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Assignment Cover Sheet

Learner name(s): Rini Simon

Learner number(s): [redacted]

Assignment Type: **Individual: Yes** _____ **Group:** _____

Course: **MSc Digital Transformation (Life Science)** **Stage/year:** **Dissertation**

Module: **Dissertation**

Study Mode: Full time Yes _____ Part-time _____

Lecturer Name: **Ankit Chaturvedi**

Assignment Title: **Digital Transformation in the Pharmaceutical Sector: A Consumer-Centric Approach to Accessibility Affordability, and Transparency**

No. of pages: **66**

Uploaded to Moodle: Yes ✓ No _____

Additional Info:

Date due: **12-05-2025**

Date submitted: 11-05-2025

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Digital Transformation in the Pharmaceutical Sector: A Consumer-Centric Approach to Accessibility, Affordability, and Transparency

By Rini Simon

A dissertation submitted in partial fulfilment of the requirements for the award of

MSc in Digital Transformation (Life Science)

Innopharma Labs

Faculty of Science Griffith College, Dublin

May 2025

DECLARATION

I certify that the research study titled "Digital Transformation in the Pharmaceutical Sector: A Consumer-Centric Approach to Accessibility, Affordability, and Transparency" is my original work. The results presented as well as the analysis carried out are done to the best of the knowledge of the author and by ethical research practice. Every source and reference within the study has been acknowledged. The results and conclusions of the research are the sole property of the writer, and have not, in any form, been reproduced, published or submitted to any institution for academic or professional advancement.

ACKNOWLEDGMENTS

This is to certify that this research study, entitled " Digital Transformation in the Pharmaceutical Sector: A Consumer-Centric Approach to Accessibility, Affordability, and Transparency ", is my original work. All the results and the analysis thereof have been prepared to the best of the author's knowledge and ethical research practice. All references and sources in the present study have been acknowledged. Therefore, the author retains sole copyright in this research study, and it has not been reproduced, published, or submitted in whole or in part for academic or professional gain elsewhere.

ABSTRACT

This study explores how older adults use digital health technologies designed to improve medication affordability and accessibility, with a particular focus on multicultural and resource-poor settings. In a trial involving 86 persons aged 60 years and above+, important results were found related to determinants influencing the adoption and effective use of these tools. Older people expressed interest in using digital technologies to support their medication; however, uptake was conditioned by a range of interconnected factors. Digital literacy, clarity of information, and ease of navigation were widely cited as impacting confidence and comfort with digital usage. Language accessibility and cultural familiarity also shaped general satisfaction, with participants reacting positively to technologies that offered clear visuals, simple-to-follow instructions, and logical layouts. The survey was carried out in English, Irish, and Malayalam, so as to be inclusive across language groups and gain a broader understanding of the difficulties and likes within this heterogeneous sample. Hybrid models that blended digital technologies with face-to-face healthcare support—like pharmacist, caregiver, or community support—were particularly valued. Such frameworks provided reassurance, reduced confusion, and enabled ongoing interaction, particularly in those who had less confidence in the use of technology. The integration of human support appeared to increase trust and have a positive impact on medication adherence. The results point to the promise of digital health technologies in lowering medication access and affordability barriers, if designed with accessibility and inclusivity in mind. Incorporating features like intuitive interfaces, culturally tailored design elements, and multilingual capabilities can facilitate usability and promote wider uptake among older adults. To fully realise the potential of such tools, it is important to promote cooperation among healthcare providers, technology creators, and policy makers. Developing solutions that are not just functional but also attuned to the specific needs of ageing populations, particularly those residing in diverse and underserved populations, can facilitate greater equity in access to health services. Enablement programmes that focus on elevating digital literacy and promoting community outreach can also help augment uptake and ensure older adults are able to manage medications effectively in an ever-digitising world.

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List of Abbreviations

AI – Artificial Intelligence

EMR – Electronic Medical Record

E-Pharmacy – Electronic Pharmacy

GDPR – General Data Protection Regulation

HBM – Health Belief Model

IoT – Internet of Things

LEP – Limited English Proficiency

ProACT – Integrated Technology Systems for ProACTive Patient Centred Care

QR codes – Quick Response codes

TAM – Technology Acceptance Model

Tele-health – Telecommunication-based Health Services

Chapter1: Introduction

1.1: Purpose of the Study

The purpose of this research is to determine consumer attitude towards such technologies in order to determine how the technologies can contribute not only to having medicine in place when gaps arise. Specifically, the essay is about the possible advantages that applied technologies such as Quick Response code (QR codes) and Artificial Intelligence (AI), machine and deep learning apps for more personalised treatments can offer consumers by making medicine less expensive and available to everyone. The goal of this study is to provide recommendations on updating strategies or strategic goals and communication of healthcare systems and drug companies in a bid to better understand consumer needs and expectations.

1.2: Brief Overall Description of the Study's Context

The drug industry is at the moment undergoing a record-breaking process of transformation powered by factors like technological innovation and shifting focus towards customers. Renowned to be sluggish and bureaucratic, the pharma business is presently seeking to adapt to the increasing requests for transparency regarding costs as well as the affordability and availability of healthcare through customers. Technological innovation, including Artificial Intelligence, block chain, Internet of Things (IoT), and mobile apps, is transforming the modes of medicine development, delivery, and prescription holds the potential of a more enlightened implementation that is cost-effective and earns consumer confidence in medicine and food, while also addressing issues like fake drugs and unequal drug and healthcare access. As more and more technological advancements shape the way we do business within the pharmaceutical sector, and at the same time and further enhancing integrity, accessibility and affordability of healthcare, companies are already starting to implement the new technologies; artificial intelligence (AI), block chain, Internet of Things (IoT), mobile apps, in a bid to revolutionise the way drugs are manufactured, delivered, or the way patients interact with their doctors.

1.3: Significance and Justification for the Study

This study looks at consumer perception of digital solutions (e.g., QR codes, mobile apps) that are designed to eliminate some of the barriers to accessibility. That is, individuals Electronic Medical Record (EMR)are to benefit, can appropriately direct stakeholders. The objective of the research will be to examine whether and how these technologies can enhance the confidentiality of drug information, reduce costs by becoming more operationally efficient, and make access easier for under-served populations. Digital transformation came to be seen as a strategic necessity for the pharmaceuticals industry as companies are putting new technologies like artificial intelligence to use for drug discovery, blockchain for supply chain transparency, or the Internet of Things for real-time monitoring of the storage conditions for medicines, for example, and, for one reason or another, are facing challenges.

Challenges like remaining compliant within regulatory boundaries, an understanding of data privacy, the digital literacy of actors and consumers who may themselves lack technological ability. Consumers' expectations are themselves a world removed from what previously existed; nowadays when it is about patient expectation on patients regarding consumer's individual experience is parallel to expectations across retail and finance services for example. This positions the study at the nexus of technology uptake and consumer needs. It is an exciting time for drugs in the pharmaceutical industry as it reinvents itself in lieu of Industry 4.0 and Pharma 4.0 with digital technologies as part of an Industry 4.0 model with the intent to modernise the operation for optimisation of efficiencies for the performance of compliance, patient safety, and accessibility.

These technologies seek to modernise and enhance operation efficiency, compliance, patient safety, and accessibility. The definition of digital transformation encompasses the application of technologies such as AI, blockchain, IOT, mobile applications utilised across various functions in drug discovery, manufacturing, supply chain, and patient engagement

Yet, the pace of digital transformation in this industry is slower compared to other industries due to regulation issues, patents, and data appropriateness. The shift to service-oriented models, and 'beyond the pill' is indicative of the emphasis on defining differentiated patient-centered engagement, along with solving for prospective solutions across the entire engagement ecosystem. This includes wearables, telemedicine apps, and real-time analytics for the patient. As well as improving affordable access to medicines for lower-income markets. Consumer attitudes are changing at pace, with consumers enabled to satisfy their wants in terms of drug authenticity, price, human-to-human contact and easily accessible information.

No wonder, therefore, that research highlights large gaps between what Pharma is currently providing and consumer expectation in terms of insight, engagement, touchpoints to desire. There is also a sense of us versus them among patients questioning the motives of Pharma, that require the creation of suitable interventions that seek to address the problems of the time the industry is facing by coming up with new, simple, honest and timely consumer solutions.

Also, tech-based solutions such as the logistics supply chain based on QR codes enabled by blockchain and IoT technologies are recognised as potential solutions to fight counterfeit drugs, and timely distribute drugs in remote locations

This study positions itself in this paradigm bridging the accessibility gap, but maintaining the principles of transparency and affordability offered by digital technology. This study is intended to act as an industry watch dog to guarantee that the methods applied in service delivery are consumer oriented, utilising creativity to bridge the operational constraints that limit improved health care delivery to

everyone globally.

1.4: Research Objectives that Guide the Study

Accordingly, and in line with this strategy, the research study aims to accomplish the following aims that are concurrent with the increasing applicability of the pharmaceutical industry's digital revolution:

Objectives:

1. To assess the current level of consumer awareness and understanding of pharmaceutical practices, including medication safety, side effects, and pricing.
2. To identify and analyse the role of digital tools such as Artificial Intelligence (AI), blockchain, Internet of Things (IoT), and mobile apps in improving operational efficiency, reducing costs, and enhancing trust in pharmaceutical products.
3. To examine consumer perceptions and acceptance of digital solutions (e.g., apps, QR codes) for accessing detailed drug information and ensuring the authenticity and safety of medicines.
4. To investigate the potential of digital technologies in overcoming accessibility barriers, ensuring medicines reach remote populations effectively.
5. To propose a consumer-centric framework for the pharmaceutical industry to adopt digital innovations that enhance transparency, affordability, and accessibility.

1.5: An overview of the structure

1. The Introduction chapter provides the general background on the research area for the background and also to elucidate the intent, objectives, and significance of the topic.

2. The literature review chapter provides an opportunity to explore the other research studies dealing with digital health consumer behaviour and describe the challenges faced in accessing medicines. By extension, theoretical frameworks for the study are furnished, and placement of the current study is discussed.

3. The research methodology chapter chronicles the methodology of the research, detailing the research design and participants on one count, and the survey method to collect research data and the method of data analysis on the other count. Ethical issues will also be treated in this chapter.

4. The chapter on findings and analysis presents the survey results graphically and figuratively for participant responses toward digital tools and medicines accessibility, followed by an elucidation of the results through an analysis of the findings and comparison to previous studies. Furthermore, this chapter discusses the implications of the findings for further work or issues to be confronted.

5. Finally, the conclusion chapter reiterates the main inferences drawn from this study and comments on digital access to medicine or access to resources with highest barriers.

Hypothesis: The use of digital tool such as QR code and medication mobile apps is closely associated with consumer awareness on drug safety, side effects, and cost, thereby improving access and affordability in the pharmaceutical sector

1.6: Chapter Conclusion

This research study will act as a link between technology innovation and medicine outside the laboratory, situating its research within consumer attitudes and experiences. It will identify the ways in which people use and engage with digital resources and inform more inclusive, transparent and ultimately less expensive health care solutions. And hopefully, the findings will help pharmaceutical stakeholders, policy makers and technology builders know how to steer the digital revolution based on what patients will encounter and sign up for when they seek their own health care today.

Chapter 2: Literature Review

2.1: Challenges in Medication Understanding and Access Among Older Adults

The ageing population (60 years and older) faces a number of issues. The review of the literature is presented under four general headings: Health literacy and Medication Understanding, Access and Affordability, Digital health solutions, and Communication with Healthcare Providers.

2.2: Health literacy and Medication comprehension

Literature discussing literacy and medication knowledge is mainly focused on the health literacy of the elderly person regarding what he/she knows and learns about medications, which influence how safely and effectively such person uses medications. Articles indicate that elderly individuals have very limited knowledge of medical information, which is a problem for their overall medication literacy. For instance, an overview of the research result shows 11.65% of the elderly read the drug instructions appropriately and then understand the prescribed drug upon prior use using those instructions

The study on literacy and understanding medication mostly focuses on the health literacy of an ageing individual concerning what he/she knows and experiences with medicines, which affect how competently such individual uses medicines in a safe and efficacious way. Studies indicated that elderly people had a very poor understanding of medical information; therefore, it would be a challenge to their overall medication literacy. A survey by the study results shows that only 11.65% of older adults accurately read the drug instructions and then understood the medication when prescribed for prior use as directed (Mei *et al.*, 2024).

Recent study indicates that older patients' lack of understanding their medications impacts their adherence- means that patient knowledge is still inadequate on the medications prescribed. Bridging medication literacy gaps results in reduced risks of adverse effects, and this is where the digital health tool and the effective communication from health providers comes in (Ali *et al.*, 2023).

According to the Health Research Board (HRB), poor Health literacy among led to poor self-care capability development, and poor use of preventive health services; all adverse effects on medication adherence (Health Research Board (HRB), 2024).

Taking medication at a time deemed appropriate, in some older adults, has unique challenges. Their cognitive barriers and confusion compound with errors of taking and not taking prescribed medication, resulting in increasing risk. Bridging the cognitive and emotional gaps has great potential to enhance adherence by simplifying medication management while at the same time enhancing the knowledge of patient (Wilson *et al.*, 2007). Research indicates that some self-management programmes assist older individuals experiencing dementia or mild cognitive impairment to better implement directions to help themselves better secure their own medical safety with easy medical instructions in a person-centred method of support (Powell *et al.*, 2022). To handle compliance challenges from elderly diabetics the healthcare system must implement methods that adapt to their cognitive disability and physical illness

while developing patient-provider relationships for personalised therapy (Rahman *et al.*, 2020).

Polypharmacy is certainly an issue with the older population, and it comes as a result of an older adult suffering from a certain chronic illness and need continued medication to deal with that health condition. Mixing drugs increases the chances of wrong use and adverse drug events, as well as toxic interaction in the patient. To enhance comprehension, render drug instructions with plain language and schematic diagrams that help them to comprehend. Studies have revealed that personalised medication strategies and digital health solutions help improve adherence among geriatric patients with coexistent cognitive impairment and polypharmacy. An untangled medication routine and better communication links with health providers can help to erase many issues with taking medicines (Chesser *et al.*, 2016).

By considering older adults, who, experience pathologically occurring non adherence without intention sheds light on important under serviced patient-centred approaches and patient-provider communication (Hughes, 2004). Pharmacists support older adults through medication reviews to help them understand their medications and medication-related issues that make complex drug prescriptions more convenient to value, and ultimately limit the risk of adverse drug events and stress on health care providers which improves medication safety among older adults (Niu, Siyu *et al.*, 2024).

2.3: Access and Affordability

Studies have indicated that around 24% of older adults are having cost-associated barriers with prescription medications and 20% of this group are engaging in activities such as reduced dose or skipping medication (Musich *et al.*, 2015) (Sen, 2023). The combination of increasing healthcare expenses together with constrained insurance coverage worsens these challenges.

Increasing healthcare costs are infrequently covered, adding onto these problems. There arise logistical hitches with the discrepancy when medicine is ordered for different periods with varying quantities of packaging and this again has political barriers in the supply of medicines. Older disadvantaged populations often face long interruptions in their treatment regimens due to multiple challenges, such as difficulties in accessing resupply or complex insurance rules that are hard to understand, all of which can disrupt their treatment. In other words, improved access to those services hinges on such policy prescriptions that would reduce out-of-pocket costs and increase the subsidies for low-income seniors. The high health care costs with the financial risks that older adults encounter require an immediate addressal of any imposed health service and medication costs (Contreras, 2024). The increasing healthcare costs accompanied by financial risks among elderly dictate the need for putting into play intervention systems geared toward the affordability and accessibility of healthcare services, including the provision of medicines to the target population(Olson, A.W. *et al.*, 2022).

Community pharmacists occupy a unique spot to fill the gaps of health care delivery. The pharmacist also acts as a point of service user in drug monitoring and the provision of immunisations, caregiver training, medication therapy review, and point-of-care testing. Expansion of pharmacists' roles

ultimately leads to improved patient outcomes through viable health care services with effective communication to vulnerable older adults who are facing financial impediments and communication barriers (Bates, David *et al.*, 2023). The input from health workers makes a big contribution to med adherence of older adults when these workers take into consideration the education of their patients about the medications they take.

The procurement of medications gets impeded by divergences among different prescriptions written on different days in terms of packaging requirements. Access to medications for elderly vulnerable patients depends both on system-related failures with prescription replacements and the side effects of healthcare insurance operations. Improving health policies should focus on minimising direct out-of-pocket costs for elderly low-income citizens needing medical care.

2.4: Digital Health Solutions

Digital health technology holds the key to the enhancement of medication administration practices for the elderly. Wearable devices provide continuous health monitoring, enabling older adults to maintain independence and quickly address medical concerns(Chen *et al.*, 2023). Medi-packs and pill dispensers have integrated QR codes redirecting the users to video and audio information assisting people with reading issues and poor eyesight (Courtney, 2025).

Acceptance of digital health by older adults is fraught with barriers, as they possess poor proficiency in information and communication technologies. Technological advancements in wearables and applications are aiding in medication adherence through real-time reminders and monitoring, thus addressing memory-related challenges faced by patients(Madzarac, 2022). These tools have modernised healthcare delivery to older adults by means of automated scheduling of medication intake and online consultations with health practitioners, where patients can contact doctors easily for improved adherence for medical treatment (Perigon Health 360, 2023). Evidence suggests that while digital health tools have the potential to improve medication adherence, their uptake is hindered by more traditional barriers, as many older adults resist the adoption of new systems (Gillespie *et al.*, 2023).

Providing educational programmes for elderly persons will close that gap by offering these exclusive trainings that will guide people in acquiring technological development skills. Medical apps combined with telemedicine sites enable treatment compliance and access to health care through a system that brings health services to the elderly consumer on demand. Telehealth and remote monitoring integrate digital platforms for better health care access of elderly patients across all health care services. These technological solutions integrate technology into continuous monitoring and rapid health responses that reduce the barriers for the elderly with regard to health care access (Cammisuli, D.M. *et al.*, 2024)

Internet and mobile phones have become powerful means in developing the old adults with multimorbidity because they allow better communication and better connectivity among them. Such applications, when designed taking account these features for older adults, prove very effective for

managing complex medication needs with multimorbidity patients (Syed, 202AD) (Cajamarca, Gabriela *et al.*, 2023).

Really basic tools such as pill boxes, calendars and the like can assist amidst all the complexity involved in complex regimens to make it simple to manage.(Care, 2024). Text messages coupled with mobile health applications work quite well in making elderly patients with coronary heart disease more involved and individualised in their pharmaceutical regimens and health progress queries regarding treatments.(Park, Linda G. *et al.*, 2020)

Innovative technologies like ingestible sensors to motion-sensor based wearables have opened very new vistas in actually checking whether the drug is ingested and detecting movements while taking the medications thereby improving their adherence monitoring and support systems(Abbott, 2021).

2.5: Communication with Healthcare Providers

The healthcare provider must know how to effectively communicate with patients about the prescribed medications since failure to do so would give rise to a lot of hospital admissions and poor control of chronic conditions in such patients making the condition more serious.

Often, the elderly cannot recall their medications correctly and that is probably due to poor verbal education done to them by the health professionals before they started on the medication. In this way, effective mode of communication with the patients might build the adherence system of the patient toward medication-practices through patient-physician interaction and would definitely assist them in even building up trust toward greater effect in adherence to treatment. (Hong, 2019)**.** Even simple communication is very important for the development of medication adherence in older adults (Ozavci *et al.*, 2021)**.**

The better linguistic mediation and recognition of cross-cultural differences will go a long way in improving trust between patients and providers. Besides, recognition of cross-cultural differences becomes imperative to recognise the marginalised populations experiencing huge divergences in adherence. Community pharmacies see older adults individually assessing and refining medication schedules: "one community pharmacy possibly" (Maidment *et al.*, 2020)**.** Community pharmacies are a fundamental health resource that can bridge the patient-provider relationship and enhance Health literacy, address social determinants of health, and contribute to better population health outcomes.

2.6: Theoretical Frameworks

Health Belief Model (HBM)and Technology Acceptance Model (TAM) models are the best-known frameworks for the understanding of health behaviours in a context like adoption of digital health tools among aged individuals. They account for medication adherence, digital tool use, and the entire healthcare decision-making processes. They serve as a means of systematically analysing the underlying causes of the nonadherence to the medication regimens and barriers to the uptake of digital solutions in

these older adults, who may be experiencing limited Health literacy skills, language problems, and lack of familiarity with technology. These models allow better formulation of strategies by healthcare providers and researchers to further improve the understanding of what influences and leads to adherence behaviours, especially through the digital channel.

Health Belief Model (HBM) and its Application in Medication Adherence: The Health Belief Model (HBM) has long been a useful framework for understanding patient behaviour concerning health practices, particularly focusing on the factors that influence how individuals perceive health risks and make decisions about preventive or corrective health actions. The model suggests that an individual's health behaviour is influenced by six key factors. These factors interact to shape an individual's decision-making process regarding health-related behaviours, such as medication adherence.

Perceived Susceptibility and Severity: In medication adherence related to older adults, perceived susceptibility is defined as the extent to which the patient believes he can have a health issue like exacerbation of the chronic disease or complications due to medication errors. Older adults at high risk for conditions like cardiovascular disease or stroke are more likely to adhere to their medication regimens. Their perception of the severity of health consequences, such as hospitalisation from missing a dose, can lead to stricter adherence.

Perceived Benefits and Barriers: Perceived benefits of medication adherence include improved health outcomes like better chronic condition management and fewer hospital visits, which encourage older adults to follow prescribed regimens. However, perceived barriers such as cost, complexity, side effects, and language issues can discourage adherence.

Self-Efficacy: Self-efficacy, a key HBM component, refers the individual's belief in being able to carry out health behaviours. The confidence in being able to manage their medicines and medication regimens positively affects adherence, particularly because patient compliance is particularly important for chronic diseases (Azizi, Nemat *et al.*, 2018).

Technology Acceptance Model (TAM) and Digital Health Tool Adoption: The Technology Acceptance Model (TAM) is an effective model for describing how an individual perceives technology and how and when they will utilise a new technology with which they are familiar, including newer digital health technologies, such as mobile health apps, telemedicine websites, and medication reminder systems. It states that usefulness and ease of use of a new technology will be the two significant variables that will influence how an individual intends to use this technology. These two attributes will decide whether an individual will adopt this technology and whether they will be able to use it in their lives.

Perceived Ease of Use: Health applications on the internet should be easy to use for older individuals. There are numerous reasons why elderly individuals become ineffective when coping with digital devices, some of which include lack of experience with the technology, physical disability (vision or dexterity) and mental disability. Simple to learn, free to navigate, and versatile digital devices that adapt to the user's needs would be more acceptable.

Perceived Usefulness: The term refers to the belief that utilising a specific technology will make life easier or better health outcome-wise. Digital health technologies providing immense benefits to older adults, such as medication reminders, real-time health monitoring, or telehealth services, will be accepted. If older adults believe that a digital solution can help them take their medication more effectively, minimise unnecessary in-person visits, or perhaps even improve their well-being, then they will be more likely to see that technology as an integral and worthwhile component of their daily lives.

Modifications to TAM for Elderly Users: Since elders tend to fear privacy and the security of information, it is crucial that designers are open to data gathering procedures, notification procedures, and the storage procedures involved. Trust results from transparent terms of privacy as well as guarantees of security. Despite the fact that not all age-adjusted users are the same, the opportunity for additional training along with the ability to fix and contact customer support makes digital health tools more accessible to seniors (Orantes-Jiménez, Sandra-Dinora *et al.*, 2018).

2.7: Case Study Box: Care Link Pharmacy – A Scalable Hybrid Electronic Pharmacy(E-Pharmacy) Model

Care Link Pharmacy – A Scalable Hybrid E-Pharmacy Model provides representative means in terms of how hybrid models of e-pharmacy make effective solutions for the supply of medicines to elderly low-income multilingual speakers with physical obstacles to access appropriate medicines. This model provides assistive digital resources for dispensing medicines while applying human-centered support using community-based solutions. QR codes are put on prescription medicines that interactively engage with the user dynamically and are provided in multiple languages where pharmacists are authorised to provide live updates to users. Where patients have low literacy; medical support is rendered using dialectal audio (Hybrid Anchor, 2025).

The combined e-pharmacy entirely enables medicine at bulk rates and some community access points in the rural broadband wasteland provide patients with the opportunity to interact with pharmacists through SMS and IVR hotlines with multi-language ability - all without depending on a smartphone. In educating our peer educators about the MediConnect and health applications employed in telecommunications-based health care(tele-health), we employ simplified interface with icons for the ability to communicate and care for medications in an independent manner (Hassett, 2022)

This model allowed 70% of its aged population digital access and reduced administration errors of medication by 50% and afforded each patient $800 in savings per year for care visits and generic drugs.

The case study under consideration illustrates how hybrid market model hybrids with digital customisation meets the medication affordability and transparency needs of under-served ageing populations. The interconnectivity that is enabled by interoperable infrastructures that enable the central linking of telehealth portals with e-pharmacies facilitates realtime synchronisation of devices such as glucose monitors for minimising prescription fine-tuning when market demand is equal to organic supply (Daniels and Bonnechère, 2024). My Local Surgery website allows patients to renew a prescription, receive a virtual consultation, and see test results on a single online platform, making it easier for elderly patients to access the system(Darley, Andrew and Carroll, Áine, 2022). Health IT content suppliers need to link an electronic device to neighbourhood community service providers such as autonomous pharmacy buildings and centre's of older persons' services in an effort to limit internet participatory access barriers. Effectively expanding care attendance was to some extent ascribed to SMS subset population who require minimal usage of smartphone surroundings, in rural India.

2.8: Literature Gaps

While the literature robustly covers cost, comprehension, and ageing challenges, very few studies examine these factors in multicultural or multilingual communities. Furthermore, the intersection between affordability, digital trust, and real-world pharmacy access remains under-researched. Most studies focus on either digital innovation or patient behaviour in isolation. This study connects key areas by exploring how consumer-facing digital tools can improve transparency and access for older adults struggling with both language and affordability barriers.

Existing research on medication understanding and access among older adults has largely focused on isolated factors such as cost, Health literacy, or digital adoption. However, critical gaps persist in three interrelated areas:

i. Multicultural and Multilingual Contexts

While research highlights language barriers as a key issue for migrant populations, few study how these barriers intersect with age-specific issues such as cognitive decline or polypharmacy. Cultural beliefs around the use of medications (e.g., preference for traditional remedies) and distrust of Western health care systems are also under-investigated even though they are influential in adherence and access(Raza, Muhammad Ahmer *et al.*, 2023) .

A recent protocol for a realist review stresses the importance of understanding the complexities of medicine optimisation among older adults from ethnic minority communities and highlights the influence of cultural backgrounds, traditional beliefs, and systemic barriers on their health-seeking behaviours and medication management.(Hamed, Nesrein *et al.*, 2024)

ii. Affordability Digital Trust Nexus

The interplay between cost barriers and trust in technology remains somewhat disconnected in current research. Research documents low-income older adults refusing to take some doses due to cost, whereas

in the same breath, for e-pharmacies, distrust in technology, privacy concerns, or inaccessible pricing models (e.g., delivery fees) stands in the way of digital solution adoption by these same populations. Poor internet infrastructure and high delivery costs in Ghana impinged on the outreach of e-pharmacy projects to rural, low-income seniors(Khan, Shamshad and EabAggrey, Naessiamba, 2025). However, existing studies have not sufficiently examined how affordability influences digital engagement within these contexts.

iii. Integrated Solutions for Real World Access

Digital innovations (e.g., medication apps), on the one hand, and patient behaviour (e.g., adherence patterns), on the other, are largely viewed as independent entities in the literature. Very few studies delve into the subject of consumer-facing tools and how those tools can bridge gaps in transparency (e.g., clarifying medication instructions) and physical access (e.g., coordinating with community pharmacies).

Integrated digital health ecosystems make fragmented digital solutions overwhelming for older adults. An integrated ecosystem offering all relevant functions will enhance usability (Hill, Jordan *et al.*, 2023).

2.9: Cultural Sensitivity in Digital Health Design

Culture plays a significant role in people's lives, meaning that healthcare decisions go beyond mere language translation. Effective development must consider cultural norms and beliefs throughout the healthcare system. Example, current pulse oximeters often lack the ability to accurately process different skin tones, leading to health disparities among racial groups.

Digital tools, much like the case above through interaction of toxins with therapy notification systems, should be able to configure to local health beliefs regarding users. Product co-design methodologies are from which community elders contribute with their knowledge in terms of best possible adaptability to their values in the design phase. In Zambia, for instance, activities reinforcing misconception correction concerning caesarean section should be strengthened by dialogue with different community cohorts (Collinson, Jenny and Sinkala, Dr. Lengwe, 2025).

Most documents and illustrative elements contained in the instructions should avoid both ambiguous phrases and images that people misinterpret. Use of schematic figures instead of text-based instructions resulted in better medication comprehension among older adults with limited literacy in Ghanaian society. The healthcare must adopt a "glocal" strategy in building digital framework cores that provide modular components that allow some local ones to be changed according to preferences best such as this guideline for medication reminder applications:

The application symbolises:

a. traditional diets by local lifestyle icons which appear as icons in nutrition apps.
b. multilingual narration by community health worker for instruction delivery.

2.10: Research Justification

With an emphasis on multicultural communities-which increases Health literacy and trust disparities-the research also examines:

i. How digital interfaces (e.g., QR codes with multilingual directions) can help prevent misunderstanding of taking medications.
ii. How to make trust and access to affordable medications even greater by integrating e-pharmacy delivery with face-to-face meeting with a pharmacist.
iii. If there are structural inequalities (e.g., you do not have internet access in a particular location) that moderate the usefulness of those digital solutions in the low-resource environment.

2.11: Bridging Gaps in Medication Access for Multicultural Older Adults

The large areas of existing disparity surrounding how older adults within multicultural populations are taken into account, namely how consumer-facing digital tools could enhance medication transparency while also improving access to medications for those who face language or cost barriers. An assessment of the current body of evidence is presented below, with a focus on supporting this investigation and uncovering areas for further development.

i. Multilingual Digital Interfaces (e.g., QR Codes)

Improved QR Codes would be capable of operating with innovative ways of enhancing medication adheres in combination with patient safety for English language-constrained patients. QR Codes have been proven to achieve significant improvement in medication safety and enhanced self-dose performance of users of all ages over conventional labeling practices (Svensk, Johanna and McIntyre, Scott E., 2021).

Packages that include QR codes provide real-time video and audio information that is available to patients in multiple languages helping them enhance their understanding of complex medical instructions. QRxDigital's evidence-reducing real-time information presented in a patient's native language can help eliminate misinterpretation of medication for those with Limited English Proficiency (LEP) through an evidence-influenced, persuasive process. Such technologies are especially valuable in the management of older patients with several chronic conditions and a limited reading capacity since they provide personalised content directly adapted to their individual needs. QR Codes have the potential to provide systemic safety to emergency professionals as they enhance the capacity for accessing critical medicine information and tracing regulatory compliance.

ii. Hybrid E-Pharmacy Models

This is an opportunity where the optimal way to be in a position to pay for the services would be to build trust in partnership between human and digital assets. Smart dispensers on the Medesto platform connect with live time services of pharmacists to make it simpler to manage medications, which reduces

opportunities for errors. 'My Local Surgery' allows patients to have access to pharmacist services through its website which is then also brought to the patients' doors (Lydon, C., 2024).

This study outlined the promise of hybrid models that integrate excellent e-pharmacy solutions like prefilled medication pods, with traditional community based pharmacist interactions. We believe these are hybrid models that have not been investigated to date, and that offer a promising alternative to increase access to medications, establish trust, and possibly lower healthcare costs, particularly in multimodal and multilingual older adults.

iii. Patient Empowerment Through Self-Management Tools

Older people want to share ownership of their health with self-management support and information that is personal to their needs. The evidence suggests:

- Older individuals need support for self-management and education that is proportionate to their needs to manage their health. Evidence shows medication reminders and reminder applications reduced hospitalisation and enhanced medication compliance by, allowing older individuals to continue their compliance with their drug dosage, while checking for drug interactions (Byrne *et al.*, 2022).
- Evidence from online health application Integrated Technology Systems for ProACTive Patient Centred Care (ProACT) has shown, on average 73 years old older adults have mastered to use new technology to monitor their health records and communicate with their care providers with adequate training.
- Nurses or pharmacists provide educational programmes whose stated objectives were to improve older adults' Health literacy in order to allow them to better understand the health care decisions they make.

Researchers can boost literacy levels if video material is tied to QR codes but this must be done with some training support from a community pharmacist in the future.

iv. Behavioural Nudges in Digital Tools for Medication Adherence

Behavioural nudges can bring to digital health tools the user's mainstream and improve their ability to achieve better access to medications or, better yet, improve medication adherence. AI-powered nudging strategies, grounded in behavioural science, can personalise notifications and communication based on individual behaviours—particularly among older adults within diverse populations. AI chatbots are indeed proving very handy when patients have to be reminded by the system about taking their medications while using language options that keep members of different cultural backgrounds dedicated to their treatment requirements (Ho and Bull, n.d.).

This system provides customised reminder functions, modelled after the NUDGE Trial (Glasgow, R. E. *et al.*, 2021) using data-driven approaches. The demonstration of value for the system occurs through real-time adaptation of medication communication approaches based upon patient behavioural signals to enhance medication refills. The system utilises individualised motivators that handle both drug-taking

habits and linguistic needs and thus provides notifications in the user-selected format or language.

Traditional tools, such as SMS reminders and smart pill bottles with automated input, reduce the need for complex logins, making them accessible even in low-internet settings. The perspective should minimise the mental strain of users which in turn increases the simplicity with which meeting the adherence tools are used (Lukacs, 2024).

By integrating community health hubs, these solutions can further support medication adherence in multicultural communities, nudging behaviour toward better health outcomes.

v. Infrastructural Inequities

People residing in low-resource areas face the challenge of adopting technology and digital solutions owing to three reasons:

a. Less access to broadband internet causes restrictions regarding the use of telehealth services among rural adult citizens compared to their urban counterparts, thus limiting their use by 20%.

b. More than 30% of older adults suffer from the dependency problem with the smartphone since the only option for them to use the internet service is through the smartphone creating a hindrance for some app-based solutions(Graves, Janessa M. *et al.*, 2021).

c. Up to now, the studies have concentrated on urban areas and the wealthy, leaving out how infrastructure plays a role in the effectiveness of digital tools. This includes the use of methods such as SMS-based reminders and working with community centre's to mitigate challenges of internet connectivity affecting rural and low-income cross-cultural minority populations.

vi. Synthesis and Innovation

This study examines how QR codes and telehealth approaches connect through hybrid models for multicultural groups during ageing years even though previous research supports their single use. Key innovations include:

a. The study tested dynamically updated multilingual instructions through QR codes which adjusted their information based on test results and medication dose changes (Fine, Jason and MacDougall, Julie, 2022).

b. The research examines economical hybrid models through which patients obtain e-pharmacy price reductions while benefiting from governmental funding for in-person medical sessions.

c. This method uses maps to identify broadband desert areas along with other infrastructure obstacles in order to develop suitable digital solutions for low-resource communities.

d. The study seeks to develop an adaptable system that increases safety in medication use while minimising expense and generating trust in digital patients among older adults who are disadvantaged by limited access.

e. The approach unites digital innovation strategies with patient interaction analysis and systemic barrier solutions to build a comprehensive framework which reduces minority access to medication management in older groups.

f. Digital educators including both professional and volunteer versions offer systematic step-by-step instruction designed for older adults which enables them to master online skills despite transportation limitations and ageing technology equipment according to Gruben et al. (2025).

g. The research demonstrates the need for direct experience-based education that leads to enhanced digital confidence among senior citizens who want to actively participate in digital societies (Gruben, Melanie *et al.*, 2025)

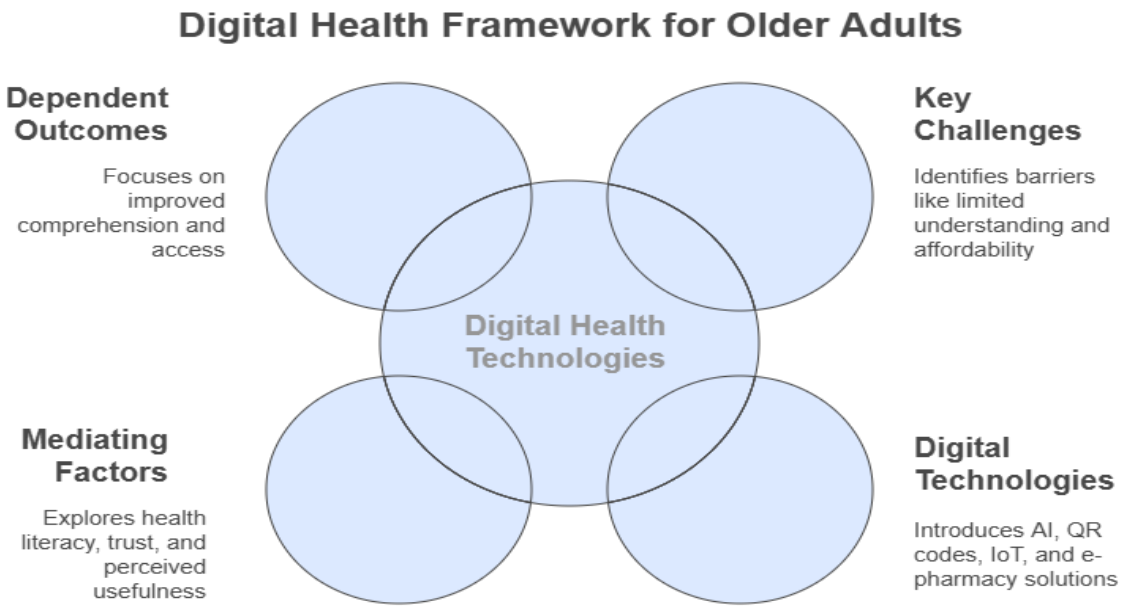
2.12: Chapter Conclusion

This research expands upon access challenges by demonstrating why digital inclusivity needs to be established for senior citizens.

The healthcare benefits of digital tools and services for older adults depend on stakeholders developing collaborative relationships between healthcare providers and technology developers and policymakers. The right collaboration among healthcare stakeholders will help resolve differences between medication availability and digital healthcare access as well as the needed transparency for informed medical choices(World Economic Forum, 2021).

Medication access and comprehension remain difficult for older adults who must handle problems including insufficient Health literacy as well as financial barriers alongside multiple medication use and cognitive deterioration together with weak doctor-patient interactions. Sufficient improvements demand specific healthcare practices that incorporate basic drug explanations and financial aid through policy changes as well as digital health technology designed for senior citizens while enhancing medical professional communication approaches. The improvement of health education and healthcare system redesign for elderly patients would produce better results in their health and quality of life.

2.13: Conceptual framework



(Source: Generated with the help of Napkin AI)

Chapter 3: Research Methodology

This section explains the methodology used to undergird the research done on the perception of and access to healthcare engagements and tools aimed at improving the access and affordability of medicines for older adults.

3.1: Justification for Chosen Methodology

In simple terms, this study takes a practical angle with some elements of positivism so as to have some empirical basis for analyses and thus have real-world implications to older adults accessing affordable and understandable medicines.

i. Philosophical Foundation: Pragmatism with Positivist Dimensions

Pragmatism serves as a philosophy, whereby it fills the gap between data and the applied innovative method in health, so that evidence-informed credible solutions can be born out. Taking a very pragmatic view of things, the study allows for the possibility of choosing approaches most relevant to our research question- measuring older adults' understanding, experience, and value of consumer-directed digital health products in accessing medications. However, embedded in our study are positivist notions that lean strongly on structured, measurable data so as to obtain an objective interpretation and to extend some external validity to their interpretation, simultaneously agreeing that a real world context exists. This leads back into the very foundation of pragmatism, which weighs informative knowledge and actionable outcomes as being more relevant than the theoretical.

ii. Quantitative Methodology Rationale

A survey of structured methodology is chosen to explore the pattern and usage of digital tools for medication adherence, guided by a few strategic and contextual factors:

•Generalisable Findings: Quantitative collection permits reporting patterns and relationships across a large representative sample of older adults in a demography.

•Objective Data: Standardised tool-based survey allows the researcher to systematically interrogate the key variables around barriers of affordability, usage of digital tools, particularly digital engagement tools, and level of Health literacy/knowledge.

•Empirical Rigor: The survey instrument is structured to contain positivist components, descriptive and inferential, producing statistically valid results that are usefully intended further up in the population pyramid.

iii. Alignment with Target Population and Research Context

The method is best suited to the target group—older persons, starting from 60 years of age, including under-served non-English speaking and multilinguistic groups.

Target group are more likely to have:

- Less digital Health literacy, and less exposed to digital technologies
- Being less digital health literate, and less exposed to digital technologies
- Language and cultural barriers regarding health topics
- Chronic cases needing complex medication schedules
- Variance in Health literacy skills and self-efficacy in technology.
- From several lingual, cultural, and socio-economic backgrounds
- Could answer the survey on their own with consent.

Through a systematic, accessible, and multilingual survey methodology, the study aims to inclusively support upscaled, cross-sectional data gathering about the usage of digital health tools and related medication challenges.

iv. Focus on Actionable Outcomes

In terms of pragmatic research values, the end goal of the methodology is the fostering of inclusive digital health solutions in terms of development and implementation. The implications will be expected to:

- Identify specific barriers to access and understanding of medicines
- Assess trustworthiness and usability drivers of uptake of digital health tools.
- Identify variances across and among languages, income bands, and online preparedness
- Enable design and policy recommendations for equitable digital health implementation.

3.2 Research Design

A quantitative research design was employed in the study using a structured survey questionnaire that was constructed to obtain data systematically from seniors aged 60 years and above+. Quantitative research was necessary because structured data had to be collected to be statistically analysed for major trends, relationships, and patterns. The key areas of investigation in the survey were medication affordability, digital access, Health literacy, and attitudes toward digital health tools. Being a structured questionnaire, the research was able to attain a reasonable degree of standardisation from the response, thereby generating valid, qualitative, and made generalisable results with much ease. The survey drew from a variety of question types, to ensure that the data so collected was diverse and in harmony with the main purpose and aim of the study.

Table 1: Summarising question types

Question Type	Format Name	Data Type
Age, usage, barriers	Multiple Choice (Single/Multiple)	Nominal
Confidence, trust	Likert Scale	Ordinal
Interest, availability	Dichotomous (Yes/No)	Binary
Key challenge	Forced Choice	Nominal

i. Multilingual and Culturally Responsive Design

The design of the research was made so that it was multilingual in order to accept the linguistics composition of the training population. The survey has been prepared in different languages: English, Malayalam and Irish-to allow participants non-native English-speakers to partake equally and fully in the study, thus eliminating barriers to the inclusiveness of the study. Language choices were dictated by the demographic baseline of the population to be surveyed, ensuring that the survey would capture participants who were on a continuum of English-language ability-from absolutely none to some level of competence.

Other accessibility considerations were taken into account:

• Large fonts were used for older adults who have visual impairment.

• The vocabulary was kept simple throughout the survey so questions could be understood and read by people with different levels of Health literacy.

• The visual design was created to ease navigation and readability by providing ample space between questions and basic intuitive features to reduce the cognitive load.

ii. Theoretical Frameworks

TAM and HBM stood at the forefront of survey design to keep the questions grounded in practical and theoretical bases toward study intention.

a. Health Belief Model (HBM):

The HBM shaped a series of questions that looked into the participants perceived barriers to medication access, such as costs, and perceived seriousness of medication problems. The model guided further questions on perceived benefits of reduction of those barriers through digital health tools, with constructs such as self-efficacy, and perceived susceptibility.

b. Technology Acceptance Model (TAM):

The TAM guided the development of questions related to older adults' perception of usefulness, ease of use, and trust of digital health technologies. This survey targeted by ironing out the extent to which older

adults would be willing to accept digital aids (e.g., e-pharmacy apps, medication reminders apps, and the like) and impediments thereto in those very areas.

The models point at some avenues to understand attitudinal and behavioural determinants of uptake and dispensing focused issues in digital health and intellectual pathways to glean some consequences from participants' responses.

iii. Ethical Considerations

The research design was made, keeping in mind the ethical considerations, and was, therefore, respectful of established guidelines applicable to research involving human subjects. These ethical foundations were implemented at every phase within the research endeavor:

• Voluntary Participation: Voluntary participation only, no reward offered to volunteers to participate, so that individuals did have an opportunity to make an unforced and free choice to participate in the study.

• Anonymity and Confidentiality: The survey ensured that there was no gathering of any personally identifiable information, and all the responses were stored securely to maintain participant confidentiality. Data were used exclusively for study purposes and were analysed in aggregated form to maintain anonymity.

• Linguistic and Cultural Respect: Effort was made to avoid both linguistic inappropriateness and cultural insensitivity of the survey, so that questions were framed in a way which was proper and respectful to multi-cultural communities.

iv. Inclusivity Principles

The research design was also inclusive in that all the participants, regardless of their level of digital literacy, language or health status, could meaningfully contribute to the study. Utilising multilingual support helped bridge the barriers to participation, and hence the sample reflected the multicultural and multilingual nature of the population.

v. Survey Delivery and Accessibility

Given the study's focus on digital health tools, it was seen appropriate to deliver this survey digitally through peer community mailing lists, social media networks, and neighbourhood health outreach opportunities. While the survey was delivered as a sole digital option, the access issue was kept in mind and the survey was made available in multiple languages (English, Malayalam, Irish) and preserved a simple easy design from the perspective of digital literacy of an older adult. This allowed for larger representation of individuals from a diverse background while preserving the consistency of data collected.

- Online Format: The online survey was disseminated through community e-mail lists, social

networks, and neighbourhood health outreach networks. The choice of this format was to engage those with internet access to the extent that they had the skills to engage in the digital context.
It came with a set of clear instructions and a Participant Information Leaflet (PIL) to rather briefly inform the participants about crucial information relating to the study, its purpose and the status of the participants.

3.3: Pilot Testing and Refinement

A pilot test was conducted on a small group of 10 participants who represented the target population of the study—older people 60 years and above+, including multicultural and multilingual backgrounds, prior to full deployment of the survey. The objective of this pilot phase was to pilot the comprehensibility, accessibility, and overall usability of the survey instrument, ensuring that it was both appropriate for the target group and capable of gathering data necessary for the study.

Feedback and Refinements

- The participants gave their feedback through casual discussions once the survey ended. The lack of official documentation for the input process did not impact the practical changes that resulted from participant feedback.
- The initial lengthy nature of the survey according to respondents created difficulties that made it challenging for older adults to understand and complete the survey. The logical structure of the questionnaire received modifications to create a simplified survey layout which could be finalised in 10–15 minutes.
- The survey included terms from medical jargon which researchers transformed into plain terminology to suit viewers ranging from health professionals to digital novices.
- The questions were rearranged to create clear logic from medication-related experiences toward digital tools.
- Bilingual subjects reviewed the Malayalam and Irish translations after which translators made small adjustments to improve comprehension while maintaining cultural sensitivity.
- Advanced visual accessibility features were implemented by increasing font size and making spacing adjustments to enhance readability especially for people with vision-related disabilities.
- The informed consent section was revised to enhance clarity, using more direct and accessible language to clearly communicate participant rights and the voluntary nature of participation.

3.4 Final Methodological Application

Following the pilot test phase and subsequent instrument revisions, the final survey was deployed systematically to collect information from a broader, demographically diverse sample of older adults. The general goal was to identify their actual-world experiences, attitudes, and challenges in terms of access to, affordability of, and utilisation of consumer-facing digital health technologies for medication,

specifically in multicultural and low-resource environments.

The cohort was designed to remain true to the very purpose of the study population of older adults who have been managing original, used tightly with medication regimen issues, especially those heightened by issues relating to language, digital exclusion, and unaffordable healthcare.

3.5 Survey Distribution Strategy

For ensuring maximal accessibility of the survey and to accommodate any digital barriers in older adults, a very specific online-only survey distribution methodology was adopted. The survey was hosted on a platform with accessibility features, larger fonts, responsive for mobile devices, and screen reader compatibility for an excellent user experience irrespective of different levels of digital literacy.

- Information was shared through community-based platforms like Facebook groups, WhatsApp groups, and local online forums that are frequently used by seniors and those who assist them.

3.6 Data Collection Procedure

We chose to collect all study data through online methods. This decision aligns with the growing trend of older adults, particularly those with chronic health conditions and on multiple medications, using digital communication. Relying solely on online data collection offered benefits such as convenience, privacy, and efficiency. The survey was carefully designed to be easy to use on a variety of devices, including smartphones, tablets, and computers. This ensured that participants, regardless of their level of tech expertise, could easily take part in the study.

Given the target group being elderly and carers, the URL for the survey was spread via multicultural networks and email groups specifically targeted to older adults. In order to assist in possible sharing of experiences regarding the outcome of this research, the networks engaged with were generally closer contact with likely potential respondents most to benefit from the research outcomes. The URL was also disseminated via social media in order to reach the older individuals and carers, who in total are more and more relying on the internet as a doorway to access data, connect with their peers, and share resources. An online only version was selected as the most effective collection method to conserve use of resources, and to speed up collection and data analysis. The online version assisted in meeting participants' expectations to answer in their own time, which is particularly applicable for older people who may be restricted by time considerations from caring responsibilities, medical appointments, and/or other daily activities.

Significantly, the web survey instrument supplemented the purpose of this study in learning how online platforms provide access and affordability of medicine since it illustrates what types of online solutions the elderly used to navigate health.

The survey was on offer for 6 weeks which was a considerable period of time to allow participants to log-in and finish the survey as and when they pleased. Over this period, the researchers regularly

checked responses and downloaded data at intervals to be analysed. No important problems relating to data integrity were encountered during collection.

3.7 Data Analysis

The method of data analysis used in this investigation was both descriptive, and inferential statistical techniques meant to summarise and identify trends from the responses. The ease of being able to analyse the data was intended to allow the data and findings to be understood and used by a broad audience, including technically-limited people such as policymakers, caregivers, and the respondents themselves. Upon completion of the data collection period, the participants. answers were downloaded from the survey's website to a spreadsheet for analysis and organisation. Depending on the question type, the analysis for all of the closed-ended questions included computing percentages based on the responses/answers to each question. Analysing the percentages was an easy way to understand how participants were distributed across the answers or options that were offered.

The steps taken during the process of analysis included:

• Visual depiction of percentages: Percentages were readily translated into pie charts, bar graphs, and tables that could be easily understood. The visual forms facilitated convenient comparison between themes and groups. Pie charts facilitated the depiction of the number of respondents who encountered issues with affordability, while bar graphs could be used to depict comparisons of rates of use of digital tools for different aged groups.

The descriptive analytical approach was chosen, since it is simple to apply and most suitable for the study purpose. Moreover, it allowed for easy communication of the results to different different groups of stakeholders - even non-academic stakeholders, such as all caregiver categories, health professionals, older people, etc. Having the capability to present the data in clear and easy-to-read form, especially as regards visual representations (i.e. pie charts, and tables) was essential to being able to disseminate the findings and be useful.

Chapter 4: Findings and Analysis-Consumer Challenges in Medication Understanding and Access

These findings will be presented in the context of concerns faced by adults aged 60 and above+ in relation to medicines, considering these issues and their connections to established literature. These findings will be set out under the four survey segments:

4.1:Section 1: Consumer Awareness & Understanding

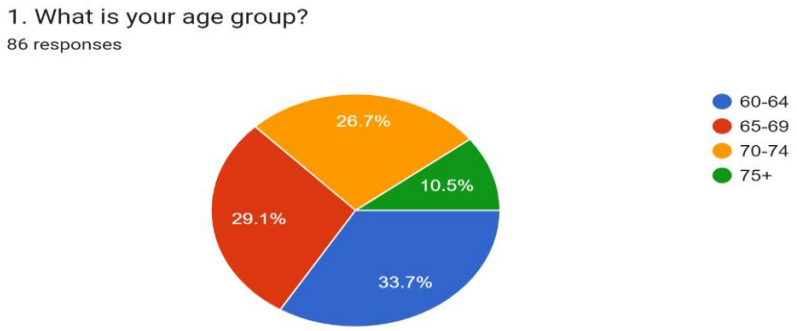
The demographic data reveals a balanced distribution across age groups

60-64: 33.7%,

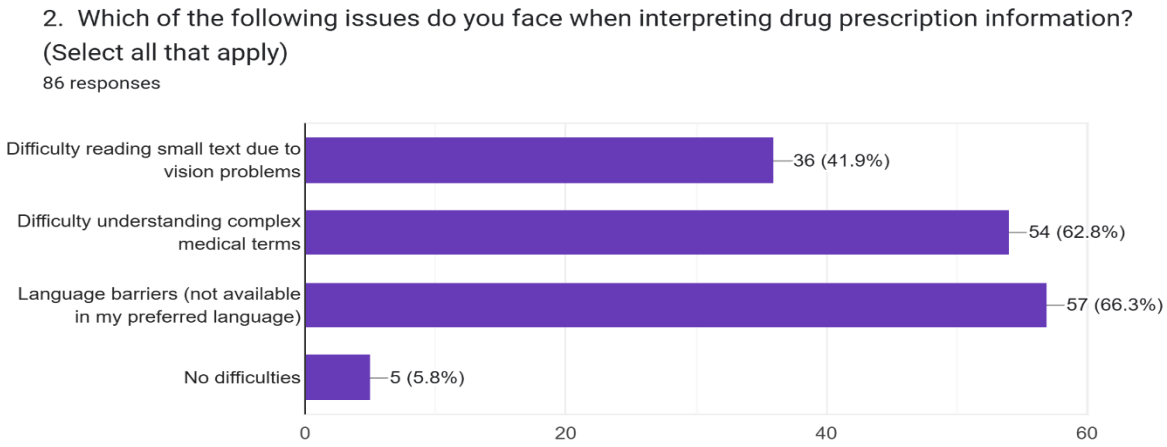
65-69: 29.1%

70-74: 26.7%,

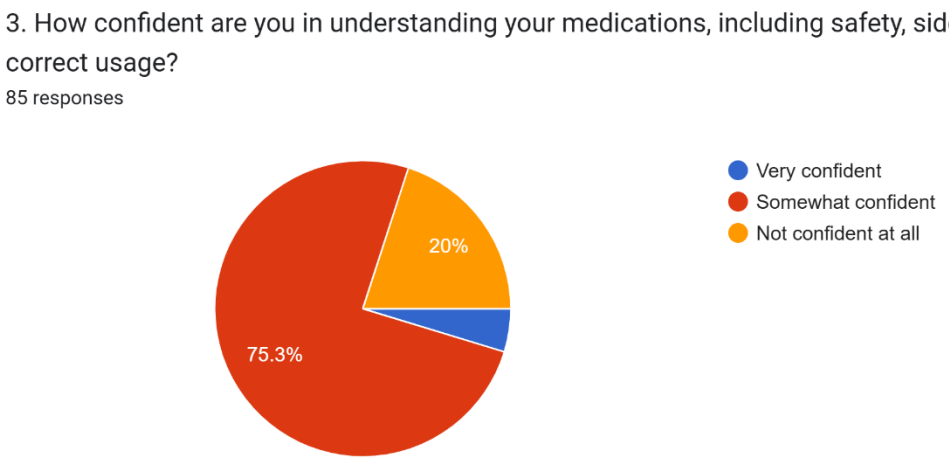
75+: 10.5%



66.3% said language was the primary difficulty, medical jargon 62.8%, and physical impediments/vision 41.9%. Only 5.8% of respondents said that they had no trouble understanding their prescription instructions-putting these findings on par with those of Wolf et al. (2012) for medication instructions, Health literacy issues, and older adults.



However, a split occurs when questioning how confident older adults felt about understanding their medicine, with 75.3% reporting being "somewhat confident" and 4.7% saying they were "very confident." In contrast, this would seem contradictory to the responses from the previous section, which then leads to using the term "unwarranted confidence" in the sense that patients are over-confident regarding their knowledge of medication instructions(O'Donovan *et al.*, 2025). About the 20% expressing "not confident at all," they are the ones who are at higher risk and will require support by implementing the network of help.



A significant 94.2% of the interviewed elderly respondents admitted having difficulties comprehending medication prescriptions, showing that limits in medicinal understanding are still very much applicable to this group. Majority of patients that indicated limits to their disclosures described the experience as limiting due to language, reported by 66.3% of the participants. Lack of congruence between the language in which instructions are given to patients by health-care providers and that preferred by patients directly impacts on the patients' ability to implement such prescriptions or warnings concerning their safety. Patients not able to comprehend medical information in a medical language stand at the high risk of misuse, being misled by their prescriptions, or even refusing prescriptions out of fear or misunderstanding.

Many prescription labels, as well as their associated informational sheets are laden with professional medical terminology in fairly routine use by healthcare professionals that are, although well understood by professionals, abstract to routine patient comprehension. Some instructions that use medical language, such as adversities and take on an empty stomach, with better Health literacy would still not be clear to patients unless fully explained in plain language. It is a reality that numerous medical terms are not understood by patients and even if just a few patients choose to stay away from them, such action translates into a huge treatment adherence gap with negative healthcare differences.

The participants' vision-related challenges included difficulties with language and terminology, and impacted 41.9% of the sample. Vision decline is widespread among older adults since using vision

usually entails both the decline of vision clarity and complicating conditions like macular degeneration and glaucoma, as well as reduced contrast detection. The use of vision and the structural limitations posed by the decline establish barriers to reading both prescription bottles and blister packs, and paper instructions regardless of the size or presentation format of text. The mediating role of vision decline for older adults makes reading medication instructions futile, essentially due to impacted vision. Corroboration of the role of poor or limited vision occurs when there is poor overall lighting, or the use of confusing labeling deeply punctuated with abbreviations that are overly succinct and brief. Older adults with poor or limited vision rely on memory and guesswork, or help from others, which can put them at greater risk for medication error when following instructions related to medication use.

The study findings are supportive of earlier medical research that found the same observations and validated there are numerous barriers experienced by older patients in understanding medication direction. Individuals with a visual impairment, in addition to literacy and cognitive challenges, demonstrated little understanding of reformatted or simplified formats to medication labels. No different problems can be examined in isolation, since low vision creates literacy issues and unclear communications compound the effects of these problems. Nonadherence to medication and error have more to do with a system failure in communication than with patient intent to not comply and not being fully aware of treatment recommendations.

The research presents conflicting data and provides insight on how well older adults comprehend their medication compared to their knowledge of their level of comprehension. A high percentage of participants had 94.2% medication interpretation difficulties however 80.9% had self-reported a moderate to high confidence level regarding their comprehension. Upon first review it appears to be a sunny disposition and with a little bit of work the situation should turn rosy. However, medication comprehension problems have a higher rate than self-reported confidence reports. The data indicates many people remain blind to the specific areas in their medication knowledge that require improvement. Twenty percent of the participants disclosed complete confidence deficiency with medication comprehension with the older adult population indicating a sizeable at-risk group.

The gap between confidence and comprehension illustrates what is labelled “unwarranted confidence,” Their data sets showed that older adults along with other patients place an excessive degree of belief for themselves in their ability to properly read and comply with medication instructions. The patients show identifiable comprehension because they identify familiarity with the medications and certain terminology but their understanding is only partly or wrongly formed. The perceived ability to understand creates an unrealistic sense of safety because patients do not seek clarification or pursue help from medical sources. The wrong perception of understanding everything causes them not to read leaflets, ask questions or use pharmacist consultations.

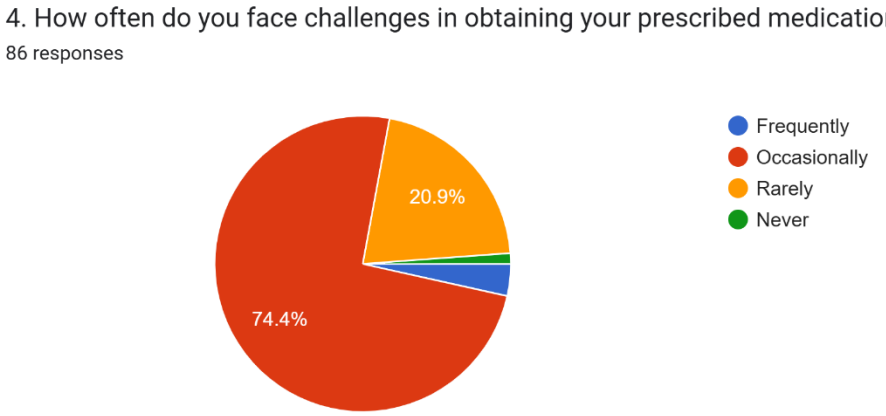
The misplaced confidence in patients prevents proper dose verification and results in the inability to recognise drug contraindications when taking more than one medication as seen with elderly patients

often. Patients exhibiting over-confidence make more medication errors than active doubt since patients exhibiting doubt will seek help when in need.

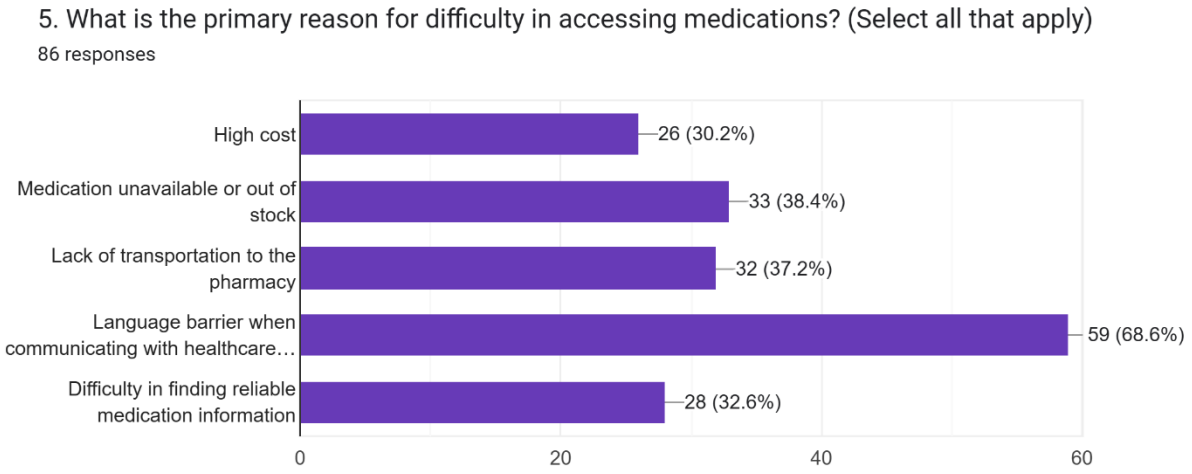
The patients exhibiting no confidence were the highest risk takers. This group included those with compromised reading skills and vision problems, dementia and disruptions to their support networks. They were at an even higher risk because problems with accessing information are compounded with dysfunctional systems in relation to those at risk unintentionally being victims to serious medication events. People suffering from low confidence as regards their medications differ from individuals suffering from overconfidence because the former feel so incapacitated by their anxiety or confusion that they simply do not take the medication, which causes risk to health. Accepting their incapacity may provide an opportunity for intervention approaches, as this population of patients may more readily accept assistance in order to better understand medications.

The findings show that older adults routinely experience complicated issues with medication understanding that are not adequately acknowledged by both healthcare systems and patients. The issues need serious reflection to develop user-friendly solutions that incorporate considerations of language, vision processing, thinking ability, and the connection of perceived confidence with a lack of understanding.

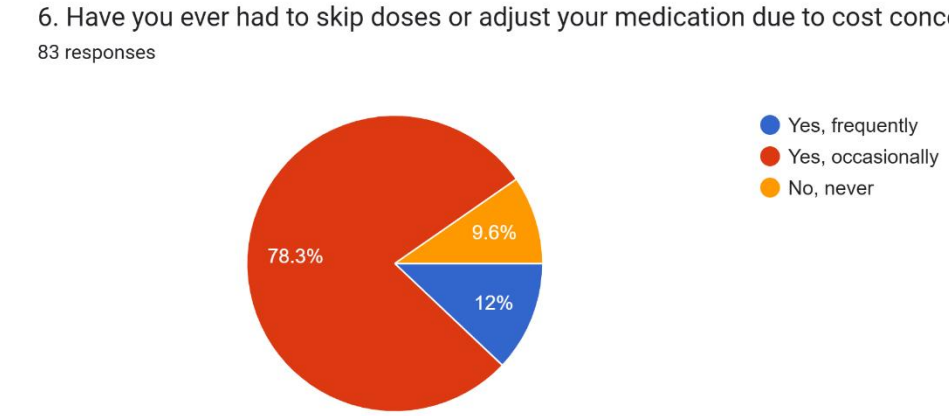
4.2: Section 2: Access & Affordability of Medications



Medication unavailability (38.4%), transportation issues (37.2%), and high cost (30.2%) were also significant barriers. 95.3% of respondents reported access issues (74.4% occasionally, 20.9% rarely, 3.5% frequently, and 1.2% never), with the most common issue being healthcare communication (68.6% reported language barrier) and the second most cited access issue was medication availability (38.4%). Next, 37.2% reported transportation issues and 30.2% reported unaffordable cost.



The affordability crisis of medications is disheartening. Most current and past participants (78.3%) reported that they changed their medication regimen at the request of a healthcare professional because of cost reasons (12% frequently and 9.6% never had concern about cost).



This corroborative finding supports studiesregarding medication non-adherence due to financial restrictions, specifically for older adult patients(Avila *et al.*, 2021). The high percentage of those affected suggests that it is not isolated issue but systemic in nature affecting medication adherence in this population.

The data clearly shows that medication access and affordability barriers for older adults are rooted in different interplayed personal, social, infrastructural, and systemic factors; these barriers cannot be reduced to a "personal" experience alone and need to be contextualised by wider socioeconomic circumstances, inefficiencies of the healthcare system, and age-related contingencies. However, these statistics not only mention the frequency and prevalence of barriers, what these barriers represent is the actual lived experience of ageing individuals and provides a sense of urgency for action. The high

proportion of language barriers at 68.6% displays elementary failures around cultural care investment within the health system. The system limits immigrant elders because they are working within a system that doesn't effectively supply their multicultural and low-literacy needs, nor is it able to sufficiently anticipate their requirements. Pharmacists also do not know how to provide medical direction for individuals who speak languages other than English, resulting in negotiation of avoidable medical errors, or simply do not use the system correctly, and finally, deter older patients from entering into official healthcare systems. Their situation is exacerbated if medical personnel do not have proper access to trustworthy interpretation services or training, and also considering identification and understanding of conflict between cultural and linguistic difference. Healthcare providers should give primary attention to both translation services and the understanding of patients as well as the respectful nature of their practice.

The frail reliance of the elderly on external auxiliary systems is manifested in the two principal obstacles to be medication unavailability (38.4%) and transportation hardships (37.2%).

The absence of prescribed medication along with payment barriers for generics at the pharmacy triggers immediate healthcare deterioration especially for patients who handle long-term diseases such as hypertension diabetes or COPD. In the meantime, limited geographic coverage, inaccessible vehicle designs, and irregular service schedules make it difficult to rely on public or paratransit choices to get care, particularly in suburban and rural locations. The journey to a pharmacy brings challenges for those who have cognitive or physical disabilities because they need help from care staff and family members as well as social workers to navigate short distances. Daily practical difficulties in healthcare access remain hidden from policy decision-makers though they represent crucial barriers to actual patient care.

The analysis of affordability issues requires an examination of choice-making processes among individuals who face economic hardship in addition to drug price and insurance coverage factors. The observed rate of 78.3% shows how older adults modify their medications because of cost by purposefully skipping doses or delaying refills or cutting pills in half. Naturally, reducing costs leads to inadequate medication oversight, exacerbation of illnesses, hospital stays, and potentially fatalities. Workaround strategies develop a permanent place in behaviour due to their long-term acceptance because cost-constrained seniors tend to minimise the risks of these methods relative to their crucial financial expenses such as rent, food or utility payments.

Vulnerable sub-populations that live independently or come from low-income backgrounds or have several health conditions must decide between essential health needs and basic payment obligations. People in such situations must select essential prescription medications over nutritious food. People with or without insurance coverage and those enrolled in high-deductible plans experience significant financial strain when facing prescription costs that Medicare might not fully reimburse. Due to inflation and drug price increases prescription coverage extends less than the amount patients can afford to buy their medication.

A major problem within clinical practice exists in the inadequate communication between patients and healthcare providers. The significant financial impact on patients gets insufficient attention during visits with healthcare professionals. Older patients feel uncomfortable talking about financial problems to healthcare providers mainly because they do not want to show embarrassment or exhibit traditional patient behaviours or because they presume their doctors lack real financial alternatives. When clinical staff operate under time restrictions, they miss key chances to start financial discussions which prevents them from customising medical plans to benefit patients financially.

Polypharmacy occurs when seniors take many medications which raises both the chance of confusion and errors among this patient group. Medication management becomes difficult for seniors when their prescription load is high especially during combined conditions of cognition decline physical disabilities or inadequate caregiver assistance. The expense of medication management becomes increasingly difficult to afford when several different prescription drugs result in individual payment costs and when synchronisation between different pharmacies is required.

The subsequent resolution requires an integrated method which incorporates equity-based strategies. Policy-makers should enhance healthcare affordability by dealing with specific elderly population needs through additional low-cost translation assistance and better health infrastructure planning and pharmacy convenience services targeted toward older citizens and standardisation of prescription systems. Medical staff should use electronic health records to conduct regular affordability reviews to find underprivileged patients more efficiently early on.

Healthcare providers need both support systems to conduct unbiased conversations on cost barriers in addition to comprehensive training about delivering compassionate care. The service delivery role of pharmacists and community health workers and local organisations extends across digital literacy and institutional trust gaps that mainly affect senior citizen populations.

Ultimately, the interplay between access and affordability reveals the systemic nature of medication non-adherence in older adults. It is not simply a matter of poor patient behaviour, but a reflection of mismatched systems, policy oversights, and insufficient attention to the lived complexities of ageing. Without deliberate redesign of services and proactive support models, these barriers will continue to undermine the health, autonomy, and quality of life of older adults across communities.

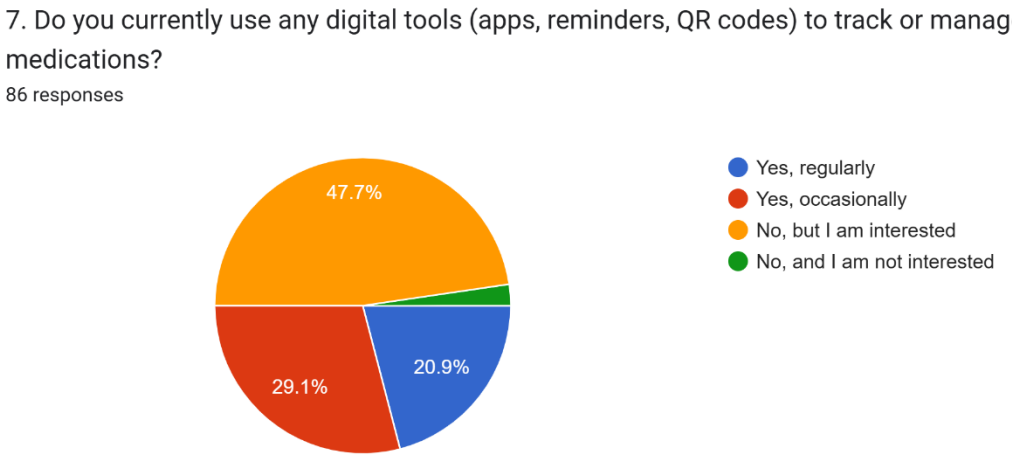
Table 2: Main Barriers to Medication Access & Affordability

Barrier	%Reporting	Description/Impact
Language barriers	68.6%	Limits communication that can cause mismanagement and poorer outcomes
Medication unavailability	38.4%	Stockouts/supply chain/formulary issues
Transportation issues	37.2%	Limiting their access to pharmacies/appointments. Significant for individuals with disability.
High cost	30.2%	Directly leads to missing doses, rationing, and poor disease control.

-

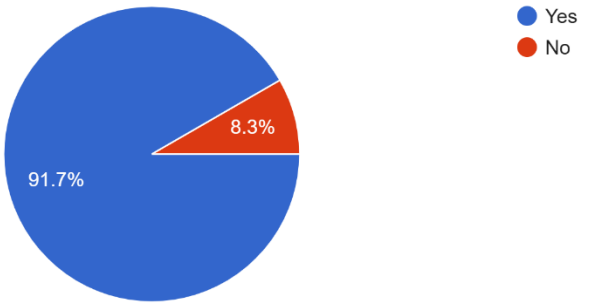
4.3: Section 3: Digital Solutions & Perceptions

Current digital tool utilisation displays a reasonable situation of adoption, where 20.9% use digital tools regularly and 29.1% used digital tools occasionally. However, 47.7% of older adults are prepared to use digital tools that provide multilingual support or larger text provided this alters their potential for technology-based interventions.



8. Would you use a digital tool (app, QR code, or website) that provides medication instructions in different languages or larger fonts for better readability?

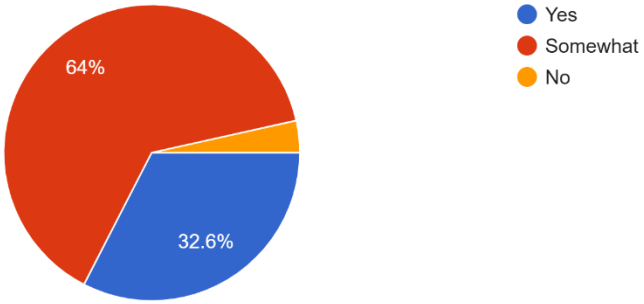
84 responses



Trust in digital verification services (apps/QR codes) demonstrated mixed levels: 32.6% trusted; 64 were somewhat trusting; and 3.4% completely distrusted.

9. Would you trust a mobile app or QR code that verifies if a medication is authentic and provides detailed information on dosage, side effects, and interactions?

86 responses



Older adults exhibit conditional patience toward digital health by utilising the increasing digital health services, although these adaptations stay mediated within the accessibility and usability of the services and trust of the technology and associated products when engaged consider older adult behaviours. When analysing older adult behaviours, we note that 20.9% use digital medication delivery devises including reminder apps and smart pill dispensers regularly and 29.1% are frequent users. Measured attention to the taking up of digital tools shows us elderly compulsions to test them rather than dismiss them outright. They commit when trialing but only at that time do they decide. They want to evaluate not only the access but also the challenges of trust and use.

It is also evident in the findings and descriptive statistics from many adult patients served in their Ages

65 and over that they would except digital health tools more readily if they included features for multilingual support and options for larger text with survey statistics. The results indicate that older adults reaction positively to technologies that demonstrate accommodation for their physical abilities and support of their communication needs. The success of digital health adoption in this age group is a function of design deliverables more than pure technology capabilities, including increasing levels of design expectations such as simple navigation and alerts, adjustable options, wearable compatibility, and color depth in displays.

Several types of digital tools fulfill separate functions. Reminder apps are designed to allow people to manage multiple medication regimens through automated notifications and to provide access to caregivers. Smart pill dispensers are capable of administering controlled distribution of medication, tracking delivery, and being managed from a remote location. Telehealth allows patients to continue care relationships, through remote video consultation and secure messaging which helps lower the barriers to access when patients attempt to contact their physicians. Wearable devices and online health dashboards serve to monitor physiological data in a streamlined manner that helps with longer-term management through the ability to track health information, recognise early warning signs and enables a secure connection between patients and caregivers and medical professionals. Ultimately, the healthcare system, through each of these tools and platforms are evolving a continuous healthcare model to enable seniors to manage their health issues independently and outside of a clinical setting.

The landscape of digital health engagement among older adults presents an image of a conditional willingness to adopt technology—where uptake is increasing, but depends on accessibility, usability, and trust. When it comes to digital medication tools (reminder apps, smart pill dispensers, telehealth platforms, and digital health dashboards), 20.9% of older adult respondents reported that they use them regularly and another 29.1% reported using them occasionally. This modest uptake does not indicate a rejection of digital tools on the part of older adults, but rather a tentative phase of using digital health tools where older users weigh convenience against barriers including unfamiliarity of using digital health, usability, and privacy issues.

Furthermore, it is enlightening to see that 47.7% of respondents reported that they would be more likely to use a digital health tool if it had features such as multilingual support and large text. This provides further support that older adults do not have an innate resistance to technology, but rather will respond positively if digital health tools reflect their sensory, linguistic, and cognitive realities. User interface elements described such as high contrast displays, simplified navigation, customisable alerts, and hardware compatibility to wearables closely correlate with what older adults seem to expect in the digital health technologies, demonstrating that the uptake of digital health technology in this population is correlated to thoughtful design and matched expectations—not necessarily the technology.

Each category of digital tool has distinct purposes. Reminder apps are utilised to manage complex medication routines with alerts and caregiver integration. Smart pill dispensers typically already include

automatic dosing along with remote monitoring capabilities. Telehealth platforms not only maintain continuity in care with virtual visits and secure messaging options, reducing logistical needs to access providers they also support long-term health management by bringing together biometric information while flagging potential issues early in the process thus allowing for existing communication between patients, caregivers and clinicians. All of these tools combined can be seen as evidence of a shift from episodic care to continuous care models, where older adults can be active participants in their own health management outside of traditional clinical environments.

Despite these capabilities, technology-based and digital verification systems are perceived, at best, and mixed, at worst. This suggests that first impression of contactless systems with app-authentication and QR-codes are mixed with research showing that participants have shown mixed feelings with 32.6% showing full trust, 64% partially trusting them, and only 3.4% showing no acceptance whatsoever. As patient and healthcare technology trust is still ambiguous, the mere function is not useful for establishing trust relationships - intentional trust development requires transparency in addition to predictable operation and ethical data governance. Individuals with limited digital literacy, or have experienced adverse digital occurrences, require specific details about how health data will be processed and the details of any protections against errors in accessing it. Basic components of trust are user interfaces that use understandable visuals and these also include recognisably plain language design which aids in maintaining consistency across the system.

Involving health care providers strategically offers additional opportunities to foster trust among users of healthcare technologies. Older adults' acknowledgment of new health technologies are influenced positively by endorsements from health care providers. For instance, patient acceptance of digital solutions improves when their trusted health care provider recommends the solution and articulates its purpose regarding their treatment processes. Healthcare professionals must take an active role in onboarding patients to the digital solution and help troubleshoot the tool because they can help customise the digital solution to reflect the individual patient's medication schedule, especially for patients using multiple medicines. Language diversity and limited Health literacy is one of the major challenges for digital solutions to be adopted. Older adults who are non-English speakers from diverse multicultural backgrounds face much more significant difficulties connecting with technological platforms, unless the platform includes language access and culturally relevant content.The direct translation of user interfaces does not effectively present complex health information, as the systems offering such support lack adaptive visual assistance and user friendly access procedures resulting in inaccessible interfaces. Human health strategies require design overlays which highlight the challenges of visual deficits faced by older adults associated with ageing and hearing loss and cognitive impairments through components of large text sized items, and audio formats with screen reader accessibility and simple icons.

Healthcare developers and systems operators advocate user-centered participatory design methods to involve older adults in the design process of the tools and to foreground the testing and optimisation

steps during these processes. Meaningful choices in design will be circumvented based on theorized assumptions, because they are being tested, documented and verified based on the users' actual behaviours and preferences. Digital tools must coordinate with existing service systems. The tools must facilitate links between the systems used by the health care provider and the community supports and public health resources to configure a complete care support system that integrates both digital and physical spaces.

There also needs to be ongoing engagement. Technical support programmes linking caregivers with older adults to facilitate knowledge and practice of digital technology; community digital education courses and digital technology support centres will allow older adults to nurture their digital competence over time.The timeframe for older adults to adapt to a digital solution is longer compared to younger age groups due to the need for hands-on support because of limitations in cognitive and physical conditions. User-centric digital health systems with ongoing feedback platforms that provide users with knowledge of the adaptation in the system update are effective at meeting changing needs of these populations.

The success of digital medication management solutions for older adults are dependent on many elements beyond the technological functionality because evidence suggests that digital medication management systems have the potential to improve the self-care and care coordination activity level. It is important to understand that the implementation of digital health services and continuous use by all users, requires simple access and adjusting to all cultural contexts while creating transparent platforms based on trust and involving health care providers into the developing solutions. For digital health solutions to support older adults' healthcare management, it needs to address the interrelated clinical and sociological factors that undermine safety and independent self-efficacy.

Table 3: Digital Tool Adoption and Perceptions

Aspect	**Key Findings**
Regular Use	20.9%
Occasional Use	29.1%
Willingness with Accessibility	47.7% (if format supports large fonts/multilingual options)
Trust in Digital Authenticity	32.6% trust, 64% somewhat trust, 3.4% distrust
Primary Barriers	Language, Health literacy, privacy/security issues, usability
Facilitating Factors	Accessibility features, provider endorsement, transparency, caregiver component

- **Spearman's Rank Correlation Assessment**

Spearman's Rank Correlation was considered to determine the relationship between digital tool use (Q7) and trust in digital tools (Q9). The analysis identified with perfection positive correlation ($r_s = 1$) meaning the strongest direct relationship between the two variables.

Findings interpretation:

A perfect correlation ($r_s = 1$) with the one-to-one relationship; the more trust in digital tools, the more the use of digital tools. In fact, the data suggest that participants that trust digital tools (say mobile apps, QR codes) are more inclined to use digital tools; on the other hand, those participants indicating mistrust should not be using the tools, or they are using them while still remaining skeptical and not really trusting the tools.

Consideration for digital health interventions:

What these findings really suggest about the adoption of digital health tools is that trust matters. If trust is not gained, no matter how good the digital solution is, it will never be picked up at scale.

Thus, any future interventions aiming at promoting adoption and actual users of digital tools should strongly consider building user trust right from the start. This includes:

- Increase transparency regarding the workings of digital tools, in particular with regards to data privacy and security;
- Design clean interfaces catering to the specific needs of older adults, such as bigger fonts and multiple language options;
- Provide examples and anecdotes of digital tool benefits in medication scheduling.

Practice Recommendations:

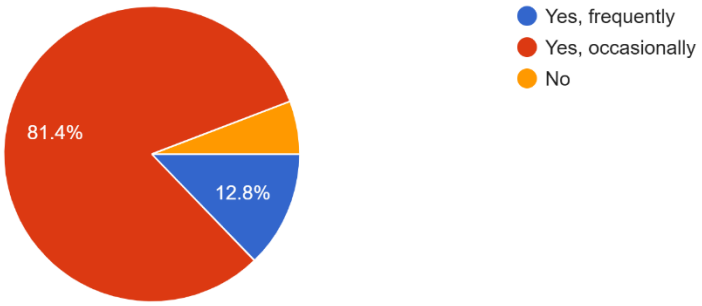
1. Build trust through transparent communication between users and digital tools.
2. Offer support to users through tutorials, customer service, and easy-to-navigate interfaces, the more a user may be inclined to adopt the tools offered.
3. Build Trust by displaying security badges, privacy policy, and easy consent forms will gain the confidence of the users.

4.4: Overcoming Barriers & Future Improvements

Communication gaps with healthcare providers were widely occurring, with 81.4% of participants frequently struggling to understand basic information about their medications. In some ways, this systemic communication breakdown is consistent with overall findings of medication management breakdowns in the patient-provider interaction (Tarn *et al.,* 2006).

10. Have you ever struggled to get clear and reliable information about your medication from healthcare providers or pharmacies?

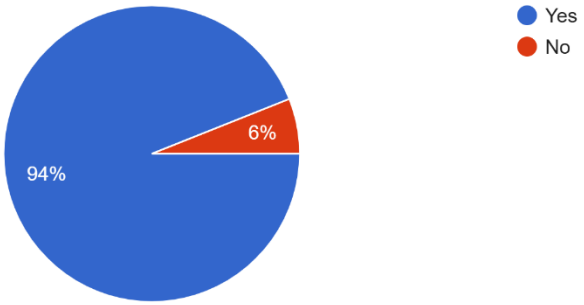
86 responses



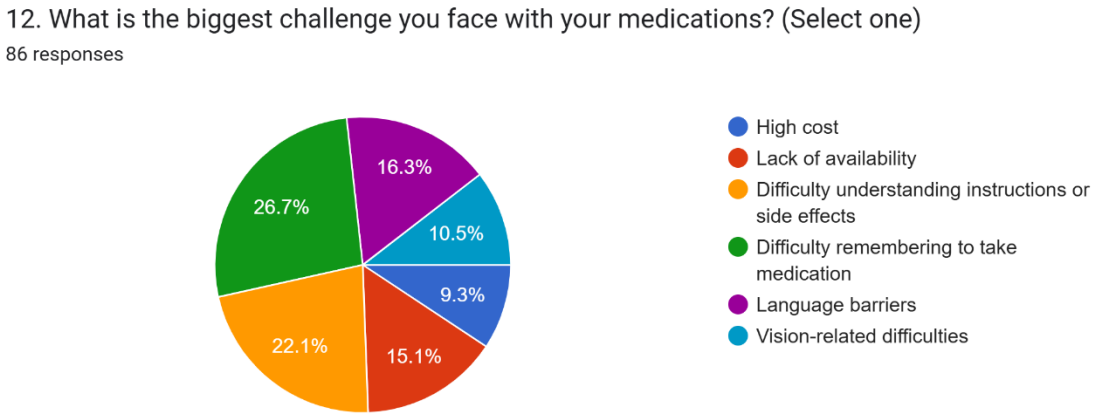
The overwhelming positive response (94%) to a proposed digital platform connecting patients with pharmacies and support services suggests a strong need for a more integrated solution. This finding aligns closely with notion of connected health as a means of improving medication adherence(Argent *et al.*, 2018).

11. Would a digital platform that connects you directly with pharmacies, delivery services, or support groups improve your access to medications?

83 responses



When asked about their single biggest challenge, responses were distributed across several issues: remembering to take medication (26.7%), understanding instructions (22.1%), language barriers (16.3%), high cost (9.3%), vision difficulties (10.5%), and lack of availability (15.1%). This distribution highlights the multifaceted nature of medication challenges requiring comprehensive rather than single-focus solutions.



A major healthcare problem exists due to the poor ability of healthcare providers to communicate with their older patient population. The inability of older adults to obtain understandable medication information during consultations amounts to 81.4% of cases according to patient reports thus revealing provider-patient interaction deficiencies and standing as a longstanding health communication issue. Medication mismanagement combined with a greater danger of adverse drug events and poor adherence connects to these communication gaps particularly when older people require management of multiple medicines or complex treatment plans.

A lack of communication drives more patients to seek integrated digital solutions for their healthcare needs. Nearly all surveyed older adults (94%) backed the creation of a digital platform that brings together patient, pharmacy and support service interfaces. A large number of consumers show interest in connected care systems that share information immediately between stakeholders through coordinated digital ecosystems rather than individual applications**.** Several key elements of "connected health" doctrine match the patient requirements which embrace proactive service coordination and data system integration and personalised health solutions. The combination of prescription tracking with refill alerts and teleconsultations and communication portals through a unified platform improves user experience by reducing health services fragmentation specifically for elderly patients dealing with numerous medical issues.

The various domestic difficulties that older people face in medicine management exist on multiple levels. Results from surveys demonstrate that older adults encounter similar problems in managing their medicine consumption with equal distribution including forgetting to take medications at 26.7% while 22.1% struggle with understanding directions and 16.3% face language challenges. Drugs that are unavailable create medication challenges for 15.1% of consumers and vision problems affect 10.5% and expensive drugs limit access for 9.3% of patients. The distribution demonstrates that a unified approach will not solve this issue. Efficient approaches to medication adherence need to consider how personal, cultural and cognitive factors and infrastructural elements combine to build barriers to practice.

Multiple intervention layers must exist as a solution for handling these challenges comprehensively.

Evaluating individuals serves as the crucial basis for successful interventions at this level. The initiation of interventions necessitates identifying the challenges that sustain issues related to memory, literacy, sensory, financial, or logistical aspects. Medical assessments aimed at older patients enable healthcare providers to comprehend how mental status as well as physical abilities alongside social networks determine individual self-medication capabilities. Following assessment of individual needs clinicians can create targeted assistance strategies that employ memory devices for mild loss patients and basic treatment plans for those affected by excessive medications.

Effective communication methods require equal attention to success. Patients with Health literacy problems alongside vision issues alongside elderly adults achieve better results when they get medication information through visual cues using symbolic images. Equitable communication for diverse communities requires the use of professional interpreters together with translated materials because family members do not provide the same level of understanding. The education programme should extend to caregivers because they function as the main link between patients and medicines in instances of cognitive impairment or frailty.

Technology provides expandable resources through which healthcare principles become integrated with regular operational practices. Pharmacies and healthcare providers can access integrated technology solutions through platforms which trigger timely medical response when patients miss doses or let their prescriptions expire. However, the success of these solutions hinges on their usability. Large fonts together with audio guidance and multilingual navigation feature in mobile design as mandatory elements that meet the needs of the ageing population. Technical tools must provide both digital and paper-based emergency procedures and phone-based alternatives for the patients who lack digital access.

The support of caregivers and the community enhances the effectiveness of digital tools. When caregivers are involved—through a shared dashboard, notifications, or a role in medication reviews—the system gains greater resilience. Trainings (virtual or in-person) can assist caregivers to feel comfortable handling tools, monitor adherence, and communicate with providers. Community resources, such as pharmacists' home visits, local health coaches, and visiting/social workers for the elderly, expand the circle of support and may detect what cannot be observed by the remote systems, like, confusion over pills that look alike

At a broader level, this would require structural reforms and policy innovation in order for it to be sustained. Regular medication reviews and deprescribing efforts contribute to reduce the complexity, particularly among frail older persons who tend to be prescribed too often. Financial need should be met through improved promotion of aid programmes, insurance navigation, and policy advocacy around afford-ability of life-saving medications. Integration between systems, perhaps by connecting an electronic health record with the pharmacy inventory system, can help to minimise lag times, and at the

same time ensure that the drugs are available, particularly in rural or underserved locations. Finally, a multidisciplinary approach among clinicians, pharmacists, social workers, and technologists guarantees the interventions are not fragmented and instead mirror a holistic patient care philosophy.

The study findings authenticate the central research argument about sufficient intervention to overcome medication management issues among older adults should involve more than singular programmes or standardised digital approaches. The research demonstrates a definitive requirement for software solutions which deliver individualised treatment approaches that mirror the various situations of elderly adults. The study centers its analysis on digital tools that face end-users through an inclusive design framework of multilingual capabilities and cultural adaptability and user-focused interfaces which satisfies this requirement. Inclusive design solutions which combine language barrier elimination with user-friendly interfaces and provider-involved feedback loops enable this model according to the research. The model seeks more than technological integration because it promotes purposeful alignment between people and processes and structures to produce digital health solutions which deliver meaningful outcomes for older adults.

Table 4: Future Improvements: Recommendations

Challenge	Recommended Solution(s)
Communication gaps	Digital platforms for direct messaging, multilingual support, regular medication reviews
Memory/complex regimens	Reminder apps, smart dispensers, caregiver involvement
Understanding instructions	Simplified, visual, and multilingual materials; teach-back methods
Language barriers	Interpreter services, translated materials, culturally competent care
High cost	Financial assistance programmes, policy advocacy, generic substitution
Vision difficulties	Large-print labels, audio instructions, accessible packaging
Medication availability	Integrated pharmacy networks, real-time inventory systems

Medication management in older adults is a complex dynamic interaction between digital readiness, systemic inefficiencies, Health literacy deficits, and variability in individual needs. This study highlights that while digital healthcare solutions such as reminder apps, intelligent dispensers, and telemedicine platforms are becoming more widely accepted among older adults, their impact is constrained by mistrust, usability challenges, and communication barriers. The inclination to employ such tools, particularly when they have been constructed with features of accessibility like multilinguality and big-

font interface, is a show of openness to innovation, but only if the technologies are based on the ageing user's lived experience.

Findings indicate older adults not just having cognitive and physical challenges to taking medication, but also considerable challenges rooted in healthcare communication and system fragmentation. With nearly half reporting disorientation around instructions, and over 80% struggling to obtain clear information from providers, patients are left to shoulder the responsibility of medication management in so many instances—especially among multicultural or digitally excluded populations.

The strong direction here calls for initiatives which bring users together in harmonious collaboration. Trust-building methods which support provider endorsements and maintain data clarity while delivering community education need to become core design elements during the development of digital tools. Policies must establish integrated connections between support networks and pharmacies as well as healthcare practitioners to assure patients receive continuous medical care.

A singular solution is inadequate. An effective model must unite personalised assessment with both dependable access to technology and caregivers' involvement and thorough system reorganisation to advance its effectiveness. The important need for systematic digital medication management proves that older people do not resist change when their healthcare needs are poorly met by current systems. Addressing this gap requires both technological advancements and ethical and social responsibilities for establishing risk-free medication management systems that are efficient and fair for elderly patients.

Chapter 5: Conclusions and Recommendations

This study investigated the attitudes and experiences of the older adults regarding digital health technologies that are supposed to support the access to and affordability of medications. The findings of this study may somewhat shed light on the opportunities and challenges older adults face in general, especially those in low-resource and multicultural communities, in the use of digital health technologies. In view of the worldwide growth in the number of older populations, it becomes imperative to know how they will accept the digital health technologies and the factors influencing adoption. Some ideas were also given on how such technology could be developed and utilised for older adults, especially those who are culturally and linguistically diverse.

5.1: Summary of Main Findings and Their Implications

Study results show a positive but cautiously interested approach of older adults towards digital health tools for medication needs. However, an enthusiast was not there among all older adults. Factors such as language, digital literacy level, and cultural acceptability affected interest in such technologies. Older adults from multicultural backgrounds-in-particular older adults from low-resource environments-encounter barriers to the use of digital health tools.

The barriers include that access to technology and technology-related services is low, technology literacy is low, technology services have privacy and security concerns, and there is also a low level of trust arising from technology and services. Yet, digital health tools with design features like multi-lingual convenience, ease of use, and appropriate cultural content for older adults would have much higher levels of engagement.

This study's most relevant contribution lies in the differentiating focus on culture and language sensitivity in creating digital health technologies. The inclusion of multilingual features enhanced engagement by ensuring that older adults from different language backgrounds could utilise the technology without hesitation. The second finding indicated that higher levels of technology literacy in older adults correlate with higher engagement in digital interventions, providing a basis for suggesting that technology literacy programmes may also increase engagement levels with health-related digital tools.

At last, it has been suggested that the accidental level of trust when on-line resources are found to be beneficial and perceived ease of use. This corroborates with the Technology Acceptance Model (TAM) assumption, which states that perceived usefulness and easiness of use are the dominant factors favoring technology adoption. They, older people, will adopt and maintain use of the tool if these older people perceive that the online health tool will make them better as medicine and it is also easy to use.

5.2: Comparison of Findings with Existing Literature

The findings of this research concur with literature regarding the prevailing patterns in the adoption of

digital health technologies among older adults, while also providing new additional insights. The study confirms barriers such as refusal of technology and the lack of trust and computer skills but adds value by confirming needed new information out of disparate knowledge found in literature. The study shows that digital health solutions provide for older adults through flexible language options and cultural congruence and through their own cooperative efforts achieve success in digital health. The study conflicts with the traditional literature describing older adults as generally resistant to utilising digital health tools. According to the findings of this study, older adults present themselves as interested and technologically competent users of technology when technology acknowledges their real-life experiences.

This constitutes a contribution to the body of knowledge by suggesting a specially crafted digital literacy programme for older adults because various researchers almost always perceive digital skills deficits as the issue. The agreed-upon practical recommendation is one that outlines successive steps upon which to 'action' a problem rather than just referring to the gap.

The research assesses the way in which hybrid service models combining digital methods with human supportive interventions can empower access to medicines and ensure compliance to their therapeutic regimen. This very model serves an innovative digital-method-of-connecting people model and most certainly a means to note and possibly reduce the technology deficit in multilingual communities and under-resourced locations. Thus, with its solutions and confirmatory evidence of existing problems, this research assumes an important standing in the current exchanges on digital health equity for older adults.

5.3: Practical and Academic Recommendations

From the research findings, some practical suggestions can be recommended to health care workers, policy makers, and technology developers.

Health Care Providers: Health care providers must work with developers around the production of an older adult-centered tool. Emphasis should be placed on usability, simplicity, and accessibility. Digital health tools should be designed in a manner that would be intuitive, with appropriate signposting, and easy-to-navigate. Training courses about how to properly use these tools should be offered by health providers. Such could be community workshops or a web-based tutorial in the interest of improving older adult’s digital literacy and confidence to use the technology.

Policy Recommendations: Policymakers have an important role toward encouraging the adoption of digital health by older adults, by offering programmes that assert the availability of digital health technologies. Such programmes can include funding that supports older adult access to low-cost internet service, or subsidising the setup of digital literacy programmes for older adults. The policy should also make sure that the digital health technologies are offered in multiple languages and that the digital health is pertinent to the culturally diverse needs of older adults from varying backgrounds.

Suggested Actions for Technologists: Technologists should work on ensuring their digital health

technologies are user friendly and culturally relevant. In addition, the digital health technologies should be easy to use and avail capabilities and preferences of older people. These considerations shall incorporate multilingual interfaces, compatibility with assistive devices (for example, screen readers), and methods to ensure that technologies remain intuitive and user-friendly. While keeping the integration of these digital solutions into present-day health care systems, engineers should consider the proper channels by which older adults get and organise their medicines.

4.4: Limitations and Contributions of the Research

While these findings may help understand the adoption and access of digital health technologies by elderly people, they are filled with limitations. The primary limitation is that this research was an online study and hence did not include older adults who may have limited internet access or digital literacy. Consequently, it is possible that certain subgroups of older adults, mainly those living in rural communities or those living in low-income settings, may have been underrepresented. Beyond this, however, the study was restricted to three languages: English, Malayalam, and Irish. While these languages are deemed important, it is unlikely the entire landscape of the diverse population could have been captured within these three. Future studies embracing even more linguistic diversity might help in giving a wider perspective on the concerns of older adults coming from diverse cultural backgrounds.

Admittedly, some limitations to this research exist. But this study stands to enhance digital health literature by illustrating how major the role of cultural and linguistic inclusivity is in the design of the digital health technologies. Additionally, this study gave concrete advice for healthcare providers, policymakers, and technology developers on how to improve digital health accessibility for the aged and provides rich material for further research that can seek to build on this study, especially in helping to understand ways to simplify digital health technologies for use by older adults, further benefiting underserved and multicultural communities.

5.5: Suggestions for Further Research

There are openings for future research following the findings of this study. One avenue could address long-term health and medication adherence outcomes among older persons who use digital health tools. Longitudinal studies would offer unique insights as to whether the longer-term efficacy of digital health tools persists and if that efficacy is moderated by any factor of digital literacy or access to technology. Another point that deserves further study is the role of hybrid e-pharmacy models in improving access to medicines and the affordability of drugs for the elderly. This study provides preliminary indications that hybrid models, i.e., online platforms combined with face-to-face health care support, may offer a promising approach to the challenges of medication use, especially in resource-poor settings. Further studies may be conducted to weigh their scale and sustainability, as well as their influence on outcomes. Lastly, one avenue for further research could be into digital literacy programmes and whether they can

increase older adults' adoption of digital health tools. Since it is important to know how to effectively teach digital literacy, this will be significant when trying to achieve the digital health adoption rate for all cohort groups.

5.6: Final Reflection

Having experienced the research journey, I now hold an understanding of the somewhat complex relationships that exist between older adults and digital health tools. The research led me to recognise some of the special opportunities that might be made available through digital health for fairly priced and easily available drugs and, conversely, some of the barriers that need to be overcome for these solutions to become accessible and valid. While indeed issues may exist with regard to digital literacy and cultural awareness in older populations, what this study has emphasised is that addressing these issues can have digital health technologies serve to improve the quality of life for older adults. I learned a lot while doing this study: both regarding the importance of digital health solutions and about the daily barriers older people face when attempting to engage with and make use of technology. It is my hope that this research is helping to move the conversation toward healthcare that is accessible to anybody, everywhere.

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APPENDICES

1. Appendix A: Ethics Approval Form

Innopharma education

GRIFFITH COLLEGE

Ethics Application & Declaration Form

DISSERTATION TITLE: Digital Transformation in the Pharmaceutical Sector: A Consumer-Centric Approach to Accessibility, Affordability, and Transparency.

RESEARCHER'S NAME: Rini Simon

PROGRAMMEME OF STUDY: MSc Digital Transformation (Life Science)

SUPERVISOR'S NAME: Ankit Chaturvedi

DECLARATION:
The information in this application form is accurate to the best of my knowledge. I undertake to abide by the principles outlined by Innopharma/Griffith College ethics policy in my research dissertation. I confirm that I have completed a full ethics assessment for my research dissertation as per the college guidelines. I will not begin my primary research until such approval from my supervisor and/or ethics Committee has been obtained.
I pledge to carry out my research according to the Innopharma/Griffith College academic integrity standards. Any results presented in my dissertation will be from my own, original research, I will reference and/or acknowledge any material or sources used in its preparation and I will not plagiarise the work of anyone else.

ForStudent:

STUDENT SIGNATURE: Rini

DATE: 26-02-2025

The research contained within this research dissertation proposal has been approved.

For Supervisor:
Ethics Committee Approval Required: ☒ Yes ☐ No

SUPERVISOR SIGNATURE: Ankit Chaturvedi

DATE: 13-03-2025

For Ethics Committee (if required):

Ethics Committee Approval Given: ☐ Yes ☐ No

ETHICS COMMITTEE MEMBER SIGNATURE:

DATE:

2. Appendix B: Survey/ Questionare

ENGLISH

* Indicates required question

Section 1: Consumer Awareness & Understanding

1. What is your age group?

- 60-64
- 65-69
- 70-74
- 75+

2. Which of the following issues do you face when interpreting drug prescription information? (Select all that apply)

- Difficulty reading small text due to vision problems
- Difficulty understanding complex medical terms
- Language barriers (not available in my preferred language)
- No difficulties

3. How confident are you in understanding your medications, including safety, side effects, and correct usage?

- Very confident
- Somewhat confident
- Not confident at all

Section 2: Access & Affordability of Medications

4. How often do you face challenges in obtaining your prescribed medications?

- Frequently
- Occasionally
- Rarely
- Never

5. What is the primary reason for difficulty in accessing medications? (Select all that apply)

- High cost
- Medication unavailable or out of stock
- Lack of transportation to the pharmacy
- Language barrier when communicating with healthcare providers or pharmacies
- Difficulty in finding reliable medication information

6. Have you ever had to skip doses or adjust your medication due to cost concerns?

- Yes, frequently
- Yes, occasionally
- No, never

Section 3: Digital Solutions & Perceptions

7. Do you currently use any digital tools (apps, reminders, QR codes) to track or manage your medications?

- Yes, regularly
- Yes, occasionally
- No, but I am interested

- No, and I am not interested

8. Would you use a digital tool (app, QR code, or website) that provides medication instructions in different languages or larger fonts for better readability?
- Yes
- No

9. Would you trust a mobile app or QR code that verifies if a medication is authentic and provides detailed information on dosage, side effects, and interactions?
- Yes
- Somewhat
- No

Section 4: Overcoming Barriers & Future Improvements

10. Have you ever struggled to get clear and reliable information about your medication from healthcare providers or pharmacies?
- Yes, frequently
- Yes, occasionally
- No

11. Would a digital platform that connects you directly with pharmacies, delivery services, or support groups improve your access to medications?
- Yes
- No

12. What is the biggest challenge you face with your medications? (Select one)*
- High cost
- **Lack of availability**
- Difficulty understanding instructions or side effects
- Difficulty remembering to take medication
- Language barriers
- Vision-related difficulties

MALAYALAM

*അടയാളപ്പെടുത്തിയവ ആവശ്യമായ ചോദ്യങ്ങളാണ്

വിഭാഗം 1: ഉപഭോക്തൃ ബോധവും മനസ്സിലാക്കലും

1. താങ്കളുടെ പ്രായ വിഭാഗം ഏതാണ്?
• 60-64
• 65-69
• 70-74
• 75+

2. ഔഷധ നിർദ്ദേശ വിവരങ്ങൾ വ്യാഖ്യാനിക്കുമ്പോൾ താങ്കൾക്ക് താഴെപ്പറയുന്ന ഏതെങ്കിലും പ്രശ്നങ്ങൾ നേരിടേണ്ടി വരുമോ? (തക്കതായവയെല്ലാം തിരഞ്ഞെടുക്കുക)
• കാഴ്ച പ്രശ്നങ്ങളാൽ ചെറിയ എഴുത്ത് വായിക്കാൻ ബുദ്ധിമുട്ട്
• സങ്കീർണ്ണമായ വൈദ്യകീയ പദങ്ങൾ മനസ്സിലാക്കാൻ ബുദ്ധിമുട്ട്
• ഭാഷാ തടസ്സം (എനിക്ക് ഇഷ്ടമുള്ള ഭാഷയിൽ ലഭ്യമല്ല)

• എളുപ്പമില്ലാത്തത് ഒന്നുമില്ല

3. താങ്കളുടെ മരുന്നുകളെ കുറിച്ച് (സുരക്ഷ, പാർശ്വഫലങ്ങൾ, ശരിയായ ഉപയോഗം) താങ്കൾ എത്രത്തോളം ആത്മവിശ്വാസം പുലർത്തുന്നു?
• വളരെ ആത്മവിശ്വാസം ഉണ്ട്
• ചിലമാത്രം ആത്മവിശ്വാസം ഉണ്ട്
• ആത്മവിശ്വാസമില്ല

വിഭാഗം 2: മരുന്നുകളുടെ ലഭ്യതയും വിലാസാധ്യതയും

4. നിരദ്ദേശിച്ച മരുന്നുകൾ വാങ്ങുന്നതിൽ എത്ര തവണ ബുദ്ധിമുട്ട് നേരിടുന്നു?
• പലപ്പോഴും
• ഇടയ്ക്കിടെ
• അപൂർവമായി
• ഒരിക്കലും ഇല്ല

5. മരുന്നുകൾ ലഭ്യമാക്കുന്നതിൽ ബുദ്ധിമുട്ട് അനുഭവപ്പെടുന്ന പ്രധാന കാരണം ഏതാണ്? (തക്കതായവയെല്ലാം തിരഞ്ഞെടുക്കുക)
• ഉയർന്ന ചെലവ്
• മരുന്ന് ലഭ്യമല്ല അല്ലെങ്കിൽ സ്റ്റോക്കിൽ ഇല്ല
• ഫാർമസിയിലേക്ക് പോകുന്നതിനുള്ള ഗതാഗതസൗകര്യം ഇല്ല
• ആരോഗ്യപ്രവർത്തകരുമായി അല്ലെങ്കിൽ ഫാർമസികളുമായി ആശയവിനിമയം നടത്തുമ്പോൾ ഭാഷാ തടസ്സം
• വിശ്വസനീയമായ മരുന്ന് വിവരങ്ങൾ കണ്ടെത്താൻ ബുദ്ധിമുട്ട്

6. ചെലവു സംബന്ധിച്ച പ്രശ്നങ്ങളാൽ താങ്കൾക്ക് മരുന്ന് ഡോസ് ഒഴിവാക്കേണ്ടി വന്നിട്ടുണ്ടോ അല്ലെങ്കിൽ ഡോസ് മാറ്റേണ്ടി വന്നിട്ടുണ്ടോ?
• ഉണ്ട്, പലപ്പോഴും
• ഉണ്ട്, ഇടയ്ക്കിടെ
• ഇല്ല, ഒരിക്കലും ഇല്ല

വിഭാഗം 3: ഡിജിറ്റൽ പരിഹാരങ്ങളും അഭിപ്രായങ്ങളും

7. താങ്കൾ ഇപ്പോൾ ഏത് ഡിജിറ്റൽ ഉപകരണങ്ങളും (ആപ്പുകൾ, ഓർമപ്പെടുത്തലുകൾ, QR കോഡുകൾ) ഉപയോഗിക്കുന്നുണ്ടോ മരുന്നുകൾ പിന്തുടരാനും നിയന്ത്രിക്കാനും?
• ഉണ്ട്, സ്ഥിരമായി
• ഉണ്ട്, ഇടയ്ക്കിടെ
• ഇല്ല, എന്നാൽ ഉപയോഗിക്കാൻ താൽപര്യമാണ്
• ഇല്ല, താൽപര്യമില്ല

8. മരുന്ന് നിർദ്ദേശങ്ങൾ വിവിധ ഭാഷകളിലും വലുതായ എഴുത്തിലും ലഭ്യമാക്കുന്ന ഡിജിറ്റൽ ഉപകരണം (ആപ്പ്, QR കോഡ്, വെബ്സൈറ്റ്) താങ്കൾ ഉപയോഗിക്കുമോ?
• ഉണ്ട്
• ഇല്ല

9. ഒരു മരുന്ന് അസലാണെന്നത് സ്ഥിരീകരിക്കുകയും ഡോസ്, പാർശ്വഫലങ്ങൾ, ഇടപെടലുകൾ എന്നിവയെക്കുറിച്ചുള്ള വിശദമായ വിവരങ്ങൾ നൽകുകയും ചെയ്യുന്ന മൊബൈൽ ആപ്പിനേയും QR കോഡിനേയും താങ്കൾ വിശ്വസിക്കുമോ?
• ഉണ്ട്
• ചിലമാത്രം
• ഇല്ല

വിഭാഗം 4: തടസ്സങ്ങൾ മറികടക്കലും ഭാവിയിലെ മെച്ചപ്പെടുത്തലുകളും

10. ആരോഗ്യപ്രവർത്തകരിൽ നിന്നോ ഫാർമസികളിൽ നിന്നോ തികച്ചും വ്യക്തവും വിശ്വസനീയവുമായ മരുന്ന് വിവരങ്ങൾ ലഭിക്കാൻ താങ്കൾക്ക് ബുദ്ധിമുട്ട് ഉണ്ടായിട്ടുണ്ടോ?
• ഉണ്ട്, പലപ്പോഴും
• ഉണ്ട്, ഇടയ്ക്കിടെ
• ഇല്ല

11. ഫാർമസികൾ, ഡെലിവറി സേവനങ്ങൾ, അല്ലെങ്കിൽ സഹായ സംഘങ്ങൾ എന്നിവയുമായി നേരിട്ട് ബന്ധിപ്പിക്കുന്ന ഒരു ഡിജിറ്റൽ പ്ലാറ്റ്ഫോം താങ്കളുടെ മരുന്ന് ലഭ്യത മെച്ചപ്പെടുത്താൻ സഹായിക്കുമോ?
• ഉണ്ട്
• ഇല്ല

12. **താങ്കളുടെ മരുന്നുകളുമായി ബന്ധപ്പെട്ട് താങ്കൾ നേരിടുന്ന ഏറ്റവും വലിയ വെല്ലുവിളി ഏതാണ്? (ഒന്ന് മാത്രം തിരഞ്ഞെടുക്കുക)*
• ഉയർന്ന ചെലവ്
• ലഭ്യത ഇല്ലായ്മ
• നിർദ്ദേശങ്ങളും പാർശ്വഫലങ്ങളും മനസ്സിലാക്കാൻ ബുദ്ധിമുട്ട്
• മരുന്ന് എടുത്ത് ഓർക്കുന്നതിൽ ബുദ്ധിമുട്ട്
• ഭാഷാ തടസ്സങ്ങൾ
• കാഴ്ചയുമായി ബന്ധപ്പെട്ട ബുദ്ധിമുട്ടുകൾ

IRISH

Tugann * le fios gur ceist éigeantach í

Rannóg 1: Feasacht agus Tuigbheáil Tomhaltóirí

1. Cé acu grúpa aoise a bhfuil tú ann?
• 60–64
• 65–69
• 70–74
• 75+

2. Cé acu de na fadhbanna seo a leanas a bhíonn agat agus tú ag léamh eolas faoi oideas leighis? (Roghnaigh gach ceann a bhaineann leat)
• Deacracht le cló beag a léamh mar gheall ar fhadhbanna radhairc

• Deacracht le téarmaí leighis casta a thuiscint
• Bac teanga (níl sé ar fáil i mo theanga roghnaithe)
• Níl aon deacrachtaí agam

3. Cé chomh muiníneach is atá tú maidir le tuiscint a bheith agat ar do chuid cógais, lena n-áirítear sábháilteacht, fo-iarsmaí, agus úsáid cheart?
• An-mhuiníneach
• Roinnt muiníne
• Gan muinín ar bith

Rannóg 2: Rochtain agus Inacmhainneacht Cógais
4. Cé chomh minic a bhíonn deacrachtaí agat do chuid cógais o prescríofa a fháil?
• Go minic
• Uaireanta
• Go hannamh
• Riamh

5. Cad é an phríomhchúis atá leis na deacrachtaí seo maidir le cógais a fháil? (Roghnaigh gach ceann a bhaineann leat)
• Costas ard
• Níl an chógas ar fáil nó tá sé as stoc
• Easpa iompair chun dul chuig an gcógaslann
• Bac teanga agus tú ag caint le soláthraithe cúraim sláinte nó le cógaslanna
• Deacracht eolas iontaofa faoi chógais a aimsiú

6. Ar chaill tú dáileoga riamh nó ar athraigh tú do chógas mar gheall ar imní faoi chostais?
• Sea, go minic
• Sea, uaireanta
• Níor tharla sé riamh

Rannóg 3: Réitigh Dhigiteacha & Dearcthaí
7. An bhfuil tú ag úsáid aon uirlisí digiteacha faoi láthair (aip, meabhrúcháin, cód QR) chun do chógais a rianú nó a bhainistiú?
• Sea, go rialta
• Sea, ó am go chéile
• Níl, ach tá suim agam
• Níl, agus níl suim agam

8. An n-úsáidfeá uirlis dhigiteach (aip, cód QR, nó suíomh gréasáin) a thugann treoracha cógais i dteangacha éagsúla nó i gcló níos mó le haghaidh inléiteachta níos fearr?
• Sea
• Níl

9. An mbeadh muinín agat as aip soghluaiste nó cód QR a dheimhníonn barántúlacht na cógais agus a thugann eolas mionsonraithe faoi dháileog, fo-iarsmaí, agus idirghníomhaíochtaí?
• Sea
• Roinnt muiníne

• Níl

Rannóg 4: Bacanna a Shárú & Feabhsuithe don Todhchaí

10.An raibh sé deacair agat riamh eolas soiléir agus iontaofa a fháil faoi do chógas ó sholáthraithe cúraim sláinte nó ó chógaslanna?
• Sea, go minic
• Sea, ó am go chéile
• Níl

11.An bhfeabhsódh ardán digiteach a nascann thú go díreach le cógaslanna, seirbhísí seachadta, nó grúpaí tacaíochta do rochtain ar chógais?
• Sea
• Níl

12.**Cad é an dúshlán is mó atá agat maidir le do chógais? (Roghnaigh ceann amháin)*
• Costas ard
• Easpa infhaighteachta
• Deacracht le treoracha nó fo-iarsmaí a thuiscint
• Deacracht cuimhneamh ar na cógais a ghlacadh
• Bac teanga
• Fadhbanna a bhaineann le radharc

3. Appendix C: Consent Form

Consent to take part in research

Digital Transformation in the Pharmaceutical Sector: A Consumer-Centric Approach to Accessibility, Affordability, and Transparency

The researcher retains one copy signed by both themselves and the participant. The participant should also receive a copy of consent form as a record of what they have signed up to.

- I [_____] voluntarily agree to participate in this research study
- I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind
- I understand that I can withdraw permission to use data from my **survey** within two weeks after the interview, in which case the material will be deleted.
- I have had the purpose and nature of the study explained to me in writing and I have had the opportunity to ask questions about the study
- I understand that participation involves a **survey that will take approximately 10-15 minutes**.
- I understand that I will not benefit directly from participating in this research
- I understand that all information I provide for this study will be treated confidentially
- I understand that in any report on the results of this research my identity will remain anonymous. This will be done by changing my name and disguising any details of my interview which may reveal my identity or the identity of people I speak about.
- I understand that disguised extracts from my interview may be quoted in **report, publication, or presentation**.
- If data is coming from within one company or specifically pertaining to the one company: *I understand that I will adhere to all of the codes of conduct and employee confidentiality for company _____ and there is no expectation to breach these by partaking in this research. Include a signed confidentiality statement between researcher and company if deemed necessary.*
- I understand that if I inform the researcher that myself or someone else is at risk of harm, they may have to report this to the relevant authorities - they will discuss this with me first but may be required to report with or without my permission
- I understand that signed consent forms and original audio recordings will be retained in **password-protected digital storage system at Griffith College**, accessible **only to the researcher and academic supervisors**, - until **the exam board confirms the results of the dissertation.**
- I understand that a transcript of my interview in which all identifying information has been removed will be retained for **two years from the date of the exam board**.
- I understand that under freedom of information legalisation I am entitled to access the information I have provided at any time while it is in storage as specified above.
- I understand that I am free to contact any of the people involved in the research to seek further clarification and information.

Researcher Details
Name: Rini Simon
Degree Programmeme: MSc. Digital Transformation (Life Sciences)
College Details: Griffith College, Dublin
Contact number: +353894345612
Contact mail: rini.simon@student.griffith.ie

Signature of participant
[Full Name – Printed]
Signature of research participant

---------- ---------- Date

Signature of researcher
I believe the participant is giving informed consent to participate in this study

---------- 10-03-2025 Date
Signature of researcher

MALAYALAM

ഗവേഷണത്തിൽ പങ്കെടുക്കാനുള്ള സമ്മതപത്രം

മരുന്ന് വ്യവസായത്തിലെ ഡിജിറ്റൽ പരിവർത്തനം: ലഭ്യത, വിലക്കുറവ്, വ്യത്യാസങ്ങൾ എന്നിവയിൽ ഉപഭോക്തൃകേന്ദ്രമായ സമീപനം

- ഞാൻ [ ] ഈ ഗവേഷണത്തിൽ സന്നദ്ധമായും ഇച്ഛാപൂർവ്വകമായും പങ്കെടുക്കാൻ സമ്മതിക്കുന്നു.
- ഞാൻ ഇപ്പോൾ പങ്കെടുത്തു കൊണ്ടിരിക്കുമ്പോഴും, എപ്പോൾ വേണമെങ്കിലും പിൻവലിക്കാം അല്ലെങ്കിൽ ഏതെങ്കിലും ചോദ്യം ഒഴിവാക്കാം, അതിന് യാതൊരു പ്രതികൂലതയും ഉണ്ടായിരിക്കില്ലെന്ന് ഞാൻ മനസ്സിലാക്കുന്നു.
- അഭിമുഖത്തിനുശേഷം രണ്ടു ആഴ്ചയ്ക്കുള്ളിൽ എന്റെ സർവേ ഡാറ്റ ഉപയോഗിക്കാനുള്ള അനുമതി ഞാൻ പിൻവലിക്കാമെന്ന് ഞാൻ മനസ്സിലാക്കുന്നു.
- ഈ പഠനത്തിന്റെ ഉദ്ദേശവും സ്വഭാവവും എനിക്ക് എഴുത്തിലൂടെ വിശദീകരിച്ചിട്ടുണ്ട്, കൂടാതെ സംശയങ്ങൾ ചോദിക്കാൻ എനിക്ക് അവസരം ലഭിച്ചു.
- ഈ സർവേ ഏകദേശം 10–15 മിനിറ്റ് സമയം വേണമെന്ന് എനിക്ക് അറിയാം.
- ഈ ഗവേഷണത്തിൽ പങ്കെടുത്തത് മൂലം എനിക്ക് നേരിട്ട് ഗുണം ഉണ്ടാകില്ലെന്ന് ഞാൻ മനസ്സിലാക്കുന്നു.
- ഞാൻ നൽകുന്ന എല്ലാ വിവരങ്ങളും രഹസ്യമായി കൈകാര്യം ചെയ്യുന്നതാണ്.
- ഗവേഷണ ഫലം റിപ്പോർട്ടിലോ പ്രസന്റേഷനിലോ ഉപയോഗിക്കുമ്പോൾ എന്റെ പേര് മാറ്റുകയോ വ്യക്തത നഷ്ടപ്പെടുന്ന തരത്തിൽ വിവരങ്ങൾ മാറ്റുകയോ ചെയ്യും.
- എന്റെ അഭിമുഖത്തിൽ നിന്നുള്ള ഭാഗങ്ങൾ വിശദീകരണത്തിനായി റിപ്പോർട്ടിലോ പ്രസന്റേഷനിലോ ഉദ്ധരിക്കാവുന്നതാണ്.
- കമ്പനി അടിസ്ഥാനമാക്കിയുള്ള വിവരങ്ങൾ ഉൾപ്പെടുന്നുവെങ്കിൽ: ഞാൻ എന്റെ കമ്പനിയുമായി ബന്ധപ്പെട്ട എല്ലാ നയങ്ങളും രഹസ്യതാ മാനദണ്ഡങ്ങളും പാലിക്കും.
- ഞാൻ അല്ലെങ്കിൽ മറ്റാരെങ്കിലും അപകടത്തിൽ ആണെന്ന വിവരം ഞാൻ ഗവേഷകനോട് പങ്കുവെച്ചാൽ, അതുവഴി അവർ ബന്ധപ്പെട്ട അധികാരികൾക്ക് റിപ്പോർട്ട് ചെയ്യേണ്ടിവരാമെന്നും ഞാൻ മനസ്സിലാക്കുന്നു.

- ഒപ്പിട്ട ഫോമുകളും ഓഡിയോ റെക്കോർഡിംഗുകളും പാസ്‌വേഡ് സംരക്ഷിത ഡിജിറ്റൽ സംവിധാനത്തിൽ സൂക്ഷിക്കും, പരീക്ഷാഫലം ലഭിക്കുന്നതുവരെ.
- വ്യക്തിത്വം അജ്ഞാതമാക്കപ്പെട്ട അഭിമുഖം 2 വർഷത്തേക്ക് സൂക്ഷിക്കും.
- വിവരസ്വാതന്ത്ര്യ നിയമപ്രകാരം ഞാൻ നൽകിയ വിവരങ്ങൾ എനിക്ക് ആക്സസ് ചെയ്യാനാകും.
- കൂടുതൽ വിശദീകരണങ്ങൾക്കായി ഞാൻ ഗവേഷണ സംഘത്തെ സമീപിക്കാം.

ഗവേഷകന്റെ വിവരം

പേര്: Rini Simon
പ്രോഗ്രാം: MSc. Digital Transformation (Life Sciences)
കോഴ്സ് സ്ഥാപനത്തിന്റെ പേര്: Griffith College, Dublin
ഫോൺ നമ്പർ: +353894345612
ഇമെയിൽ: rini.simon@student.griffith.ie

പങ്കെടുക്കുന്ന വ്യക്തിയുടെ ഒപ്പ്

പൂർണ്ണ പേര് (അക്ഷരമാലയിൽ): _____
ഒപ്പ്: _____
തീയതി: _____

ഗവേഷകന്റെ ഒപ്പ്

ഈ വ്യക്തി അറിവോടെ സമ്മതം നൽകിയിരിക്കുന്നതായി ഞാൻ വിശ്വസിക്കുന്നു.
ഒപ്പ്: _____
തീയതി: 10-03-2025

IRISH

Toiliú le Páirt a Ghlacadh sa Taighde

Claochlú Digiteach sa Tionscal Cógaisíochta: Cur Chuige Dírithe ar an gTomhaltóir maidir le hInrochtaineacht, Inacmhainneacht, agus Trédhearcacht

- Aontaím go deonach le páirt a ghlacadh sa staidéar taighde seo.
- Tuigim gur féidir liom tarraingt siar ag am ar bith nó ceisteanna a dhiúltú gan iarmhairt ar bith.
- Tuigim gur féidir liom mo chead ar úsáid sonraí ón suirbhé a tharraingt siar laistigh de dhá sheachtain ón agallamh, agus go scriosfar na sonraí sin.
- Míníodh cuspóir agus nádúr an staidéir dom i scríbhinn agus bhí deis agam ceisteanna a chur.
- Tuigim go mbeidh an suirbhé thart ar 10–15 nóiméad.
- Tuigim nach mbeidh aon sochar díreach agam ó pháirt a ghlacadh sa taighde seo.
- Tuigim go gcoimeádfar gach eolas a thugaim faoi rún.
- Tuigim go bhfanfaidh m'aitheantas gan ainm in aon tuarascáil. Athrófar m'ainm agus clúdófar sonraí a d'fhéadfadh m'aitheantas a nochtadh.
- Tuigim go bhféadfadh sleachta faoi cheilt ón agallamh a bheith luaite i dtuarascáil nó i gcur i láthair.
- Má bhaineann an taighde le cuideachta: Aontaím cloí le cód iompair agus rúndacht mo fhostóra.
- Tuigim má deirim leis an taighdeoir go bhfuil mé féin nó duine eile i mbaol, d'fhéadfadh air é a thuairisciú d'údaráis ábhartha, le mo chead nó gan é.
- Tuigim go gcoinneofar foirmeacha sínithe agus taifid fuaime i stóráil dhigiteach atá cosanta le focal faire in Griffith College, agus go mbeidh siad inrochtana ag an taighdeoir agus na maoir acadúla amháin, go dtí go gcuirfidh an bord scrúdaithe torthaí i bhfeidhm.

- Tuigim go gcoinneofar tras-scríbhinn den agallamh, gan sonraí aitheantais, ar feadh dhá bhliain ón dáta a dheimhníonn an bord scrúdaithe na torthaí.
- Tuigim go bhfuil sé de cheart agam rochtain a fháil ar an eolas a thug mé de réir na reachtaíochta um Shaoráil Faisnéise.
- Táim saor teagmháil a dhéanamh leis an bhfoireann taighde chun tuilleadh eolais nó soiléiriú a fháil.

Sonraí an Taighdeora
Ainm: Rini Simon
Clár Céime: MSc. Digital Transformation (Life Sciences)
Coláiste: Griffith College, Baile Átha Cliath
Uimhir Gutháin: +353894345612
Ríomhphost: rini.simon@student.griffith.ie

Síniú an Rannpháirtí
Ainm Iomlán (i gcló): _____
Síniú: _____
Dáta: _____

Síniú an Taighdeora
Creidim go bhfuil an rannpháirtí ag tabhairt toiliú feasach leis an staidéar seo.
Síniú: _____
Dáta: 10-03-2025

4. Appendix D: Participant Information Letter

GRIFFITH COLLEGE

Participant Information Letter

Digital Transformation in the Pharmaceutical Sector: A Consumer-Centric Approach to Accessibility, Affordability, and Transparency.

I would like to invite you to take part in a research study. Before you decide you need to understand why the research is being done and what it would involve for you. Please take time to read the following information carefully. Ask questions if anything you read is not clear or if you would like more information. Take time to decide whether or not to take part.

WHO I AM AND WHAT THIS STUDY IS ABOUT

My name is Rini Simon, and I am conducting this study as part of my research at Griffith College, Dublin. This study explores how digital tools—such as Artificial Intelligence, blockchain technology, and mobile applications—can improve transparency, affordability, and access to medications in the pharmaceutical industry.

The study aims to provide insights into consumer knowledge and perception regarding digital solutions within a pharmaceutical context and their challenges in accessing medications.

WHAT WOULD TAKING PART INVOLVE?

- The survey process will require 10-15 minutes of your time.
- The survey requires responses about your experiences regarding medication information accessibility together with understanding of that information.
- You can decline any survey question by choosing to skip it if you prefer not to answer. The participation remains entirely voluntary.
- Your consent to participate allows you to terminate the study at any point without providing any reason.

WHY HAVE YOU BEEN INVITED TO TAKE PART?

The research examines how senior citizens (aged 60 and above+) encounter pharmaceutical digital solutions while accessing medications.

DO YOU HAVE TO TAKE PART?

- Whether you decline or opt out of participation it results in no adverse effects.
- Participants have the option to omit questions they wish to avoid answering.
- You can leave the study anytime you want by sending an email to rini.simon@student.griffith.ie

WHAT ARE THE POSSIBLE RISKS AND BENEFITS OF TAKING PART?

Risks: Participation in this study involves no identified safety risks. The survey avoids requesting any personal or sensitive details from respondents.

Benefits: Your survey responses enable researchers alongside the pharmaceutical sector to clarify about advanced tools' power to enhance drug accessibility.

WILL TAKING PART BE CONFIDENTIAL?

Yes. Your privacy is important.

- **The survey is completely anonymous**. All information stays completely confidential because the survey does not record names or personal details.
- All data will be used only for research purposes.
- The researchers will publish findings within academic publications without revealing any information about individual participants.
- Despite these restrictions the researcher must break confidentiality when serious risks exist that could harm either yourself or others.

HOW WILL INFORMATION YOU PROVIDE BE STORED AND PROTECTED?

- The secure system stores your answers in digital files protected by encryption along with the system requiring a password for access.
- The data will be accessible only to approved research personnel.
- The data will remain safe for five years before being deleted permanently.
- The investigation obeys ethical standards and respects data protection regulations including GDPR.

WHAT WILL HAPPEN TO THE RESULTS OF THE STUDY?
This data will support academic research that could be included in academic publications or academic conferences. If you are interested in the study's results, please contact me at rini.simon@student.griffith.ie

WHO SHOULD YOU CONTACT FOR FURTHER INFORMATION?
If you have any questions, please contact:
Rini Simon
Griffith College, Dublin
Email: rini.simon@student.griffith.ie

MALAYALAM

പങ്കെടുക്കുന്നവരുടെ വിവരക്കത്ത്

ഫാർമസ്യൂട്ടിക്കൽ മേഖലയിൽ ഡിജിറ്റൽ പരിവർത്തനം: ലഭ്യത, കിന്തത, വ്യക്തത എന്നിവയുടെ ഉപഭോക്ത്യമധ്യസ്ഥ സമീപനം
ഞാൻ നടത്തുന്ന ഒരു ഗവേഷണ പഠനത്തിൽ പങ്കെടുക്കാൻ നിങ്ങളെ ക്ഷണിക്കുന്നു. നിങ്ങൾ പങ്കെടുക്കാൻ തീരുമാനിക്കുന്നതിന് മുമ്പ്, ഈ ഗവേഷണം എന്തിനാണ് നടത്തുന്നത് എന്നതും അത് നിങ്ങളെ എങ്ങനെ ബാധിക്കും എന്നതും മനസ്സിലാക്കേണ്ടതാണ്. താഴെ നൽകിയിരിക്കുന്ന വിവരങ്ങൾ ശ്രദ്ധയോടെ വായിക്കുക. എന്തെങ്കിലും സംശയങ്ങൾ ഉണ്ടെങ്കിൽ ദയവായി ചോദിക്കുക.
ഞാൻ ആരാണ്, ഈ പഠനം എന്താണ്?
എന്റെ പേര് റിനി സിമൺ, ഞാൻ ഗ്രിഫിത്ത് കോളേജിൽ പഠിക്കുന്ന MSc Digital Transformation (Life Sciences) പ്രോഗ്രാമിന്റെ ഭാഗമായി ഈ പഠനം നടത്തുകയാണ്.
ഈ പഠനം ഡിജിറ്റൽ ടൂൾസ് (AI, ബ്ലോക്ക്ചെയിൻ, മൊബൈൽ ആപ്പുകൾ) മരുന്നുകളുടെ വ്യക്തത, കിന്തത, ലഭ്യത എന്നിവയിൽ എങ്ങനെ സഹായിക്കുന്നു എന്ന് പരിശോധിക്കുന്നു.
പങ്കെടുക്കുന്നതിൽ എന്താണ് ഉൾപ്പെടുന്നത്?

- സർവ്വേയ്ക്ക് 10-15 മിനിറ്റ് സമയമെടുക്കും.
- മരുന്നുകൾ സംബന്ധിച്ചുള്ള നിങ്ങളുടെ അനുഭവങ്ങൾ പങ്കുവെക്കേണ്ടതുണ്ട്.
- നിങ്ങൾക്ക് ഏതെങ്കിലും ചോദ്യങ്ങൾ ഒഴിവാക്കാൻ കഴിയും.
- നിങ്ങൾക്ക് ഇടയ്ക്കും ഗവേഷണത്തിൽ നിന്ന് പിൻവാങ്ങാം.

നിങ്ങളെ എന്തുകൊണ്ട് ക്ഷണിച്ചു?

60 വയസ്സിന് മുകളിലുള്ള മുതിർന്ന പൗരന്മാർ മരുന്നുകൾക്ക് ഡിജിറ്റൽ പരിഹാരങ്ങൾ എങ്ങനെ അനുഭവപ്പെടുന്നു എന്നതിനെ കുറിച്ചാണ് ഈ ഗവേഷണം.

പങ്കെടുക്കേണ്ടതുണ്ടോ?

- ഇല്ല, നിങ്ങൾക്ക് താത്പര്യമില്ലെങ്കിൽ ഒഴിവാക്കാം.
- നിങ്ങൾക്ക് ഏതെങ്കിലും സമയത്ത് പിൻവാങ്ങാം: rini.simon@student.griffith.ie എന്ന ഇമെയിലിലേക്കു സന്ദേശം അയച്ച്.

പങ്കെടുത്താൽ എന്താണ് ഉപകാരവും അപകടവും?

- അപകടങ്ങളൊന്നുമില്ല. വ്യക്തിഗത വിവരങ്ങൾ ആവശ്യപ്പെടുന്നതല്ല.
- ഉപകാരമായി, ഫാർമസ്യൂട്ടിക്കൽ മേഖലയിൽ മികച്ച ഡിജിറ്റൽ പരിഹാരങ്ങൾ ഒരുക്കാൻ സഹായകമാകും.
- നിങ്ങളുടെ വിവരങ്ങൾ രഹസ്യമായി സൂക്ഷിക്കപ്പെടുമോ?
- ഹൗ, നിങ്ങളുടെ പേര് അല്ലെങ്കിൽ വ്യക്തിഗത വിവരങ്ങൾ ഒന്നും എടുക്കുന്നില്ല.
- എല്ലാ വിവരങ്ങളും ഗവേഷണത്തിനായേ ഉപയോഗിക്കൂ.
- ഗൗരവമായ അപകടം ഉണ്ടെങ്കിൽ മാത്രം രഹസ്യത ഒഴിവാക്കേണ്ടിവരും.
- വിവരങ്ങൾ എങ്ങനെ സൂക്ഷിക്കും?
- കംപ്യൂട്ടറിൽ പാസ്വേർഡും എൻക്രിപ്ഷനും ഉപയോഗിച്ച് സൂക്ഷിക്കും.
- അംഗീകരിച്ച ഗവേഷകർക്ക് മാത്രമേ ആക്സസ് ഉണ്ടാകൂ.
- ഡാറ്റ 5 വർഷം സൂക്ഷിക്കും.
- GDPR നിബന്ധനകൾ പാലിക്കും.
- പഠനഫലങ്ങൾ എന്തായിരിക്കും?
- അക്കാദമിക് റിപ്പോർട്ടുകൾക്കും കോൺഫറൻസുകൾക്കും ഉപയോഗിക്കും.
- ഫലങ്ങൾ അറിയാൻ: rini.simon@student.griffith.ie

കൂടുതൽ വിവരങ്ങൾക്കായി ബന്ധപ്പെടുക:

റിനി സൈമൺ
Griffith College,
Dublin
ഇമെയിൽ:
rini.simon@studen
t.griffith.ie

IRISH

Litir Eolais don Rannpháirtí

Claochló Digiteach sa Tionscal Cógaisíochta: Cur Chuige Lárnach ar an Tomhaltóir maidir le hInrochtaineacht, Inacmhainneacht agus Trédhearcacht

Ba mhaith liom cuireadh a thabhairt duit páirt a ghlacadh i staidéar taighde. Sula ndéanann tú cinneadh, ba chóir duit tuiscint a fháil ar chúis an taighde agus ar a bhfuil i gceist duit féin. Léigh na sonraí thíos go cúramach. Má tá aon cheist agat nó má theastaíonn tuilleadh eolais uait, ná bíodh drogall ort iarraidh. Tóg do chuid ama le cinneadh a dhéanamh an mian leat páirt a ghlacadh nó nach mian.

CÉ MÉ FÉIN AGUS CÉARD ATÁ SA STAIDÉAR SEO

Is mise Rini Simon, agus táim ag déanamh an staidéir seo mar chuid de mo thaighde in Griffith College, Baile Átha Cliath. Tá sé mar aidhm ag an staidéar seo scrúdú a dhéanamh ar conas is féidir le huirlisí digiteacha cosúil le hIntleacht Shaorga, teicneolaíocht blockchain, agus feidhmchláir soghluaiste feabhas a chur ar thrédhearcacht, inacmhainneacht agus rochtain ar chógais sa tionscal cógaisíochta.

Tá sé d'aidhm ag an staidéar léargas a thabhairt ar eolas agus dearcthaí tomhaltóirí maidir le réitigh dhigiteacha agus na dúshláin a bhaineann lena rochtain ar chógais.

CÉARD A BHEIDH I GCEIST LE PÁIRT A GHLACADH?

- Tógfaidh an suirbhé thart ar 10-15 nóiméad.
- Iarrfar ort freagraí a thabhairt bunaithe ar do thaithí le rochtain agus tuiscint ar fhaisnéis faoi chógais.
- Tá sé de cheart agat ceisteanna a scipeáil mura dteastaíonn uait freagra a thabhairt.
- Is saor-roghnach é do pháirt a ghlacadh agus is féidir leat éirí as ag am ar bith gan míniú a thabhairt.

CÉN FÁTH A BHFUIL TÚ FAOI CHOMHAIRLE PÁIRT A GHLACADH?

Tá an staidéar dírithe ar shaoránaigh sinsearacha (60 bliain d'aois agus os a chionn) agus ar an gcaoi a mbíonn siad ag idirghníomhú le réitigh dhigiteacha sa réimse cógaisíochta.

AN BHFUIL ORT PÁIRT A GHLACADH?

- Níl aon oibleagáid ort páirt a ghlacadh.
- Féadfaidh tú ceisteanna a scipeáil nó éirí as an staidéar ag am ar bith trí ríomhphost a chur chuig: rini.simon@student.griffith.ie

CAD IAD NA RIOSCAÍ AGUS NA BUNTÁISTÍ A BHAINEANN LEIS AN STAIDÉAR?

Rioscaí: Níl aon rioscaí ar eolas ag baint leis an taighde seo. Ní iarraimid sonraí pearsanta ná íogaire. Buntáistí: Cabhraíonn do fhreagraí le taighdeoirí agus an tionscal cógaisíochta tuiscint níos fearr a fháil ar úsáid uirlisí digiteacha chun rochtain ar chógais a fheabhsú.

AN BHFUIL DO PHÁIRT A GHLACADH FAOI RÚN?

Tá.

- Ní thaifeadtar ainmneacha ná sonraí pearsanta sa suirbhé.
- Ní úsáidfear na sonraí ach chun críocha taighde amháin.
- Ní nochtfar do chéannacht i dtuarascálacha ná foilseacháin.
- Ní dhéanfar ach amháin mura bhfuil an taighdeoir imní faoi do shábháilteacht nó faoi shábháilteacht daoine eile—sa chás sin, d'fhéadfadh sé nó sí é a thuairisciú do na húdaráis ábhartha.

CÉN CHAIGHDEÁN A BHÍONN LE STÓRÁIL AGUS COSAINT DO SHONRAÍ?

- Coinneofar na sonraí i gcomhad leictreonach faoi chosaint focal faire agus criptiúcháin.
- Ní bheidh rochtain ag ach foireann taighde formheasta.
- Coinneofar na sonraí slán ar feadh cúig bliana sula scriosfar iad go buan.
- Comhlíonfaidh an staidéar caighdeáin eiticiúla agus rialacháin GDPR.

CAD A DHÉANFAR LE TORTHAÍ AN STAIDÉIR?

D'fhéadfaí an taighde seo a úsáid i bhfoilseacháin acadúla nó i gcruinnithe eolaíocha. Má tá suim agat sna torthaí, seol ríomhphost chugam: rini.simon@student.griffith.ie

CÉ A BHFUIL LE DUL I DTEAGMHÁIL LEO CHUN TUILLEADH EOLAIS A FHÁIL?

Rini Simon
Griffith College, Baile Átha Cliath
Ríomhphost: rini.simon@student.griffith.ie

5. **Appendix E: Survey Responses Link-** **survey response.xlsx**

6. **Appendix F: Spearman's Rank Correlation Assessment** **correlation Table.xlsx**

	A	B	C	D	E	F	G
1	**Tool Usage**	**Trust Level**	**Rank_Usage**	**Rank_Trust**	**Diff (d)**	**d^2**	
2	3	2	1	1	0	0	0.5
3	2	1	2	2.5	-0.5	0.25	1
4	1	1	3	2.5	0.5	0.25	
5	0	0	4	4	0	0	

Tool Usage (Q7)	**Trust Level(Q9)**
3 = Yes, regularly	**2** = Yes, trusts fully
2 = Yes, occasionally	**1** = Somewhat, trusts partially
1 = No, but interested	**0** = No, does not trust
0 = No, not interested	