constructs rarely examined together in healthcare contexts. This integrated model bridges the gap between technology adoption and health behavior theories, offering a holistic view of how cognitive, affective, and contextual factors shape users' online health engagement, especially with e-pharmacies. Practically, the findings suggest that e-pharmacy providers should prioritize building trust-centric, user-friendly, and literacy-supported platforms, while policymakers should strengthen digital inclusion initiatives and regulatory frameworks that foster safety and transparency. Collectively, these efforts can transform e-pharmacy from a transactional convenience into a trusted, accessible, and equitable healthcare channel for diverse user segments. In essence, the study concludes that the journey from adoption to usage of e-pharmacy is not merely a technological progression but a multidimensional behavioral evolution, driven by trust, health literacy, and innovativeness, underpinned by equitable online health infrastructure.

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## **PUBLICATIONS**

1. Kushal Pal Singh, Pawan Kumar. Factors influencing E-pharmacy adoption in India: A study of user experiences through interpretative phenomenological analysis. *Exploratory Research in Clinical and Social Pharmacy*, Volume 17, 2025,100550, ISSN 2667-2766, <https://doi.org/10.1016/j.rcsop.2024.100550>.
2. Singh, Kushal & Kumar, Pawan. (2025) (in press). Exploring Consumer Readiness and Engagement Catalysts for E-Pharmacy Adoption in India: a Healthcare Perspective. *International Journal of Services and Operations Management*. 10.1504/IJSOM.2025.10072498.
3. Singh, Kushal & Kumar, Pawan. (2025). Determinants of E-Pharmacy Adoption and Usage: A Study of Influencing Factors and Demographic Moderators in the National Capital Region. *Journal of Advanced Pharmacy Education and Research*. Manuscript ID jpr-25-3483 (under review).

## **LIST OF CONFERENCES**

1. Participated and presented a paper titled “Customers adoption and acceptance of e-pharmacy for purchasing prescription medicines online: A Qualitative Study” in the international conference on “Business in Turbulent World: Keeping Connections Alive” held on 21<sup>st</sup> November, 2022 organized by Mittal School of Business, Lovely Professional University, Punjab, India.
2. Participated and presented a paper titled “Analyzing the factors affecting the acceptance of e-pharmacies in India” in the International Conference on “The role of Innovation, Entrepreneurship and Management for Sustainable Development (ICRIEMSD-2024)” held on 17<sup>th</sup> & 18<sup>th</sup> October 2024 organized by School of Management, O.P. Jindal University, Raigarh, India.
3. Participated and presented a paper titled “Understanding Influencing Factors in E-Pharmacy Adoption and Usage” in the International Conference on “Global Sustainability for a Resilient Future (ICGSRF-2024)” held on 29<sup>th</sup> & 30<sup>th</sup>

November 2024 organized by Department of Commerce, Patna Women's College (Autonomous), Patna University, Bihar, India.

#### **LIST OF WORKSHOPS**

1. Completed the 8-week "Health Research Fundamentals" NIE-ICMR e-certificate course NIECER-101 with a score of 79% during Jan-Mar 2022 organized by NIE-ICMR in collaboration with NPTEL SWAYAM platform, an initiative by the Ministry of Education, Government of India
2. Participated in Workshop on "Partial Least Squares Structural Equation Modeling using SmartPLS 4" organized by Lovely Professional University w.e.f. November 5, 2024 to November 12, 2024 and obtained "B" Grade.
3. Participated in the Three Day International Workshop on Structural Equation Modeling (SEM) using SmartPLS organized by Dept. of Research & Publications, A2Z EduLearningHub on 21st, 22nd & 23rd April 2025.
4. Participated in the "Workshop on Research Review Article Writing with AI Support" organized by Department of Research & Publications, A2Z EduLearningHub on 15th July 2025.
5. Participated in "Three-Day International Workshop on Structural Equation Modeling (SEM) using SmartPLS " organized by Department of Research & Publications, A2Z EduLearningHub on 17<sup>th</sup>, 18<sup>th</sup> & 19<sup>th</sup> July 2025.
6. Participated in "Three-Day International Workshop on Structural Equation Modeling (SEM) using SmartPLS " organized by Department of Research & Publications, A2Z EduLearningHub on 22nd, 23rd & 24th September 2025.

## **QUESTTIONAIRE**

Dear Sir/Ma'am-

My Name is Kushal Pal Singh, currently pursuing my doctoral research program from Lovely Professional University, Phagwara, Punjab, India, conducting a survey on “Customer’s Adoption, Acceptance and Usage Of E-Pharmacy in National Capital Region, India”. Purpose of this study is to evaluate and analyze the antecedents leading to adoption, and in turn acceptance and usage of e-pharmacies from the e-pharmacy user’s perspective. The proposed theoretical research model for adoption, acceptance, and usage of e-pharmacy will be validated using survey research. In this research model, interplay of various factors will be employed to determine adoption, acceptance, and usage of e-pharmacies to order medicines. This questionnaire is part of a larger study that is being carried out for academic research purposes. I would like to invite you to take part in this research by filling out a questionnaire. I greatly appreciate your assistance, and I assure you that any information you provide will be treated confidentially and used solely for academic research purposes.

Regards!

Kushal Pal Singh,  
Research Scholar, Mittal School of Business,  
Lovely Professional University Punjab India,  
Mobile: +91-9650908507  
Email: [kushalpal2008@gmail.com](mailto:kushalpal2008@gmail.com)

Qualifying Statement:

1. Have you used E-Pharmacies in last one year to order medicines?

|                              |                             |
|------------------------------|-----------------------------|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No |
|------------------------------|-----------------------------|

### Section: A [Demographic Traits]

|                             |                                     |                                  |                                            |                                   |                                   |
|-----------------------------|-------------------------------------|----------------------------------|--------------------------------------------|-----------------------------------|-----------------------------------|
| 1. Name of the Respondent   |                                     |                                  |                                            |                                   |                                   |
| 2. Occupation               | <input type="checkbox"/> Govt       | <input type="checkbox"/> Private | <input type="checkbox"/> Professional      | <input type="checkbox"/> Business | <input type="checkbox"/> Others   |
| 3. Mode of buying medicines | <input type="checkbox"/> E-Pharmacy |                                  | <input type="checkbox"/> Offline from shop |                                   | <input type="checkbox"/> Both     |
| 4. Gender                   | <input type="checkbox"/> Male       |                                  | <input type="checkbox"/> Female            |                                   | <input type="checkbox"/> Other    |
| 5. Age                      | <input type="checkbox"/> Below 20   | <input type="checkbox"/> 21-30   | <input type="checkbox"/> 31-40             | <input type="checkbox"/> 41-50    | <input type="checkbox"/> 51-60    |
|                             |                                     |                                  |                                            |                                   | <input type="checkbox"/> Above 60 |

|                                            |                                                          |                                     |                                                              |                                         |
|--------------------------------------------|----------------------------------------------------------|-------------------------------------|--------------------------------------------------------------|-----------------------------------------|
| 6. Marital Status                          | <input type="checkbox"/> Un-married                      | <input type="checkbox"/> Married    | <input type="checkbox"/> Others (Widow, Divorcee, Separated) |                                         |
| 7. Education                               | <input type="checkbox"/> 12 <sup>th</sup> Blass or Below | <input type="checkbox"/> Graduate   | <input type="checkbox"/> Masters or higher                   |                                         |
| 8. Average Annual Income (Rs.)             |                                                          |                                     |                                                              |                                         |
| <input type="checkbox"/> Less than 3 Lakhs | <input type="checkbox"/> 3-5 Lakhs                       | <input type="checkbox"/> 6-10 Lakhs | <input type="checkbox"/> 11-20 Lakhs                         | <input type="checkbox"/> Above 20 Lakhs |
| 9. Place :                                 |                                                          |                                     |                                                              |                                         |

### Section: B [E-pharmacy Adoption, Acceptance and Usage]

Please indicate your level of agreement or disagreement with each of the following statements, where 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

### Section: B [Predictor Variables]

| Items                                                                      | 1                        | 2                        | 3                        | 4                        | 5                        |
|----------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <b><i>Effort Expectancy</i></b>                                            |                          |                          |                          |                          |                          |
| I believe purchasing medicine from E-pharmacy is easy for me.              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe learning to purchase medicine from E-pharmacy is easy for me.    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe operation of purchasing medicine from E-pharmacy is easy for me. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

|                                                                                                         |                          |                          |                          |                          |                          |
|---------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| I believe with less effort one can place orders through E-pharmacy for their required medicines.        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b><i>Performance Expectancy</i></b>                                                                    |                          |                          |                          |                          |                          |
| I believe purchasing medicine from E-pharmacies is useful for me.                                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe purchasing medicine from E-pharmacies increases my chances of meeting my health needs.        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe using E-pharmacies to order medicines, helps me in managing my health efficiently.            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe using E-pharmacies to order medicines helps me in managing my close one's health efficiently. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe purchasing medicines from E-Pharmacies is convenient for me.                                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b><i>Perceived Risk</i></b>                                                                            |                          |                          |                          |                          |                          |
| I believe purchasing medicine from E-pharmacies has risk.                                               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I'm afraid that purchasing medicines from E-pharmacies will reveal my identity.                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I'm afraid that medicines from E-pharmacies are counterfeit.                                            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I'm afraid that medicines from E-pharmacies are harmful to my health.                                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b><i>Perceived Trust</i></b>                                                                           |                          |                          |                          |                          |                          |
| I believe purchasing medicines from E-pharmacies is trustworthy.                                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe purchasing medicines from E-pharmacies is safe.                                               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe purchasing medicines from E-pharmacies is reliable.                                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe E-pharmacies keep promises.                                                                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe E-pharmacies have integrity.                                                                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b><i>Facilitating Conditions</i></b>                                                                   |                          |                          |                          |                          |                          |
| I believe I have the resources necessary to use E-pharmacies to order medicines.                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

|                                                                                                            |                          |                          |                          |                          |                          |
|------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| I believe I have the knowledge necessary to use E-pharmacies to order medicines.                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe E-pharmacies are compatible with other technologies I use.                                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe I can easily get help when I find difficulties while using E-pharmacies to order medicines.      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b><i>Hedonic Motivation</i></b>                                                                           |                          |                          |                          |                          |                          |
| I believe using E-pharmacies to order medicines is fun.                                                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe using E-pharmacies to order medicines is enjoyable.                                              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe using E-pharmacies to order medicines is entertaining.                                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe I am always at peace with using E-pharmacies to order medicines.                                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b><i>Health Literacy</i></b>                                                                              |                          |                          |                          |                          |                          |
| I have all the information to maintain good health whenever I purchase medicines online from E-pharmacies. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I'm aware about the recent, local and national, health related issues.                                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I have the ability to find information about health problems.                                              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe that I can read and understand all the information related to health and medicines.              |                          |                          |                          |                          |                          |
| <b><i>Price Value</i></b>                                                                                  |                          |                          |                          |                          |                          |
| I believe benefits of using E-pharmacies to order medicines outweigh the monetary cost of using it.        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe medicines are reasonably priced on E-pharmacies.                                                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe using E-pharmacies to order medicines online is a good value for the money.                      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe Using E-pharmacies to order medicines online can save money compared to offline shopping.        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b><i>Social Influence</i></b>                                                                             |                          |                          |                          |                          |                          |

|                                                                                                                         |                          |                          |                          |                          |                          |
|-------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| E-pharmacies are popular, that's why I am using it.                                                                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| People who are important to me, expect that I should use E-pharmacies to order medicines.                               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| People who influence my behavior encourages me to use E-pharmacies to order medicines.                                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| People whose opinion I value, suggested me to use E-pharmacies to order medicines.                                      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe people in my social circle, who use E-pharmacies to order medicines have higher status than those who do not. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b><i>Personal Innovativeness</i></b>                                                                                   |                          |                          |                          |                          |                          |
| I enjoy trying novel idea's like E-pharmacies to order medicines.                                                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| If I heard about new information technology, I would look for ways to experiment with it.                               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| In my Social circle, I am usually the first to try out new information technologies.                                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I am not hesitant to try out new information technologies.                                                              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b><i>Adoption</i></b>                                                                                                  |                          |                          |                          |                          |                          |
| I believe E-pharmacies satisfies all my needs pertaining to medicines.                                                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe using E-pharmacies, to order medicines, helps me to achieve my objective in health.                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe ordering medicines from E-Pharmacy don't have any risk for me.                                                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| If need arises, E-pharmacies will be my first choice to order medicines.                                                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b><i>Acceptance</i></b>                                                                                                |                          |                          |                          |                          |                          |
| I intend to continue to use E-pharmacies in near future.                                                                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

|                                                                                 |                          |                          |                          |                          |                          |
|---------------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| E-pharmacies are my first choice to order medicines compared to physical store. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I would like to recommend people to use E-pharmacies to order medicines.        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I am planning to increase the use of E-pharmacies to order medicines.           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b><i>Usage</i></b>                                                             |                          |                          |                          |                          |                          |
| I rarely order medicines from E-pharmacies.                                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I sometimes order medicines from E-pharmacies.                                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I often order medicines from E-pharmacies                                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I order medicines from E-pharmacies on regular basis.                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Thanks for your Valuable Time.

## ARTIFACTS

K

Kushal pal singh  
kushalpalsingh@gmail.com  
[to: kushal@lovely.ac.in](#) | [cc: Prasen \\*](#)

Dear Dr. Shwamy Mulum:

I hope you are doing well!

Mum, My name is Kushal research scholar under Dr. Parwan Kumarj I am writing in continuation of our in-person discussion regarding the vetting of my questionnaire, when i was at campus on 28th May.

Mulum Im sharing the latest version, attached herewith, for your input:

The attached workbook has the following link:  
1. Notes to be responded  
2. Objectives: Contain the objectives of my study  
3. Research Model: Contain the Research model of the study  
4. Model Constructruct: contain the model construct and relevance of their adoption  
5. For Validation: Need your input on the tab

Mulum, Im thankful to you in advance and looking forward to your feedback.

Thanks and Regards,

Section 1 of 6

CUSTOMER's ADOPTION, ACCEPTANCE AND USAGE OF E-PHARMACY IN NATIONAL CAPITAL REGION, INDIA

Dear Sir/Mam:-  
My Name is Kushal Pal Singh, currently pursuing my doctoral research program from Lovely Professional University, Phagwara India, conducting a survey on "CUSTOMER's ADOPTION, ACCEPTANCE AND USAGE OF E-PHARMACY IN NATIONAL CAPITAL REGION, INDIA ". Purpose of this study is to evaluate and analyze the antecedents leading to acceptance, and in turn adoption and usage of e-pharmacies from the pharmacy users perspective. The proposed theoretical research model for adoption, acceptance, and Usage of e-pharmacy will be validated using survey research. In this research model, interplay of various factors will be anticipated to determine adoption, acceptance, and Usage of e-pharmacies to order prescription medicines. This questionnaire is part of a larger study that is being carried out for academic research purposes. I would like to assure you that information you provide will be treated confidentially and used solely for academic research purposes.

Email \*

Valid email

This form is collecting emails. [Change settings](#)

Name \*

Short answer text

Contact Number

Contact Number

Short answer text

After section 1 Continue to next section

Section 2 of 6

Qualifying question

Information required to find eligibility to participate in the survey:

How have you used E-Pharmacies in last one year to order medicines?

☐ Yes

☐ No

☐ Add option or add "Other"

Multiple choice

Required

The image shows a laptop screen with a web browser open. The browser address bar shows 'app.gptmind.com'. The main content area displays a document titled 'T\_Introduction...' with a 'Not saving' indicator. The document text discusses the integration of digital health and AI, mentioning the 'Advanced scan' feature. A table of contents is visible on the right side of the document, listing pages 10 through 17. Below the document, there is a 'Basic scan' section with a 'human' icon and a 'AI Detector' section. The 'AI Detector' section shows a 'human' icon and a 'AI Detector' label. The document text is partially visible, showing the title 'Thesis For AI check...' and the abstract section. The abstract discusses the rapid expansion of digital health services and the role of AI in healthcare.



# NPTEL Online Certification

(Funded by the MoE, Govt. of India)



This certificate is awarded to

**KUSHAL PAL SINGH**

for successfully completing the course

**Health Research Fundamentals**

(NIIE-ICMR e-Certificate course: NiiCer 101)

with a score of **79** %

|                    |          |                |          |
|--------------------|----------|----------------|----------|
| Online Assignments | 19.88/25 | Proctored Exam | 59.25/75 |
|--------------------|----------|----------------|----------|

Total number of candidates certified in this course: **674**



**Dr. Manoj Murhekar**  
Scientist 'B' & Director  
ICMR National Institute of Epidemiology, Chennai



**Prof. Kalpana Bhargava**  
Secretary to Govt. of India, Dept. of Health Research  
& Director General, Indian Council of Medical Research



**Prof. Andrew Thompson**  
NPTEL, Coordinator  
IIT Madras



**ICMR NIE**  
NATIONAL INSTITUTE OF  
EPIDEMIOLOGY, CHENNAI

Jan-Mar 2022  
(8 week course)



**swayam**  
e-Open School

Roll No: NPTEL22H050549332107

To validate and check scores: <https://nii.nic.in/nc>

Summary

Question

Individual

Who has responded?

neha1995cs@gmail.com

alkaasingh1998@gmail.com (1)

pawan30k@gmail.com

dr.priyanshi12@gmail.com

meenakshi.sharma@mimt.org

shashibala@griotmba.net

drjaspreetkaur18@gmail.com