A Quantified Self Technology Framework for Monitoring and Managing Diabetes

by

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A QUANTIFIED SELF TECHNOLOGY FRAMEWORK FOR MONITORING AND MANAGING DIABETES

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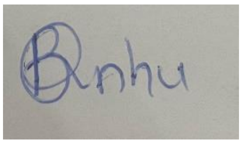

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DEDICATION

This thesis is dedicated to my mother, Chipo Mutunhu. "Mum, you fought a good fight!!!".

ABSTRACT

Background: Diabetes is a chronic disease that requires constant monitoring of blood glucose levels. However, in developing nations, most patients with diabetes fail to manage this disease. This is chiefly because the prevailing traditional methods involve infrequent hospital visits and the use of glucometers, spreadsheets, and logbooks. This is a tedious and inaccurate process that lacks real-time decision-making. Thus, most patients fail to be actively involved in the management of the disease, leading to serious complications. Quantified self-technology (QST), which uses wearable devices and mobile applications to monitor physiological parameters, offers an interactive, integrated solution for managing diabetes. However, owing to a lack of expertise, sociocultural challenges, and insufficient tailored theoretical frameworks, the adoption of QST is minimal in developing nations.

Objective: The main objective of this study was to propose a framework for adopting quantified self-technology for managing diabetes in developing countries.

Methodology: To understand QST, a systematic literature review identified the components of the QST framework. Resultantly, a conceptual framework was developed, which served as a guide in designing the research instruments for data collection. Thus, this study employed a single, embedded case study design and face-to-face interviews for data gathering. An interpretivist paradigm was used to interview 35 patients with diabetes from a hospital in Bulawayo, who were purposively and self-selected. Braun and Clarke's thematic analysis, facilitated by ATLAS.ti software, was used to improve methodological rigour.

Results: The six core drivers and inhibitors of QST adoption among diabetics were identified as user characteristics, technology preparedness, perceived benefits, usability, social norms, and cybersecurity risks. Key user characteristics include digital literacy, self-efficacy, and awareness. Technological preparedness depends on cost, access to resources, training, and lowering technology anxieties. Over 70% of participants had a tertiary education, yet 69% were unaware of QST before the study. Participants perceived usability to be determined by usefulness, ease of use, and enjoyment. Furthermore, social norms can encourage or discourage adoption, depending on the views of the family and social surroundings. Cybersecurity risks may include privacy breaches, financial losses, and the misuse of information.

Conclusion: This study proposes a framework for adopting QST to enhance diabetes self-care in developing countries. With the help of QST, patients can prevent acute complications, reduce hospital admissions, and be proactive in managing diabetes. The cybersecurity risks identified must be addressed to build trust and unlock QST benefits, including improved monitoring, adherence, motivation, data sharing, and cost savings. Thus, national health strategies should integrate QST into preventive care policies, as it will aid in monitoring, patient empowerment, and personalised treatment. However, the findings should be interpreted within the context of the study's limitations, including self-selection bias, the single-hospital setting, and the focus on one QST application.

Contributions: This research contributes to the field of health informatics theoretically. This is achieved through, first, offering a new conceptual framework for the adoption of QST within a developing country context and, secondly, identifying two new determinants, namely training and technology anxiety, and demonstrating the contextual operationalisation of digital literacy and motivation in a developing-country diabetes-management context. It also highlights the importance of explicitly recognising perceived benefits in adoption theory, demonstrating that understanding value is essential before introducing new technologies among patients. Practically, the framework provides actionable guidance for designing low-cost, user-friendly QST interventions suited to resource-constrained settings. Lastly, the framework is particularly valuable to healthcare providers, developers, and policymakers who seek to improve diabetes management through innovative self-monitoring solutions.

Keywords: Diabetes; Quantified self-technology; Self-monitoring; Self-tracking; Technology adoption; Mobile health application; Developing nations

PUBLICATIONS AND RESEARCH OUTPUTS

Journal Articles

Mutunhu, B., Chipangura, B., & Singh, S. (2024a). An Exploration of Opportunities for Quantified-Self Technology in Diabetes Self-Care : A Systematic Literature Review Quantified-Self Technology. *Journal of Health Informatics in Africa*, *11*(2), 17–30. https://doi.org/10.12856/JHIA-2024-v11-i2-481. (Impact Factor 2.422, Cite score 2.6)

Mutunhu, B., Chipangura, B., & Singh, S. (2024b). Towards a quantified-self technology conceptual framework for monitoring diabetes. *South African Journal for Science and Technology*, *43*(1), 69–84. https://doi.org/10.36303/SATNT.2024.43.1.970 (Impact factor 0.1, Cite score 2.3)

Ndlovu, B. M., Chipangura, B., & Singh, S. (2025). The readiness to use quantified self-technology : A case of diabetic patients from a hospital in Bulawayo, Zimbabwe. *Digital Health Journal.* https://doi.org/10.1177/20552076251376286 (Impact Factor 3.3; Cite score 3.5)

Mutunhu, B., & Chipangura, B. (2026). Patient Perspectives on Quantified Self Technologies and Healthcare Costs Among Patients with Diabetes in Zimbabwe. International Journal of Environmental Research and Public Health, 23(5), 663. https://doi.org/10.3390/ijerph23050663 (Impact Factor 3.2, Cite Score 8.5)

Conference Paper

Ndlovu, B. M., Chipangura, B., & Singh, S. (2024). Factors Influencing Quantified SelfTechnology Adoption in Monitoring Diabetes. In X.-S. Yang, S. Sherratt, N. Dey, & A. Joshi (Eds.), Proceedings of Ninth International Congress on Information and Communication Technology (pp. 469–479). Springer Nature Singapore. https://doi.org/https://doi.org/10.1007/978-981-97-3562-4_37

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Post Graduate Symposium

Key issues from the thesis were presented at the South African Institute for Computer Scientists and Information Technologists (SAICIT) conference and the University of South Africa (UNISA), School of Computing Post Graduate Symposiums in 2022.

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LIST OF ABBREVIATIONS

ABBREVIATION	FULL TERM
ASB	Arabic Speaking Background
CAES HREC	College of Agriculture and Environmental Sciences Health Research Ethics Committee
CAQDAS	Computer-Aided Qualitative Data Analysis Software
CVD	Cardiovascular Disease
CGM	Continuous Glucose Monitoring
COVID 19	Coronavirus Disease 19
CSET	College of Science, Engineering and Technology
DM	Diabetes Mellitus
DOI	Diffusion of Innovation
EVT	Extended Valence Theory
GDP	Gross Domestic Product
HBM	Health Belief Model
isCGM	intermittently scanned Continuous Glucose Monitoring
IoT	Internet of Things
mHealth	mobile Health
MS	Multiple sclerosis
NCD	Non-Communicable Disease
PA	Physical Activity
PD	Parkinson’s Disease
PEOU	Perceived Ease of Use
PGHD	Patient-Generated Health Data
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PU	Perceived Usefulness
QST	Quantified self-technology
QS	Quantified Self
rtCGM	real-time Continuous Glucose Monitoring
SCT	Social Cognitive Theory
SDT	Self-Determination Theory
SDG3	Sustainable Development Goal 3
SMBG	Self-Monitoring of Blood Glucose
ST	Self-Tracking
TAM	Technology Acceptance Model
T1DM	Type 1 Diabetes Mellitus
T2DM	Type 2 Diabetes Mellitus
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
UTAUT	Unified Theory of Acceptance and Use of Technology
UTAUT2	Unified Theory of Acceptance and Use of Technology 2
UNISA	University of South Africa
USD	United States Dollar

Chapter 1 : INTRODUCTION AND CONTEXT OF THE RESEARCH

1.1 INTRODUCTION

The Sustainable Development Goal 3 (SDG 3) advocates the right to good health and healthcare for every human being (Paget & Patterson, 2020). However, the human population is ever-increasing, and meeting this goal requires a significant transformation within the healthcare sector (Hameed et al., 2024), marked by a fundamental shift towards patient-centred care and through the integration of new technologies (Ogugua et al., 2024). Digital health technologies can completely revolutionise healthcare, especially in the management of chronic diseases such as diabetes (Chiolero, 2023). Diabetes is a chronic disease characterised by elevated blood glucose levels (Banday et al., 2020).

Diabetes mellitus, once thought to be a western countries' disease (Fasanmade et al., 2014; Goyal et al., 2020), is currently affecting 536.6 million people globally, including in low- and middle-income nations (Guzman-Vilca & Carrillo-Larco, 2024; Hossain et al., 2024). As the prevalence of diabetes continues to rise, propelled by urbanisation, climate change (Meo & Meo, 2024), sedentary lifestyle habits, COVID-19 (Sseguya et al., 2024), and alterations in dietary patterns (Alshehri et al., 2020), the implementation of effective self-management strategies becomes essential (Mishra et al., 2024). Self-management of diabetes is achieved through monitoring of blood glucose levels (Biryukova & Shinkin, 2024), regular exercise, weight management, adherence to medication, and other precautionary routines (Araruna et al., 2024).

Usually, millions of people monitor and manage their diabetes using traditional methods such as manual glucose meters, record-keeping (Barsukov & Demina, 2023; Kasole et al., 2019), depending on the health practitioner, and other traditional methods that include herbal medicine (Ghorat et al., 2024; Kasole et al., 2019; Sriraman et al., 2023). These traditional methods were found to be inefficient because they are expensive, sometimes prone to inaccurate readings, and do not empower patients to proactively participate in their own healthcare (Anhalt, 2016; Barnard-Kelly et al., 2024). Furthermore, the methods do not provide real-time insights necessary for effective diabetes management. To counter most of these challenges, there is a growing trend in healthcare known as the "Quantified Self movement," which employs quantified self-technology (QST) (Majmudar et al., 2015; Shin & Biocca, 2017).

Quantified self-technology is a transformative tool that enables one to collect, analyse, and reflect on their personal biomedical data (Feng et al., 2021; Heyen, 2020). Quantified self-technology also helps in personal analysis of physiological metrics and behaviours like blood glucose levels, sleep habits, exercise patterns and dietary choices (Lupton, 2019). A deep understanding of these physiological metrics facilitates timely interventions. Such technology also allows patients to make better personal decisions in their personal lives, resulting in better blood glucose management and improved quality of life (Lupton, 2019; Pare et al., 2018).

Whilst developed countries seem to be early adopters of QST in diabetes care, third-world countries, especially in Africa, seem to be laggards (Bernabe-Ortiz et al., 2023; Ebekozien et al., 2024; Karachaliou et al., 2020; Tomoko et al., 2024). Individuals diagnosed with diabetes in developing nations face challenges owing to limited access to appropriate healthcare services and resources (Chanda-Kapata et al., 2022; Zimmermann et al., 2018), coupled with the absence of customised information technology solutions that adequately address their distinct needs (Mogre et al., 2019; Farai et al., 2024; Magada, 2024), limited digital literacy and diverse cultural perceptions (Whitehead et al., 2023). Even though developed nations have successfully integrated QST into diabetes management, horizontal transfer of these solutions has been found incompatible with the third-world context (Bahendeka, 2023; Fazlyn et al., 2019; Goyal et al., 2020). Technological solutions developed for developed nations often fail to address third-world challenges (Banna & Ottesen, 2018). In many developing countries, the adoption of modern technologies for diabetes management remains low, leaving patients dependent on traditional methods such as manual logbooks and intermittent clinic visits (Barsukov & Demina, 2023; Kasole et al., 2019). Therefore, this study posited that developing countries may have underlying factors that inhibit their adoption of QST for diabetes management.

Based on the above premises, this study sought to investigate the factors influencing the adoption of QST for diabetes management in developing countries and to propose a framework to inform its adoption. The rest of Chapter 1 is structured as follows: Section 1.2 is study context, while Section 1.3 is problem statement, and Section 1.4 is research aim, questions, and objectives. Furthermore, Section 1.5 focuses on research methodology, while Section 1.6 focuses on significance and contribution of the study, and Section 1.7 is dedicated to scope of the study. Then, Section 1.8 is on limitations of the study; Section 1.9 is on ethical considerations, while Section 1.10 is on structure of the thesis, and Section 1.11 is on summary of the chapter.

1.2 STUDY CONTEXT

Diabetes is a chronic metabolic disorder characterised by elevated blood glucose levels, which can damage vital organs such as the kidneys (Mishra et al., 2024). It also causes retinopathy, which is blindness associated with diabetes and kidney failure (Gupta & Thool, 2024; Hazime & Burner, 2024; Ngwazi et al., 2025). Diabetes can be categorised into type 1, characterised by absolute insulin deficiency, and type 2, which arises from diminished insulin production and insulin resistance (Bereda, 2022; World Health Organization, 2019). Currently, there are approximately 24 million people living with diabetes in Africa (Abdul et al., 2024), although estimates vary across studies. The prevalence of diabetes in the region is projected to increase significantly in the coming decades due to population growth, urbanisation, and lifestyle changes, placing additional pressure on already constrained healthcare systems (Guzman-Vilca & Carrillo-Larco, 2024; The Lancet Diabetes & Endocrinology, 2024; Chilunga et al., 2023). Among African countries facing the challenge posed by diabetes is Zimbabwe (Mpofu et al., 2024; Kuguyo et al., 2024; Mukona & Zvinavashe, 2020; Mutowo et al., 2015). Zimbabwe is where this research was undertaken, as a case of a developing country confronting the challenge of diabetes.

Zimbabwe is confronted with substantial healthcare challenges that make it difficult to access quality healthcare (Chikwawawa & Bvirindi, 2019). These challenges include the lack of access to healthcare resources (Chikuni, 2016), the high prevalence of chronic diseases (Mangundu et al., 2020), and negative socio-economic factors that adversely affect diabetes treatment and management (Woodward et al., 2024). Indicators suggest that hospitals in Zimbabwe rely on traditional methods to monitor diabetes (Chirombe et al., 2018; Kuguyo et al., 2020). There is little to no evidence of the use of modern information technologies for managing and monitoring diabetes (Frieden et al., 2020; Mutowo et al., 2020).

In Zimbabwe, literature has documented the potential of e-health initiatives and interventions. However, full implementation has not been realised owing to financial limitations (Chilunjika et al., 2024; Chidhau et al., 2021). Recognising prior initiatives to introduce information technologies in the Zimbabwean health sector (Kidia, 2018; Chikwawawa & Bvirindi, 2019;

Musekiwa & Musekiwa, 2023), this study proposes QST to enhance diabetes management. Potential success of QST in managing diabetes is pinned on that it runs on mobile devices, which are already owned by many people (Fields et al., 2025; Shandhi et al., 2024). Thus, QST can easily be integrated into diabetes treatment and management (Almegbel & Aloud, 2021; Felipe et al., 2022).

Zimbabwe was chosen as a typical case of a developing country that is affected by challenges of managing and monitoring diabetes. As a country in Southern Africa, Zimbabwe is recognised as unique in key indicators such as GDP per capita, the human development index, poverty rate, access to basic services, infrastructure, and political stability and governance. Even though these indicators are unique to the country, they are within the range for countries considered third-world countries. That makes the standard of living in Zimbabwe comparable to that of neighbouring countries, such as Malawi, Zambia, Mozambique, Tanzania, and many others in Sub-Saharan Africa.

1.3 PROBLEM STATEMENT

In developing countries, diabetics face challenges in managing the chronic condition (Karachaliou et al., 2020; Nouhjah & Jahanfar, 2020), which compromises their overall health and exposes them to complications (Barsukov & Demina, 2023; Kasole et al., 2019). The challenges grow from failure to adhere to manual diabetes monitoring routines (Sonmez et al., 2022). Manual diabetes monitoring routines are complex because they require diabetics to self-monitor several physiological areas, including glucose testing, blood pressure, cholesterol, nutrition, and medication adherence (Barsukov & Demina, 2023; Kasole et al., 2019). Literature identified factors that make it difficult for diabetics to adhere to manual monitoring. These include dependency on medical practitioners, frequent hospital visits, limited financial resources, limited access to self-monitoring resources, and integrating monitoring routines into daily life (Adhikari et al., 2021; Farzana et al., 2020; Keresi et al., 2022; Nouhjah & Jahanfar, 2020). Manual self-monitoring was found to be prone to irregular data-collection routines, which prevent the patient from having a full view of blood glucose fluctuations, rendering the results uninformative (Anhalt, 2016; Barnard-Kelly et al., 2024). Research found that challenges encountered in manual self-monitoring of diabetes can be overcome using information technology-based self-tracking interventions (Call et al., 2024). One such technology appropriate for managing and monitoring diabetes is QST (Lupton, 2019; Pare et al., 2018).

Quantified Self is the systematic collection and analysis of personal data, often facilitated by the use of wearable technologies and mobile applications (Dulaud et al., 2020; Maltseva & Lutz, 2018). Quantified self-technology applications can be embedded and run on devices such as wearable sensors, mobile devices, and glucometers. Devices running QST can automatically collect physiological data, including blood glucose levels, physical activity, and sleep patterns (Cappon et al., 2022). Quantified self-technologies have the intelligence to analyse, present results in easy-to-understand visuals, and provide recommendations on how to respond to the results (Heyen, 2020; Feng et al., 2021). The visualisation enables patients to gain constructive insights into their health conditions, helping them respond appropriately. The response can be taking medication, exercising or seeking help from a medical practitioner (Lupton, 2019; Pare et al., 2018).

Despite the advantages associated with QST, their adoption among diabetic patients remains underexplored in developing countries (Bernabe-Ortiz et al., 2023; Dsouza et al., 2022; Ebekozien et al., 2024; Karachaliou et al., 2020). Numerous human, financial, and technological obstacles impede the widespread adoption of QST in developing contexts. The obstacles include low digital literacy, cultural resistance to novel practices, and limited financial resources to purchase compatible devices that can run quantified-self applications (Chanda-Kapata et al., 2022; Keresi et al., 2022; Zimmermann et al., 2018). While ownership of wearable devices and smartphones is on the rise, the successful integration of QST into daily diabetes self-management routines and clinical practices lags in developing countries (Mansour et al., 2024; Bernabe-Ortiz et al., 2023; Ndlovu et al., 2025). In that respect, in most developing countries, there is greater integration of fourth industrial revolution (4IR) technology services, such as social media, mobile banking, and e-hailing, into daily life than of health technologies, such as QST. This mismatch highlights a practical challenge in translating technological availability into meaningful health outcomes.

As 4IR solutions are sought to transform diabetes treatment and management, several technological adoption frameworks have been documented in the literature. Analysis of the literature in this study (see Chapter 2) identified limited theoretical frameworks that fully explain the adoption of QST in developing countries. From a theoretical perspective, although established theoretical frameworks, such as the Technology Acceptance Model (Davis, 1985), Unified Theory of Acceptance and Use of Technology (UTAUT) and UTAUT2 (Venkatesh et al., 2016; Venkatesh et al., 2003), and Self-Determination Theory (Ryan & Deci, 2000) provided valuable insights into technology adoption, none of these frameworks accounts for context-specific factors relevant to developing countries. For example, they do not explicitly incorporate infrastructural constraints such as intermittent electricity supply, socio-economic dependencies such as family financial support, or broader contextual conditions that influence the adoption of healthcare-related technologies. The frameworks inadequately address the multifaceted complexities of QST adoption for diabetes management in developing nations (Bawack & Jean, 2018; Fazlyn et al., 2020). The frameworks predominantly focus on developed countries, raising concerns about their transferability to developing countries (Ammenwerth, 2019). This limits their applicability in third-world contexts that are characterised by unique socioeconomic, cultural, and infrastructural conditions that may affect technology adoption (Bahendeka, 2023; Fazlyn et al., 2019; Goyal et al., 2020). The frameworks inadequately account for disparities in technology access, digital literacy, cultural intricacies, or other contextual obstacles (Bayaga & du Plessis, 2023; Miranda et al., 2023). In addition, the focus on individual autonomy in Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (Al-Mamary et al., 2016) may not adequately capture the impact of communities or families on decision-making practices prevalent in various developing countries (Masupe et al., 2022; Lee et al., 2023).

Therefore, the key knowledge gap addressed in this study is the lack of a contextually grounded framework explaining how technological, socio-economic, cultural, and infrastructural factors interact to influence the adoption of QST for diabetes management in developing-country settings. This study sought to address this gap by developing a framework that integrates these factors to better explain and support the adoption of quantified self-technology in such contexts.

1.4 RESEARCH AIM, QUESTIONS AND OBJECTIVES

Research Aim: To propose a framework for adopting quantified self-technology for managing diabetes in developing countries.

Objectives

1. To identify the factors that influence the adoption of quantified self-technology for managing diabetes. *The objective called for a systematic literature review to identify*

the factors that affect the adoption of quantified self-technology and the proposal for a conceptual framework.

2. To examine how the factors influence the adoption of quantified self-technology for managing diabetes in practice. *This objective enabled collection of data and empirically evaluating the factors influencing the adoption of quantified self-technology. This directed research towards the development of a framework for adopting quantified self-technology for managing and monitoring diabetes in developing countries.*

To accomplish research objective 2, the following sub-objectives were formulated to facilitate data collection. The sub-objectives were formulated based on the constructs of the conceptual framework presented in Chapter 2 (Figure 2.7).

Sub- objectives

2.1 To determine how user characteristics influence the adoption of quantified self-technology for managing diabetes.

2.2 To determine how technology preparedness influences the adoption of quantified self-technology for managing diabetes.

2.3 To determine how social norms influence the adoption of quantified self-technology for managing diabetes.

2.4 To determine how the perceived benefits influence the adoption of quantified self-technology for managing diabetes.

2.5 To determine how usability influences the adoption of quantified self-technology for managing diabetes.

2.6 To determine how cybersecurity risks influence the adoption of quantified self-technology for managing diabetes.

Research Questions

The main research question of this study was: How can a framework be developed to inform the adoption of quantified self technology for managing diabetes in developing countries?

The main research question was answered through two sub-research questions. The sub research questions were:

1. What are the factors that influence the adoption of quantified self-technology for managing diabetes?
2. How do the factors influence the adoption of quantified self-technology for managing diabetes in practice?

To answer sub-research question 2, the following investigative research questions, which were informed by the constructs of the conceptual framework proposed in Chapter 2 (Figure 2.7) were asked:

2.1 How do user characteristics influence the adoption of quantified self-technology for managing diabetes?

2.2 How does technology preparedness influence the adoption of quantified self-technology in managing diabetes?

2.3 How do social norms influence the adoption of quantified self-technology for managing diabetes?

2.4 How do perceived benefits influence the adoption of quantified self-technology for managing diabetes?

2.5 How does usability influence the adoption of quantified self-technology in managing diabetes?

2.6 How do cybersecurity risks influence the adoption of quantified self-technology for managing diabetes?

The questions informed data collection in a case study setup.

1.5 RESEARCH METHODOLOGY

This qualitative research employed an interpretivist research paradigm to investigate factors that influence the adoption of QST for managing diabetes in developing countries. The research was undertaken as a case study at a single public hospital located in Bulawayo, Zimbabwe. The research was undertaken in four phases as explained below.

1.5.1 Phase 1: Systematic literature analysis

Phase 1 answered sub-research question 1, namely "What are the factors that influence the adoption of QST for managing diabetes?" To do this, the initial phase entailed analysing and synthesising existing literature to build a conceptual framework that could inform our understanding of QST . The review explored various areas of QST and uncovered the definition of the Quantified Self, the opportunities presented by adopting QST , the factors influencing its adoption, and the theoretical frameworks adopted by prior literature. Throughout the review, important factors influencing the adoption of QST were identified and grouped in themes and subthemes. Thus, six main themes were uncovered. These were user characteristics, technology preparedness, usability, benefits, social norms, and cybersecurity risks. These components were categorised to form a conceptual framework for QST, illustrated in Figure 2.7.

1.5.2 Phase 2: Identifying units of analysis, creating data collection tools

The second phase laid the groundwork for the data-gathering techniques used in the study (Chapter 3). This included selecting units of analysis and determining data-collection methods. The data collection protocol for this study was designed (Table 3.1), page 92. The table matched the main components of the conceptual framework with the data collection methods and data sources. The interview tool was also designed at this stage (Table 3.4), page 100. It contained the construct of the conceptual framework, the interview question that was asked of the diabetic patient, references where such a question (similar/closely related) has been asked before by prior literature, and the objective of the study that is answered by that particular question/s.

1.5.3 Phase 3: Case site, sampling, data collection, and analysis

This study was undertaken as a single case study at a hospital in Bulawayo. Qualitative data were collected from a total of 35 diabetic individuals whose age range was between 18 and 65 years. The sampling methods used to recruit participants were self-sampling and purposive sampling.

To facilitate participant recruitment, a hospital in Bulawayo was contacted to promote and disseminate a recruitment form to diabetic patients who visit the hospital for diabetes medical consultations. Participation in the research was voluntary, and individuals who consented to participate contacted the researcher through email, WhatsApp, or phone. Participants were first trained on using a self-quantification application named “mySugr,” obtained from the Google Play Store and App Store. In-depth face-to-face interviews were then conducted with the diabetic patients as and when available.

1.5.4 Phase 4: Data analysis and reporting

The data analysis was qualitative and utilised the Braun and Clarke (2006)-thematic analysis procedures. The Atlas.ti software, designed for computer-assisted qualitative data analysis, was also used. This subsequently led to the identification of six themes and the development of the QST framework for managing and monitoring diabetes. Research rigour was maintained throughout the research to establish credibility, dependability, transferability, and confirmability of the research findings. Research ethics and standards were upheld throughout the study.

1.6 SIGNIFICANCE AND CONTRIBUTION OF THE RESEARCH

This study proposed a framework for adopting QSTs to manage diabetes in developing countries. The constructs of the framework are user characteristics, technology preparedness, benefits of quantified self-technology, usability, social norms, and cybersecurity risks. The framework is valuable theoretically and practically.

1.6.1 Theoretical significance

The study advances understanding of health technology adoption by identifying shortcomings in existing theoretical frameworks, including TAM, Unified Theory of Acceptance and Use of Technology (UTAUT), UTAUT2, and Self-Determination Theory. This research demonstrates the shortcomings of these established models in addressing the unique needs and conditions of diabetes patients in developing nations. Thus, it enables the development of a more relevant and tailored framework. The literature indicates that developing another framework is necessary, as the QST phenomenon is still emerging; thus, the technology's context and users need to be considered.

Through an empirical investigation, this study contributed to the body of knowledge by identifying six main factors influencing the adoption of quantified self-technology, namely user characteristics, technology preparedness, social norms, perceived benefits, usability, and cybersecurity risks. Of particular significance is the explicit identification of three more factors that influence adoption, and these are “motivation”,” technology anxiety”, and “training”. In addition, a gap was identified in the literature that the theoretical frameworks used to underpin research do not explicitly state the benefits of the technology. This is despite benefits being one of the most dominant user factors influencing technology adoption. Benefits affect compliance and adoption of QST in the monitoring of diabetes. If benefits are determined, it becomes easier to improve technology adoption to ensure an effective process of identifying, monitoring, controlling, and preventing the occurrence and management of diabetes.

1.6.2 Practical significance

The framework will provide practical assistance and valuable insights for healthcare practitioners and policymakers. The proposed framework aims to provide a systematic approach to understanding and addressing the various factors that influence the adoption of QST among diabetes patients in developing nations where healthcare resources may be constrained. This will ultimately contribute to enhanced diabetes care, improved patient engagement, greater adherence to monitoring methods, better health outcomes, and minimised prevalence of the chronic condition mentioned above within the context of developing countries. This framework can guide and inform healthcare practitioners and policymakers in improving the healthcare delivery system by enhancing diabetes monitoring, thus managing one of the non-communicable diseases.

Applying QST solutions functions to address an important public health concern, namely, diabetes. This is especially important in developing countries, where effective diabetes management is vital to reducing complications. While the application of information technology is well underway, the factors that influence general technology and QST may differ. Adopting QST is essential for several reasons. Quantified self-technology helps diabetics to actively control their health by facilitating real-time monitoring of blood glucose levels, dietary intake, and physical activity. This self-monitoring enhances awareness and encourages proactive decision-making, potentially improving health outcomes. By streamlining data collection and processing, QST may enhance the precision and timeliness of health insights, thus promoting improved diabetes self-care.

1.7 SCOPE OF THE STUDY

This research was undertaken in the field of Information Systems (IS). The investigation was limited to the adoption of QST for the purposes of managing diabetes in developing countries. For data collection, a single case study was used, and qualitative data were collected through interviews from a purposeful sample of participants who self-selected to participate in the study. The participants were diabetes patients from a hospital in the city of Bulawayo in Zimbabwe. The participants had type 2 diabetes only.

The participants in this study were introduced to only one QST application called “mySugr” for managing diabetes. In this study, mySugr was installed on smartphone mobile devices. The app was not tested on other devices, such as smart watches or wearable devices.

1.8 LIMITATIONS OF THE STUDY

The case study was done at a single government hospital, and this limits the generalisability of the findings to a wider population. Although the results cannot be generalised, they are applicable to countries in sub-Saharan Africa and other developing countries because these countries share comparable political, economic, social, and technological developments. However, further validation across a spectrum of settings is necessary.

This study utilised purposive sampling, in which participants self-selected to participate. Although the sampling methods were suitable for this study, they introduced selection bias. Individuals who volunteer for self-sampling research may not represent the broader population, as they may be interested in the phenomenon under study. However, self-selection techniques were used to align with the hospital's ethical guidelines, which mandated that patient involvement in research must be voluntary, and the hospital is not responsible for recruiting patients for research.

Participation was restricted to the age range of 18-65 years and ownership of a smartphone. This excluded other possible participants. Hence, the demographics misrepresent the entire diabetic population. Data collection in the study was based on only one QST, the "mySugr" mobile application. The application was chosen because it is free and the highest-rated and popular diabetes application. mySugr application has over 6 million registered accounts worldwide.

1.9 ETHICAL CONSIDERATIONS

This research was carried out guided by the University of South Africa (UNISA) code of ethics. Thus, the researcher read the University’s Policy and Procedures on Research Ethics and Procedures on Managing and Preventing Acts of Plagiarism to understand its contents. Data collection then followed the UNISA and a hospital in Bulawayo ethical requirements. The hospital name had to be anonymised for ethical reasons. A permission letter to the hospital requesting the use of its participants is attached as Appendix C. To use the participants from the hospital, a gatekeeper letter was granted (attached as Appendix D). Participants were invited to participate in the study through a participant invitation form attached as Appendix E. Ethical Clearance from the College of Agriculture and Health Sciences was granted and is attached as Appendix F. There was a need to get informed consent from the diabetic patients, and the informed consent form is attached as Appendix G to show voluntary participation from the participants. All participant details were anonymised, and confidentiality was maintained throughout the study.

The write-up of this thesis avoided plagiarism and Turnitin was utilised to ensure a low similarity index. A report is provided, showing the overall similarity index of the study. It is attached as Appendix A.

1.10 STRUCTURE OF THE THESIS

Figure 1.1 below illustrates the overall structure of the thesis, outlining the organisation and logical progression of the study across chapters. While the chapters are presented sequentially, the structure also reflects the interconnected and iterative nature of the research process, where later chapters build on and relate back to earlier sections.

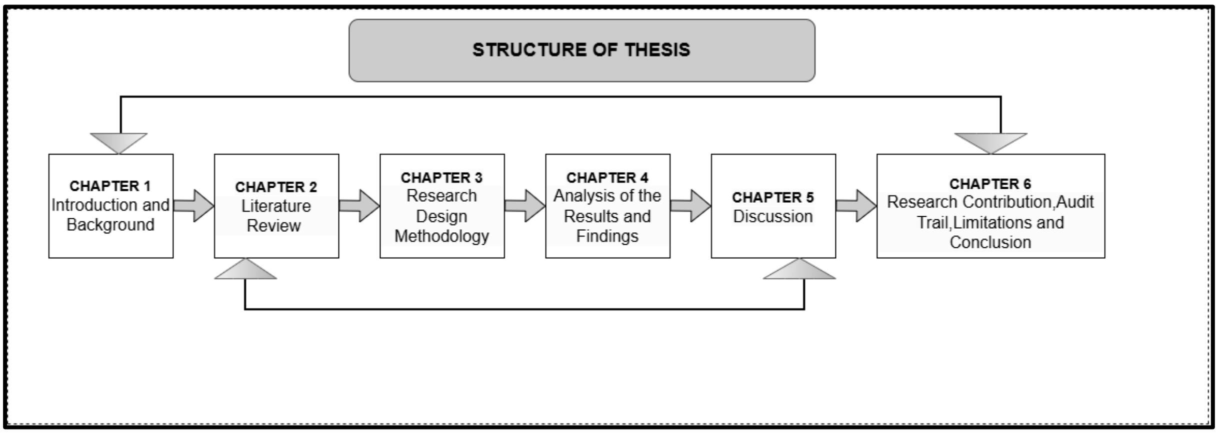

Figure 1.1: Structure of Thesis

Chapter 1: Introduction and Background-This chapter introduces the research topic, provides the background of the study, presents the statement of the problem, outlines the research aim and objectives, and identifies the research questions. It further describes the research methodology, defines the scope of the study, discusses the limitations of the study, and explains the contribution of the research.

Chapter 2: Literature Review - This chapter presents a systematic literature review that provides an overview of QST , including the opportunities it presents, factors that influence its adoption, theories employed, and research gaps. This chapter also presents the conceptual framework developed to guide the data collection process.

Chapter 3: Research design and methodology - This chapter discusses the research methods used in the study's design. The research approach (i.e., inductive), research strategy (i.e., case study), methodological choice (i.e., qualitative), data collection instruments (i.e., interview schedule), ethical considerations, and data analysis techniques supported by Computer-Aided Qualitative Data Analysis software, namely ATLAS.ti, are discussed in this chapter.

Chapter 4: Analysis of the Results and Findings – The results of the study are presented in this chapter.

Chapter 5: Discussion- A discussion of the findings is done in this chapter. The research questions posed in this study are also answered in this chapter. Furthermore, the chapter present the QST framework.

Chapter 6: Conclusion, limitations, and recommendations – This chapter highlights the research's practical, methodological, and theoretical contributions. Also highlighted is the rigour of the research in terms of the physical and intellectual trail. Finally, recommendations for future research, limitations of the research, and conclusions are presented.

1.11 Summary of Chapter

This chapter introduced the study by providing a background on QST and the context in which it is applied in diabetes monitoring and management. It presented the research problem, articulated the research questions and objectives guiding the inquiry, and outlined the study's scope and contributions to the scholarly literature and practice. Ethical considerations underpinning the study were also highlighted. While the study offers important theoretical and practical insights, its findings should be interpreted within the context of certain limitations, including self-selection bias, a single-hospital setting, and a focus on a single QST application. Building on this foundation, the next chapter presents a systematic literature review to identify and synthesise factors influencing the adoption of QST for diabetes management.

Chapter 2 : SYSTEMATIC LITERATURE REVIEW AND THE CONCEPTUAL FRAMEWORK

2.1 INTRODUCTION

Building on the research problem, objectives, and questions established in Chapter 1 above, this chapter provides a systematic literature review of QST and addresses Research Question 1(RQ1), which is, "What are the factors that influence the adoption of quantified self-technology for managing diabetes?" The chapter presents the methodology adopted for the literature review (Section 2.2), the results of the literature review (Section 2.3), a discussion of the findings (Sections 2.4, 2.5, and 2.6), and the research gaps identified (Section 2.7). Lastly, Section 2.8 presents the proposed conceptual framework. The flow of this chapter is depicted in Figure 2.1 below.

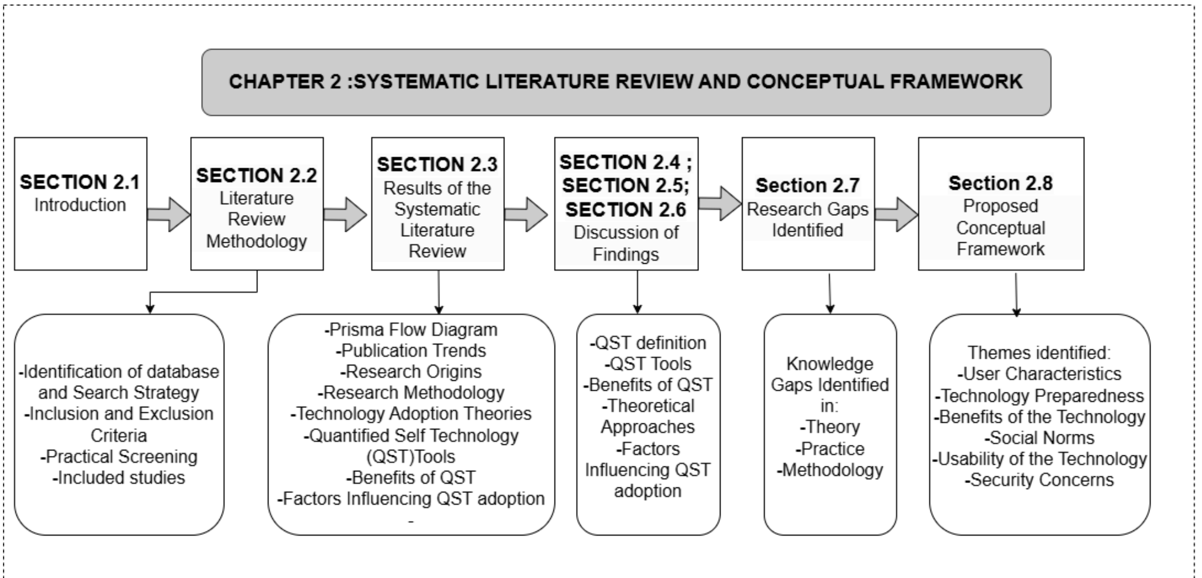

Figure 2.1 Chapter Outline

2.2 REVIEW METHODOLOGY

The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) 2020 guidelines by Page et al. (2021) was utilised in this study. The guideline provides a systematic and sequential methodology for conducting systematic reviews, ensuring consistency, transparency, and minimising any risk of bias (Albhirat et al., 2024; Muthiah et al., 2024; Sguanci et al., 2024). Consequently, the findings of the study are replicable to other contexts when PRISMA is employed (Chircop et al., 2021). This protocol has four main steps, namely identification, screening, eligibility, and inclusion. The following section outlines the steps for this review, guided by the PRISMA protocol.

2.2.1 Identification of Databases and Search Strategy

The first step in conducting this review entailed the researcher identifying the most appropriate scholarly databases for the literature search. Thus, six databases were chosen that permit the retrieval of multidisciplinary, peer-reviewed scholarly articles, including PubMed, EBSCOhost, Scopus, ProQuest, Springer, and Web of Science. These databases were selected for their comprehensive coverage of multidisciplinary, high-impact peer-reviewed literature relevant to healthcare, information systems, and digital technologies. For example, PubMed was included for its strong coverage of biomedical and health-related research, while Scopus and Web of Science were selected for their extensive indexing of high-quality, citation-tracked publications. EBSCOhost and ProQuest provided access to a wide range of academic journals and conference proceedings across information systems and social sciences, while Springer was included for its strong representation of digital health and technology-focused publications. The combination of these databases ensured broad coverage and reduced the risk of publication bias. The researcher then constructed a search strategy that was used to streamline searches across these databases. The search strategy was predicated on specific keywords. These keywords were derived from the literature and the study's purpose. To enhance the search strategy's effectiveness, it was imperative to incorporate synonyms for certain keywords, such as “quantified self” and “diabetes”. The resulting search strategy was crafted and subsequently modified, considering the syntax variations associated with the identified five databases, as shown below:

(("lifelog" OR "life-log" OR “self-monitor*” OR “self monitor*” OR “self-track*” OR “self track*” OR “quantified self” OR “quantified-self” OR “self quantif*” OR “self-quantif*”) AND ("diabet* OR “blood glucose” OR “blood sugar”))

The searches conducted across these databases yielded the following results: 52 articles from PubMed, 353 from Scopus, 171 from EBSCO, 231 from Springer, 452 from ProQuest, and 723 from Web of Science.

2.2.2 Inclusion and exclusion criteria

To be included in this review, an article had to satisfy the following inclusion criteria:

The article must have been published between 2018 and 2024 and written in English. The review period was limited to studies published between 2018 and 2024 to capture the most recent and relevant evidence, as research on QST in healthcare experienced accelerated growth after 2015 due to advancements in wearable technologies, mobile health applications, and the broader digital health ecosystem, making this period appropriate for capturing contemporary and relevant studies aligned with the study objectives. The article needed to be either a journal article or a peer-reviewed conference paper, with the full text accessible. Moreover, the subject matter must encompass literature on QST from a healthcare perspective.

Excluded studies comprised commentary articles, reports, and grey literature. In addition, research that did not address QST from a healthcare perspective was excluded. Furthermore, non-peer-reviewed research publications, preprints, and abstracts were removed. This approach ensured that the review focused on recent, high-quality, and contextually relevant studies while maintaining methodological rigour and transparency.

2.2.3 Practical Screening

The next step entailed assessing for inclusion. The search query yielded 1982 documents, including both journal articles and conference papers across the six databases. Four hundred and thirty-eight (438) duplicates were eliminated, leaving 1544 documents. The titles, abstracts, and keywords of the remaining 1544 publications were then examined for relevance and 1357 (1231 titles and 126 abstracts) articles were eliminated because they did not consider data related to self-tracking, self-quantification, and self-monitoring. Secondly, the publication needed to examine the prevalence of QST through the lenses of self-improvement, use, and uptake. Sinopoulou et al. (2024) express concern that abstracts sometimes exclude crucial information and may display significant inconsistencies with their corresponding full-text articles, indicating that abstracts should be handled thoughtfully. Thus, 187 publications remained after this process. The screening process was supported by Mendeley Desktop version 1.19.8 software, which was used to manage references, remove duplicates, and organise articles for title, abstract, and full-text screening based on the predefined inclusion and exclusion criteria.

2.2.4 Quality Appraisal

To enhance methodological rigour, the Mixed Methods Appraisal Tool (MMAT) (Hong et al., 2018) was employed to assess the quality of the included studies. MMAT was selected because the review incorporated studies that used qualitative, quantitative, and mixed-methods approaches. Table 2.1 below summarises the quality appraisal of each included study.

Table 2.1: Summary of Quality Appraisal of Included Studies Using MMAT

Study Design Category	Number of Studies (n)	MMAT Criteria Applied	General Appraisal Outcome
Qualitative	19	5 qualitative criteria	The majority of the studies were of high methodological quality.
Quantitative	48	5 quantitative criteria	The majority of the studies were of moderate to high methodological quality.
Mixed Methods	2	5 mixed-methods criteria	Studies were of moderate methodological quality.
Total	69	-	Overall, the included studies were of acceptable methodological quality.

Each study was assessed against five methodological quality criteria relevant to its respective design category, as prescribed by MMAT (Hong et al., 2018). For qualitative studies, the appraisal focused on aspects such as the appropriateness of the qualitative approach, the adequacy of data collection methods, the coherence between data sources and interpretation, the substantiation of findings, and the consideration of contextual influences. Quantitative studies were evaluated based on criteria including appropriateness of sampling, representativeness, validity of measurements, risk of bias, and adequacy of statistical analysis. Mixed-methods studies were assessed according to the rationale for methodological integration, effectiveness of integration between qualitative and quantitative components, interpretation of integrated findings, and the methodological quality of each individual component.

The appraisal revealed that most of the reviewed studies were of moderate to high methodological quality, suggesting that the findings synthesised in this review are grounded in generally credible, methodologically sound evidence. Nevertheless, some studies exhibited limitations, including small sample sizes, limited contextual descriptions, inadequate reporting of methodological procedures, and insufficient explanation of data integration processes in mixed-methods research.

2.2.5 Included Studies

The entire manuscript of the 187 retained articles was reviewed. The exclusion criteria for these articles were predicated on their capacity to exhibit thorough scholarly work; hence, publications that lacked suitable summaries of findings, alignment with the study aim, and comprehensiveness were excluded. Moreover, Gentles et al. (2016) contend that publications that are devoid of comprehensiveness are frequently preliminary investigations. Thus, in the final screening, only 69 publications met the study selection criteria, and these were the papers whose full texts were read and analysed in detail. After reviewing the whole text, the subsequent phase was synthesising, which entailed determining the most salient findings regarding the factors that influence the adoption of QST in healthcare, as well as documenting the methodologies and theories (if any). The findings are reported in the subsequent section, accompanied by Figure 2.2, which illustrates the entire procedure.

2.3 RESULTS OF THE SYSTEMATIC LITERATURE REVIEW

Figure 2.2 below presents the data flow of the literature search and screening process, following the PRISMA 2020 guidelines. It illustrates the stages of study identification, screening, eligibility, and inclusion, along with the number of records retained and excluded at each stage. This provides transparency and rigour in documenting the systematic review process.

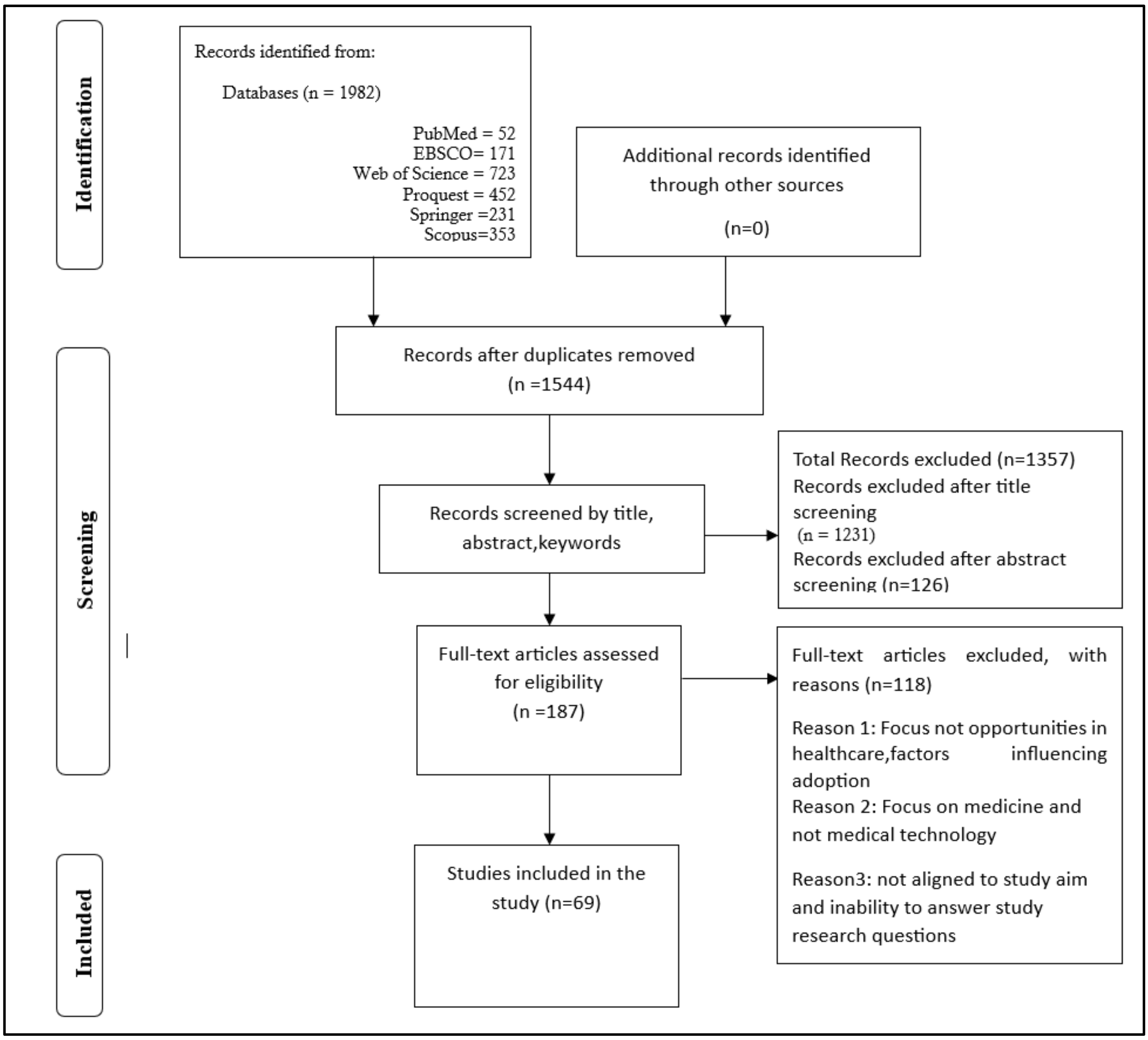

Figure 2.2: Data Flow of the Search Strategy of the Literature Review

The next section summarises the outcomes of the review. The table includes the works reviewed, the research origins, the theories, the factors that influence adoption, technologies, and methodologies employed in the reviewed studies. Finally, the main findings of the research are delineated. Appendix J presents the list of the 69 articles chosen for this review.

Figure 2.3 below presents a concept map summary of Appendix J. It highlights the most important findings about the QST phenomenon and the methodological approaches employed in the reviewed literature.

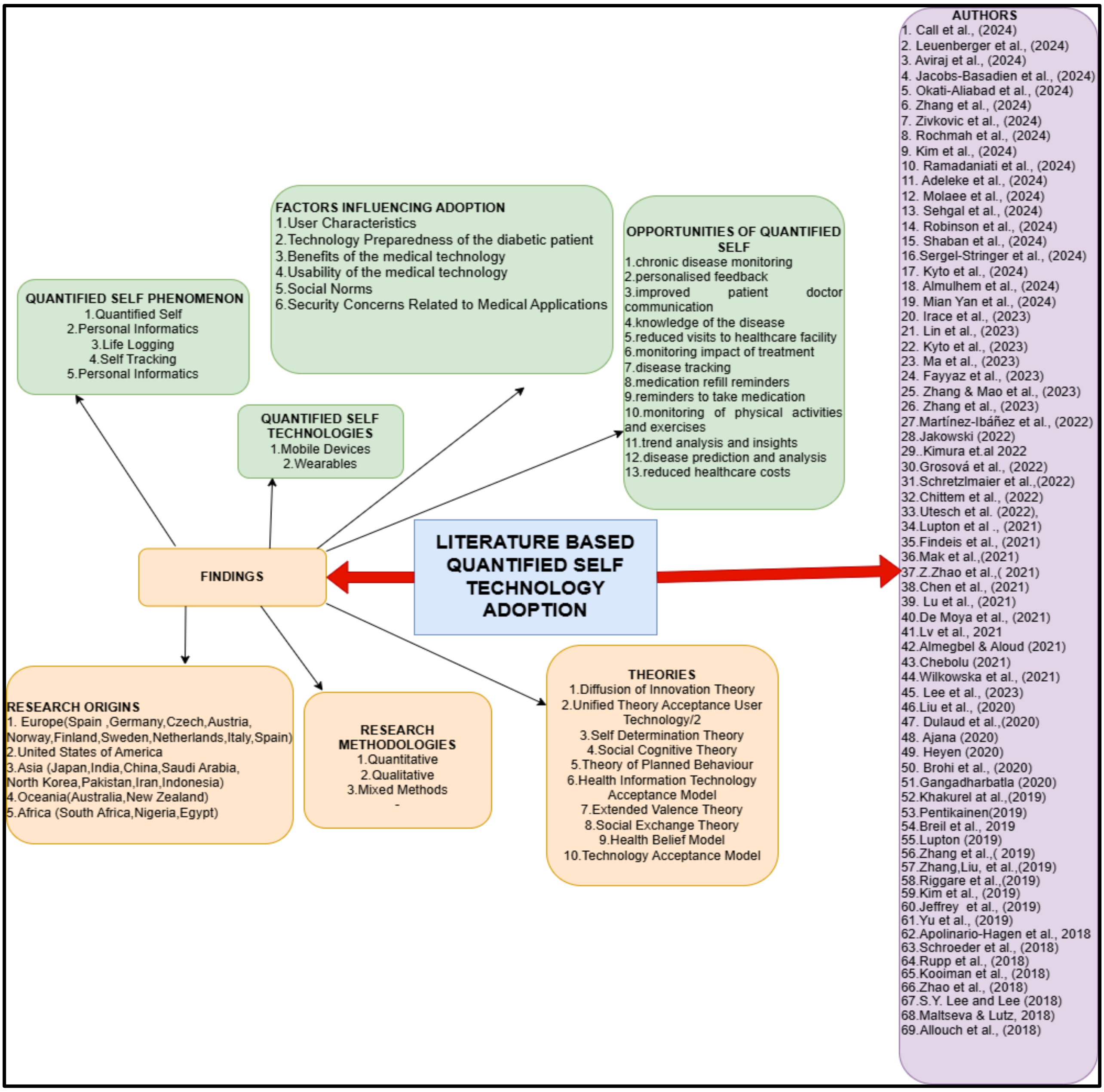

Figure 2.3: Concept Map for Literature Review

2.3.1 Publication Trends

Figure 2.4 depicts the publication trends for 2018 (8 publications), 2019 (10 publications), 2020 (7 publications), 2021 (10 publications), 2022 (7 publications), 2023 (10 publications) and 2024 (17 publications).

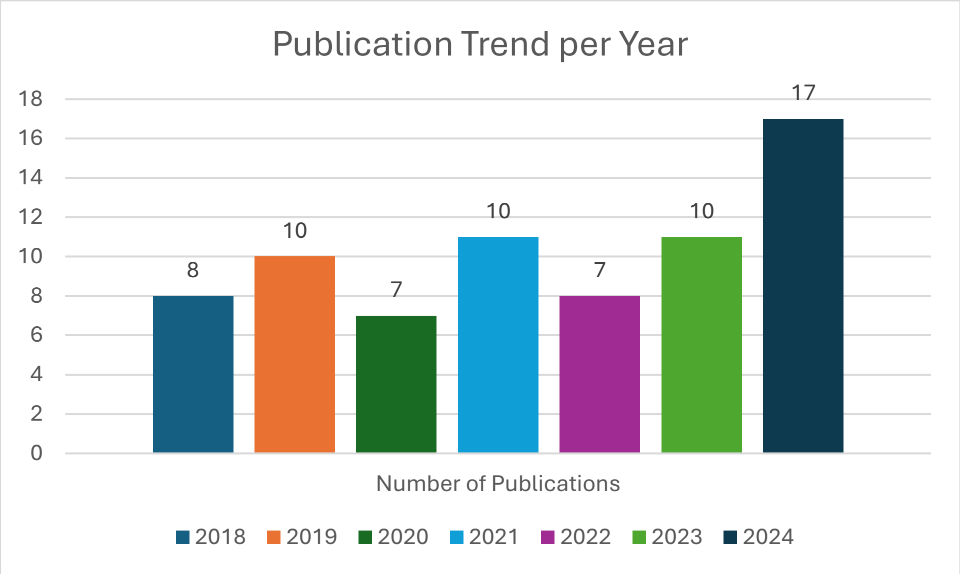

Figure 2.4: Publications per Year

There is a significant increase in publications in 2024 after fluctuations from 2018 to 2022. The trend generally shows that QST is still an emerging field, but one that is gradually progressing towards maturity, as evidenced by increasing research interest and publication output, particularly in 2024. This may be driven by technological advancements and the need for patients to engage in self-tracking practices.

2.3.2 Research Origins

The origins depict the study location from which the research sample emanated. Figure 2.5 below illustrates the origins of the research by continent.

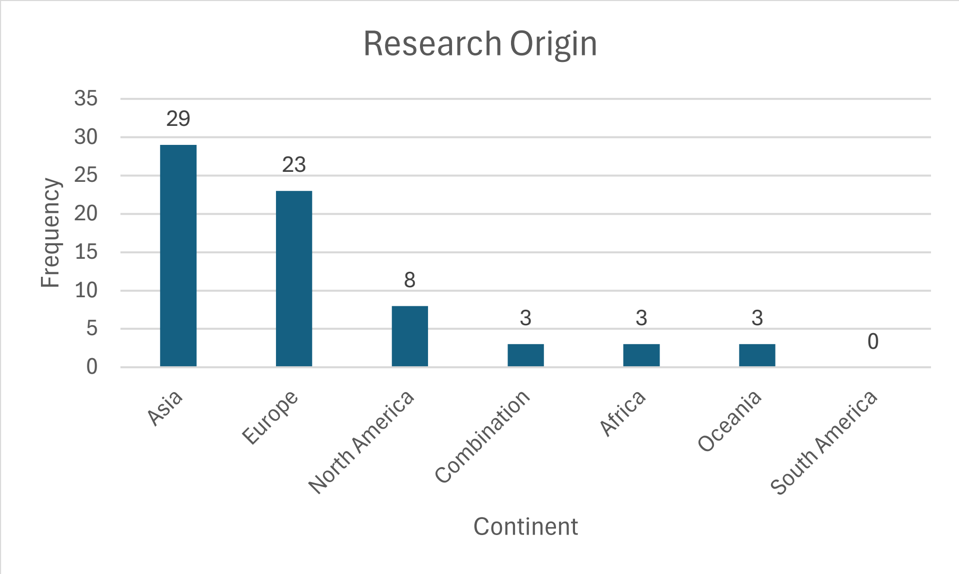

Figure 2.5: Research Origin by Continent

The geographical distribution of scholarly articles on QST reveals a notable concentration of research in Asia, with 29 publications, followed by Europe, with 23. Kitchin (2021) posits that these continents may possess more sophisticated technological ecosystems or display heightened patient engagement with QST. The combination (3) reveals collaborative efforts among researchers to discover technologically enabled interventions that benefit the global community. The comparatively low number of publications from North America (8), Oceania (3), Africa (3), and South America (0) may reflect limited representation of these regions in the reviewed dataset rather than an absence of research activity. This distribution may be influenced by factors such as database coverage, publication indexing, or the application of inclusion criteria. Nevertheless, the observed pattern highlights the need for further research in underrepresented regions, particularly in low-income and developing-country contexts, where socio-cultural, economic, and infrastructural factors may shape the adoption of QST differently.

2.3.3 Research Methodology

Figure 2.6 below illustrates the distribution of research methodologies employed in the studies reviewed. It provides an overview of the methodological approaches adopted across the literature, highlighting the relative dominance of different research designs. This visualisation supports the identification of methodological trends and gaps relevant to this study.

Figure 2.6: Research Methodology

The methodological choices employed in the reviewed studies on QST exhibit a pronounced inclination towards quantitative research methodologies. Thus, 48 studies utilised surveys and questionnaires, and only 19 studies implemented qualitative techniques such as interviews and focus group discussions. Quantitative approaches primarily yield descriptive insights into the quantified self-phenomenon, highlighting patterns and trends rather than comprehensively explaining the underlying mechanisms of QST. This emphasis on description and prediction echoes the present research environment, where the main objective is to analyse and understand data produced by self-tracking techniques rather than to investigate the intricate causal links that drive this phenomenon.

In contrast, the reliance on qualitative methodologies underscores a commitment to examining users' complex experiences and perceptions, although its use remains comparatively low. Integrating mixed methods provides a more holistic comprehension of the complex nature of QST. Therefore, it is essential to explore the QST phenomenon using alternative methodologies for research, such as qualitative or mixed methods on people from different socio-cultural contexts. These may uncover additional insights, thus facilitating a more enriched scholarly discourse and a more profound understanding of the phenomenon than quantitative studies, which primarily offer statistical meanings.

2.3.4 Technology Adoption Theories

Table 2.2 presents a summary of the key technology adoption theories identified in the reviewed literature. The table outlines the foundational models commonly used to explain technology acceptance and use, highlighting their core constructs and the studies that have applied them. This provides a conceptual basis for understanding how existing theories inform the adoption of QST.

Table 2.2: Technology Adoption Theories

Theory	**Studies that adopted the theory**	**Count**
Cognitive-affective-social-motivational model	(Zhang & Mao, 2023)	1
Unified Theory of Technology Acceptance and Use of Technology	(Breil et al., 2019) (Zhang et al., 2019)(Apolinário-Hagen et al., 2018)(Almegbel & Aloud, 2021)(Kytö et al., 2023)	5
Unified Theory of Technology Acceptance and Use of Technology 2 (UTAU2)	(Grosová et al., 2022) (Jacobs-Basadien et al., 2024)(Schretzlmaier et al., 2022)	3
Extended Valence Theory (EVT)	(Jean François De Moya et al., 2021)	1
Self Determination Theory (SDT)	(Okati-Aliabad et al., 2024)(Rupp et al., 2018)	2
Cognitive Motivation Relational Theory	(Zhao et al., 2021)	1
Social Cognitive Theory	(Utesch et al., 2022) (Lu et al., 2021)	2
Revised TAM model (Diffusion of Innovation, Self-Efficacy, Social Exchange Theory)	(Gangadharbatla, 2020)	1
TAM, Health Information Technology Acceptance Model	(Jeffrey et al., 2019)	1
Theory of Reason Action and Technology Acceptance Model	(Zhang & Mao, 2023)	1
Healthcare Technology Acceptance Model (HTAM)	(Almulhem, 2023)	1
Protection Motivation Theory	(Zhang et al., 2023)	1
Theory of Planned Behaviour (TPB), Knowledge, Attitudes, Practices, and Beliefs (KAPB)	(Lee & Lee, 2020)	1
No use of Theory		48

The results indicate that the use of theoretical frameworks in the reviewed studies was limited, with only 21 out of 69 studies explicitly grounding their research in theory. The UTAUT model was the main theory utilised by five (5) works. Other authors used a single theory or a combination of theories as illustrated in Table 2.1. Despite the use of these theories, most of the reviewed studies (48 of 69) did not explicitly report using a formal theoretical framework, although some may have been implicitly informed by theoretical constructs. Schoenfeld (2011) posits that the absence of a theoretical foundation may constrain the analytical depth, generalisability, and comprehension of the fundamental factors that influence user engagement and outcomes within QST, as evidenced by over two-thirds of the studies that did not utilise a theory. The reliance on empirical data without a theoretical context can hinder the ability to formulate broader inferences or relate findings to existing scholarly literature (Schoenfeld, 2011). The integration of established theoretical constructs can provide a substantial framework for explaining complex phenomena. It can facilitate the advancement of a more cohesive corpus of knowledge within the domain of QST (Fried, 2020; Kouam, 2024). This presents a research gap, offering prospects for future research to adopt and empirically evaluate theoretical frameworks, which could enhance the rigour and relevance of investigations within this dynamic field. Furthermore, the findings highlight the importance of developing new substantive research theories that may contextualise the quantified self-phenomena to better relate to context-specific demands.

2.3.5 Quantified Self-Technology Tools

Appendix J lists all the QST tools identified in this review. An analysis of these technological tools reveals that QST tools are divided into two categories, i.e., wearables and mobile health apps. To function, mobile health apps require a smart mobile device (Aviraj et al., 2024; Findeis et al., 2021; Lu et al., 2021; Lupton, 2019). The specific wearable devices identified were intermittently scanned continuous glucose monitors (Kimura et al., 2022; Lv et al., 2021), smartwatches, smart glasses, and smart bracelets (De Moya et al., 2021; Sehgal et al., 2024; Zhao et al., 2021), wearable blood-pressure monitoring system, wristband devices (Chen et al., 2021), Fitbit (Dulaud et al., 2020; Kooiman et al., 2018; Ajana, 2020; Sehgal et al., 2024).

2.3.6 Benefits Presented by Quantified Self-Technology

Twelve (12) benefits were identified and are presented in Table 2.3 below. The benefits fall into four (4) main themes, namely monitoring, adherence to medication, data collection and sharing, and reduced costs. Of these benefits, 37 studies acknowledge the effectiveness of QST in chronic disease monitoring.

Table 2.3: Benefits Presented by Quantified Self-Technology

Benefits	Sub-Benefits	Cited Literature
Monitoring	Chronic disease monitoring	(Apolinário-Hagen et al., 2018)(Brohi et al., 2020) (Martínez-Ibáñez et al., 2023) (Fayyaz et al., 2023) (Sehgal et al., 2024)(Robinson et al., 2024) (Shaban et al., 2024) (Kytö et al., 2024)(Pleus et al., 2022)

		(Shroeder et al., 2018)(Jeffrey et al., 2019) (Kimura et al., 2022) (Schretzlmaier et al., 2022) (Chittem et al., 2022) (Mak et al., 2021) (Lupton, 2019) (Riggare et al., 2019) (Irace et al., 2024) (Yan et al., 2023) (Findeis et al., 2021) (Liu et al., 2020) (Yu et al., 2019) (Riggare et al., 2019) (Ma et al., 2023) (Jeffrey et al., 2019) (Sergel-Stringer et al., 2024) (Kytö et al., 2023)(Aviraj et al., 2024)(Jacobs-Basadien et al., 2024)(Okati-Aliabad et al., 2024)(Zhang et al., 2024)(Zivkovic et al., 2024)(Rochmah et al., 2024)(Ramadaniati et al., 2024)(Adeleke et al., 2024)
	Tracking of diseases	(Jakowski, 2022) (Rupp et al., 2018) (Kooiman et al., 2018) (Schroeder et al., 2019) (Jin et al., 2022) (Heyen, 2020) (Riggare et al., 2019) (Kim et al., 2019)(Mishra et al., 2019)(Jacobs-Basadien et al., 2024)(Zivkovic et al., 2024)(Rochmah et al., 2024)
	Monitoring the impact of treatment	(Sehgal et al., 2024)(Schretzlmaier et al., 2022) (Findeis et al., 2021)(Dulaud et al., 2020) (Riggare et al., 2019) (Kim et al., 2019)(Mishra et al., 2019) (Schroeder et al., 2019) (Aviraj et al., 2024)(Zivkovic et al., 2024)(Kim et al., 2024)
	Monitoring of physical activities and exercise	(Zhang & Mao, 2023)(Utesch et al., 2022) (Jakowski, 2022)(Kimura et al., 2022)(Kooiman et al., 2018)(Okati-Aliabad et al., 2024)
Adherence to medication	Reminders to take medication	(Irace et al., 2024)(Liu et al., 2020)(Shaban et al., 2024)(Sergel-Stringer et al., 2024) (Apolinário-Hagen et al., 2018) (Chittem et al., 2022) (Lv et al., 2021) (Mak et al., 2021) (Kooiman et al., 2018) (Jeffrey et al., 2019)(Okati-Aliabad et al., 2024)(Rochmah et al., 2024)(Kim et al., 2024)
	Medical refill reminders	(Breil et al., 2019)(Liu et al., 2020)(Sehgal et al., 2024)(Almulhem, 2023)(Wilkowska et al., 2021) (Zhang et al., 2023)
Data collection and sharing	Personalised Feedback	(Irace et al., 2024)(Yan et al., 2023) (Zhao et al., 2021) (Kytö et al., 2023)(Ma et al., 2023) (Almegbel & Aloud, 2021) (Wilkowska et al., 2021) (Dulaud et al., 2020)(Heyen, 2020) (Gangadharbatla, 2020)(Kim et al., 2019) (Yu et al., 2019) (Lu et al., 2021)(Ramadaniati et al., 2024)
	Trend Analysis and Insights	(Zhang et al., 2023) (Mishra et al., 2019) (Schroeder et al., 2019) (Shaban et al., 2024) (Sergel-Stringer et al., 2024) (Kytö et al., 2023) (Chittem et al., 2022) (Lupton, 2019) (Liu et al., 2020) (Yan et al., 2023) (Kim et al., 2019)(Call et al., 2024)(Leuenberger, 2024)(Zivkovic et al., 2024)
	Knowledge about the Disease	(Heyen, 2020)(Sehgal et al., 2024)(Gangadharbatla, 2020) (Almegbel & Aloud, 2021) (Findeis et al., 2021) (Liu et al., 2020)(Kim et al., 2019)
	Improved Doctor Patient Communication	(Almulhem, 2023)(Irace et al., 2024)(Kim et al., 2019) (Kimura et al., 2022)(Yiyu Zhang et al., 2019)(Allouch & van Velsen, 2018)(Zivkovic et al., 2024)

Reduced Costs	Reduced visits to a healthcare facility	(Almegbel & Aloud, 2021)(Kimura et al., 2022) (Martínez-Ibáñez et al., 2023) (Breil et al., 2019) (Molaee et al., 2024) (Almulhem, 2023) (Aviraj et al., 2024)
	Reduced healthcare cost	(Dulaud et al., 2020) (Ajana, 2020)(Schroeder et al., 2019)(Kimura et al., 2022)(Kytö et al., 2023) (Grosová et al., 2022) (Jin et al., 2022) (Findeis et al., 2021) (Lupton, 2019) (Liu et al., 2020) (Utesch et al., 2022) (Zhang & Mao, 2023) (Rupp et al., 2018)(Kim et al., 2024)(Molaee et al., 2024)

2.3.7 Factors that influence the adoption of Quantified Self-Technology

Table 2.4 below presents the factors influencing the adoption of quantified self-technology as reported in the reviewed literature.

Table 2.4: Factors That Influence the Adoption of Quantified Self-Technology

Sub constructs	**Reference**	**Count**
Participants Age	(Jacobs-Basadien et al., 2024)(Adeleke et al., 2024)(Robinson et al., 2024)(Shaban et al., 2024)(Ma et al., 2023)(Fayyaz et al., 2023)(Schretzlmaier et al., 2022)(Utesch et al., 2022)(Findeis et al., 2021(Mak et al., 2021)(Lv et al., 2021)(Wilkowska et al., 2021))(Gangadharbatla, 2020)(Breil et al., 2019)(Zhang et al., 2019)(Rupp et al., 2018)(Allouch & van Velsen, 2018)	17
Gender	(Jacobs-Basadien et al., 2024)(Wilkowska et al., 2021)(Gangadharbatla, 2020)(Breil et al., 2019)(Khakurel et al., 2019)	5
Participants Level of Education	(Okati-Aliabad et al., 2024)(Rochmah et al., 2024)(Adeleke et al., 2024)(Robinson et al., 2024)(Almulhem, 2023)(G. Ma et al., 2023) (Martínez-Ibáñez et al., 2023)(Utesch et al., 2022)(Mak et al., 2021)(Chittem et al., 2022) (Findeis et al., 2021)(Zhang et al., 2019)	12
Awareness of Technology	(Rochmah et al., 2024)(Ramadaniati et al., 2024)(Robinson et al., 2024)(Fayyaz et al., 2023)(Chittem et al., 2022) (Lee & Lee, 2020)(Brohi et al., 2020)(Lupton, 2019) (Zhang et al., 2019)(Zhang, Liu, et al., 2019) (Jeffrey et al., 2019)(Zhao et al., 2018)	12
Technological Experience	(Almulhem, 2023)(Wilkowska et al., 2021)(Yan et al., 2023)(Chittem et al., 2022) (Lu et al., 2021)(Brohi et al., 2020) (Gangadharbatla, 2020)(Apolinário-Hagen et al., 2018)(Breil et al., 2019) (Jeffrey et al., 2019)	10
Self efficacy	(Okati-Aliabad et al., 2024)(Shaban et al., 2024)(J. Zhang & Mao, 2023(Yan et al., 2023)(Martínez-Ibáñez et al., 2022)(Lu et al., 2021)(Lv et al., 2021)(Chebolu, 2021)(Lee & Lee, 2020))(Gangadharbatla, 2020)(Breil et al., 2019)(Zhang, Liu et al., 2019) (Apolinário-Hagen et al., 2018)	13

Affordability of the Technology	(Okati-Aliabad et al., 2024)(Kim et al., 2024)(Ramadaniati et al., 2024)(Molaee et al., 2024)(Sehgal et al., 2024)(Sergel-Stringer et al., 2024)(Fayyaz et al., 2023)(Zhang & Mao, 2023) (Martínez-Ibáñez et al., 2022)(Kimura et al., 2022)(Grosová et al., 2022)(Schretzlmaier et al., 2022)(Chittem et al., 2022) (Lu et al., 2021)(Findeis et al., 2021)(Almegbel & Aloud, 2021)(Brohi et al., 2020)(Zhang et al., 2019) (Zhang, Liu, et al., 2019)(Lee & Lee, 2018)	20
Access to resources	(Aviraj et al., 2024)(Jacobs-Basadien et al., 2024)(Ramadaniati et al., 2024)(Sehgal et al., 2024)(Robinson et al., 2024)(G. Ma et al., 2023) (Grosová et al., 2022)(Yan et al., 2023)(Schretzlmaier et al., 2022)(Chittem et al., 2022)(Utesch et al., 2022)(Mak et al., 2021) (Findeis et al., 2021)(Lv et al., 2021)(Almegbel & Aloud, 2021)(Ajana, 2020)(Pentikäinen, 2019)(Breil et al., 2019)(Zhang et al., 2019)(Zhang, Liu, et al., 2019) (Jeffrey et al., 2019)	21
Social Identity	(Call et al., 2024)(Zhang et al., 2024)(Robinson et al., 2024)(Yan et al., 2023)(Chittem et al., 2022) (Almegbel & Aloud, 2021)(Chebolu, 2021)(Lee & Lee, 2020)	8
Subjective Norms	(Jacobs-Basadien et al., 2024)(Almulhem, 2023(Fayyaz et al., 2023) (Zhang & Mao, 2023)(Yan et al., 2023)(Kimura et al., 2022)(Grosová et al., 2022)(Schretzlmaier et al., 2022)(Chittem et al., 2022) (Mak et al., 2021)(Lu et al., 2021)(Lv et al., 2021)(Almegbel & Aloud, 2021) (Brohi et al., 2020) (Gangadharbatla, 2020)(Breil et al., 2019) (Apolinário-Hagen et al., 2018)(Schroeder et al., 2019) (Rupp et al., 2018)(Kooiman et al., 2018)(Zhao et al., 2018)(Lee & Lee, 2018)	22
Ease of use of the Technology	(Aviraj et al., 2024)(Sehgal et al., 2024)(Sergel-Stringer et al., 2024)(Almulhem, 2023)(Irace et al., 2024)(Kytö et al., 2023)(Zhang & Mao, 2023) (Zhang et al., 2023)(Kimura et al., 2022)(Grosová et al., 2022)(Schretzlmaier et al., 2022)(Utesch et al., 2022)(Lu et al., 2021)(Jean François De Moya et al., 2021)(Almegbel & Aloud, 2021)(Wilkowska et al., 2021)(Liu et al., 2020)(Gangadharbatla, 2020)(Breil et al., 2019)(S. Kim et al., 2019)(Jeffrey et al., 2019) (Yu et al., 2019)(Apolinário-Hagen et al., 2018)(Rupp et al., 2018)(Zhao et al., 2018)(Allouch & van Velsen, 2018)	26
The Usefulness of the Technology	(Call et al., 2024)(Leuenberger, 2024)(Jacobs-Basadien et al., 2024)(Zivkovic et al., 2024)(Kim et al., 2024)(Sehgal et al., 2024)(Kytö et al., 2024)(Almulhem, 2023)(Yan et al., 2023)(Irace et al., 2024)(Kytö et al., 2023)(Zhang & Mao, 2023) (Zhang et al., 2023)(Grosová et al., 2022)(Schretzlmaier et al., 2022)(Jakowski, 2022)(Lupton et al., 2021)(Mak et al., 2021)(Zhao et al., 2021)(Lu et al., 2021)(Jean François De Moya et al., 2021)(Almegbel & Aloud, 2021)(Wilkowska et al., 2021)(Liu et al., 2020)(Dulaud et al., 2020) (Ajana, 2020) (Heyen, 2020)(Gangadharbatla, 2020)(Breil et al., 2019)(Lupton, 2019)(Riggare et al., 2019)(Kim et al., 2019)(Mishra et al., 2019) (Jeffrey et al., 2019) (Yu et al., 2019) (Apolinário-Hagen et al., 2018)(Schroeder et al., 2019) (Rupp et al., 2018)(Kooiman et al., 2018) (Zhao et al., 2018)	40
Reliability	(Call et al., 2024)(Leuenberger, 2024)(Sehgal et al., 2024) (Findeis et al., 2021)(Jean François De Moya et al., 2021)(Almegbel & Aloud, 2021)(Jin et al., 2022)(Jeffrey et al., 2019)	8

Enjoyment	(Zhang et al., 2023)(Grosová et al., 2022)(Mak et al., 2021)(Lupton, 2019) (Jin et al., 2022)(Schretzlmaier et al., 2022)(Zhao et al., 2021)(Lupton, 2019)(Qingyu Zhang et al., 2023)	8
Data Theft	(Chen et al., 2021) (Jean François De Moya et al., 2021)(Ajana, 2020)	3
Data Privacy Concerns	(Call et al., 2024)(Leuenberger, 2024)(Lupton et al., 2021)(Lu et al., 2021)(Jean François De Moya et al., 2021)(Chebolu, 2021)(Ajana, 2020) (Gangadharbatla, 2020)(Pentikäinen, 2019)(Zhang et al., 2019)(Khakurel et al., 2019)(Lee & Lee, 2018) (Maltseva & Lutz, 2018)	13
Data misuse	(Call et al., 2024)(Lupton et al., 2021)(Findeis et al., 2021)(Jean François De Moya et al., 2021)(Chebolu, 2021)(Rupp et al., 2018)(Yang Zhao et al., 2018) (Maltseva & Lutz, 2018) (Yiyu Zhang et al., 2019) (Hutton et al., 2018)(Ajana, 2020) (Zhang et al., 2019) (Zhang, Liu et al., 2019) (Rupp et al., 2018)(Lee & Lee, 2018) (Maltseva & Lutz, 2018)	17

The findings, derived from 69 reviewed studies, identified 16 factors that were frequently associated with adoption. Perceived usefulness was the most frequently reported factor (40 studies), followed by perceived ease of use (26 studies) and subjective norms (22 studies). The least frequently reported factors were data theft (3 studies), gender (5 studies), and social identity, reliability, and enjoyment (8 studies each). These counts represent the frequency with which factors were mentioned across studies and do not reflect weighted evidence based on study quality or effect size, which should be considered when interpreting these findings. Nonetheless, the results provide useful insight for researchers and developers when designing and promoting QST .

2.4 DISCUSSION

This section answers the research question, "What are the factors influencing the adoption of quantified self-technology for managing diabetes?" This discussion begins by examining the outcomes that emerged from the systematic literature review. This includes an analysis of the quantified self-phenomenon, the prospects and benefits of QST, the technological tools used, research theories, and lastly, answering the research question.

2.4.1 The definition of "Quantified-Self"

The definitions of the quantified self that have been determined from the literature review are presented in Table 2.5.

Table 2.5: Quantified Self Definitions from Literature

AUTHOR	DEFINITION
(Maltseva & Lutz, 2018)	"Self- quantification is the process of collecting and reflecting on personal data by using wearable technologies and self-tracking applications".
(Khakurel et al., 2019)	"Quantified Self practices involve individuals who engage in the self-tracking of any kind of biological, physical, behavioral, or environmental information, such as continuous data about vital signs (e.g., heart rate, skin temperature)."
(Dulaud et al., 2020)	"quantified self", "self-tracking", "personal analytics", or "personal informatics" refer to systems and practices that help people collect and reflect on their personal information".
(Ajana, 2020)	"self-tracking is the philosophy of 'self-knowledge through numbers'; a form of 'wisdom' espoused by the Quantified Self community and one that encourages the gathering and analysis of data about the body and its vital aspects and extracting meaningful insights for self-improvement".
(Gangadharbatla, 2020)	"Wearable tech is typically used to keep track of health and fitness among other things, a phenomenon commonly referred to as Quantified Self."
(Chen et al., 2021)	"Self-monitoring is a technology used to provide the elderly with measurements and early warnings of various physical health indicators and enable elderly to be at home safely".
(Findeis et al., 2021)	"Self-Tracking can be seen as relevant to changes in individual lifestyle, self-, and body images."
(Yfantidou et al., 2023)	"Self-tracking (ST) or self-monitoring refers to the use of ubiquitous technology (such as wearable or mobile devices and apps) for helping users monitor and manage their PA." "ST (also referred to as self-monitoring, life-logging, quantified self, and personal informatics) refers to "the practice of gathering data about oneself on a regular basis and then recording and analyzing the data to produce statistics and other data (such as images) relating to regular habits, behaviors and feelings".

In the literature, the term quantified self is synonymised with words such as self-tracking (Ajana, 2020; Heyen, 2020; Kim et al., 2019; Riggare et al., 2019), self-monitoring (Brohi et al., 2020; Yfantidou et al., 2023), lifelogging (Kim et al., 2019; Wilkwoska 2021), personal analytics (Maltseva & Lutz, 2018), self-measurement, and personal informatics/analytics (Dulaud et al., 2020; Feng et al., 2021; Heyen, 2020; Kooiman et al., 2018).

The quantified self has been defined as the concept of self-tracking and self-improvement. This entails the systematic accumulation and examination of personal data, frequently facilitated by the utilisation of wearable technologies and mobile applications. Nevertheless, the scope and objectives of this data collection exhibit variability. Certain definitions underscore the quantification of physical and biological metrics, including weight loss, restful sleep, healthy behaviours, wellness and calorie consumption (Ajana, 2020; Calvard, 2019; Khakurel et al., 2018; Lupton, 2019). Conversely, others accentuate the overarching aim of self-awareness and self-enhancement (Dulaud et al., 2020; Gangadharbatla, 2020; Lupton, 2019).

Although the initial emphasis of the quantified self centred on health and fitness, the concept has broadened to encompass a wider range of human experiences. For instance, it has been associated with facilitating lifestyle modifications and enhancing well-being (Findeis et al., 2021), as well as influencing body image and self-conception (Gangadharbatla, 2020).

Not all definitions explicitly address the technological dimension of the quantified self. While many associate it with wearable technologies and digital tools (Chen et al., 2021; Gangadharbatla, 2020; Maltseva & Lutz, 2018), others focus on the act of self-tracking without emphasising technological modalities (Dulaud et al., 2020). This raises questions about whether traditional methods of self-observation may also be considered to be forms of the quantified self.

Furthermore, the quantified self era has empowered individuals to improve themselves beyond the confines of nature, age, and disease (Lupton, 2019). Motivational factors for self-quantification include self-optimisation, self-reflection, self-knowledge, curiosity, self-awareness, enjoyment, self-experimentation, and understanding one’s body(Dulaud et al., 2020; Findeis et al., 2021; Lupton, 2019). Consequently, communities of self-trackers have emerged where individuals meet, discuss, and contribute to self-tracking innovations (Lupton, 2019).

Empirical findings by Zhang et al. (2023) indicate that goal-setting functions as a motivational mechanism that supports sustained engagement in self-tracking activities. However, self-quantification practices may also have adverse effects. Activity trackers can generate erroneous data, negatively affecting users’ performance and confidence in the system (Almalki et al., 2016; Shi & Chen , 2021). Nonetheless, the concept of the quantified self remains prevalent in a world where humans and technology continue to co-develop, reflecting an ongoing desire to improve physical, mental, and emotional wellness (Gambier-Ross et al., 2018; Feng et al., 2021; Heyen, 2020).

In essence, although definitions of the quantified self differ in their emphasis on technology, information, and personal development, they all indicate a significant cultural shift towards self-quantification and data-driven self-awareness. As self-quantification progresses, it is essential to critically evaluate these definitions to comprehend the comprehensive spectrum of its potential advantages and disadvantages.

Based on the numerous definitions and arguments presented above, each contributing unique aspects to the understanding of the concept, this study synthesises current definitions of QST from the literature and defines it as a technology that enables people to track their own physiological, mental, behavioural, and social factors to learn more about themselves and enhance their health and well-being. It is a self-awareness activity that aligns with sociocultural norms emphasising self-awareness, reflection, and the embrace of responsibilities for managing, governing, and improving one's life chances.

2.4.2 Technological Tools Utilised in Self-Quantification

Over 500 self-tracking tools are listed in the literature as QST tools for healthcare (Lupton, 2017). Despite the various tools, these are mainly divided into two categories: (i) wearables and (ii) mobile health applications (apps) (Heyen, 2020; Lupton, 2017). The principal objective of these devices is to collect data that users can analyse on various devices (e.g., laptop, computer, or smartphone) to monitor their health and fitness.

2.4.2.1 Wearable devices

Wearable technology includes electronic devices affixed to the body, such as smartwatches and fitness trackers, capable of monitoring diverse health metrics (Adeghe et al., 2024). These tools employ sensors, microprocessors, and wireless connections to gather and transmit data (Baid, 2023). One of their properties is the ability to be unobtrusive and non-invasive (Tarafder, 2023). Hence, they frequently utilise accelerometry and other sensors to assess behavioural and physiological alterations associated with chronic pain and mental health (Vitali et al., 2024; Walsh et al., 2024). Consequently, they consistently monitor and document patients' physiological metrics, including blood pressure, electrocardiograms, blood glucose levels, temperature, and they also assess physical activity and sleep habits (Zhao et al., 2021). These devices include Fitbits, glucose-sensing lenses, and fitness trackers (Lupton, 2017; Kim et al., 2024; Pardamean et al., 2020). Smartwatches are ubiquitous fitness trackers that provide users with pleasure, efficiency, and extended functionalities such as alert notifications (Lee &

Lee, 2018; Maltseva & Lutz, 2018). However, the information exhibition on these devices is minimal, and one cannot install apps on them (Fuchs et al., 2018).

2.4.2.2 Mobile Health Applications

Mobile health applications are predicted to grow due to consumers' increasing interest in using them to manage chronic diseases (Khadge, 2024; Okolo et al., 2024; Pawar, 2025). Mobile health (mHealth) leverages the use of the internet and fine-sensors embedded in smartphones to gather health-related data (Shan et al., 2019; Velmovitsky et al., 2024). Without additional sophisticated devices, they can fulfil numerous health management and monitoring activities (Chen et al., 2021). Hence, some mobile phones are installed with smartphone applications that have specific functions to help address health-related challenges, e.g., a tracking application must be able to measure the physical parameters of an individual, such as sleep, steps, and calories (De Moya et al., 2021; Fan & Zhao, 2022; Yan et al., 2021). Some applications implement a single-core function, focusing on one primary feature such as glucose monitoring, while others are multifunctional, integrating multiple features such as physical activity tracking, diet monitoring, medication reminders, and data visualisation within a single platform (Arnika et al., 2024). The data collected is manipulated by these smartphone apps and conveyed to third parties through the cloud infrastructure (Sartori & Melen, 2023). Smartphone sensors are the same as those in smartwatches or activity bracelets. As a result, it is critical to remember that QST utilisation through mobile health applications is impossible without a smartphone.

Mobile apps enable remote self-monitoring of chronic diseases such as diabetes, mental health conditions, and high blood pressure (Ahmad et al., 2017). Remote monitoring provides prompt delivery of healthcare advice since these apps can record, send, and receive input at any time and from any location (Jeffrey et al., 2019). This ability boosts self-management skills, supports important lifestyle changes, and enhances communication between patients, families, and medical professionals (Jeffrey et al., 2019). Furthermore, patients are urged to track their symptoms through remote monitoring and share this information with others through patient support networks like PatientsLikeMe (Lupton, 2017). However, to be able to share this data, patients require access to the internet.

2.4.3 Benefits of utilising Quantified Self-Technology in Healthcare

Table 2.2 presents some of the benefits of quantified self-technology as alluded to by different researchers. The four main benefits of QST are monitoring, reduced costs, adherence to medication and data collection and sharing. The benefits are now discussed.

2.4.3.1 Monitoring

Monitoring involves chronic disease management, disease tracking, monitoring the impact of treatment and monitoring of physical activities and exercise.

Chronic Disease Management

Chronic disease management is a structured approach to enhance the health and quality of life for persons afflicted with chronic diseases, including diabetes, heart disease, and asthma (Gbigbi-Jackson et al., 2024). It is essential because chronic diseases often require ongoing care and can lead to significant complications if not managed properly. This management is accomplished through patient education, regular monitoring, personalised care plans, and coordination among healthcare providers (Bader et al., 2024). Patient education is essential, as one's cultural background and health literacy may affect how they manage their chronic disease (Alneami et al., 2024). The benefits of chronic disease management include better control of symptoms, improved patient satisfaction, and enhanced overall well-being (Gbigbi-Jackson et al., 2024). Examples of chronic disease management programs (CDMPs) include diabetes self-management programs and cardiac rehabilitation programs (Gbigbi-Jackson et al., 2024).

For a diabetic, QST helps manage daily dietary requirements by enabling users to monitor food intake, track nutritional values, and align dietary behaviour with blood glucose levels (Tomoko et al., 2024). This is particularly important, as dietary patterns play a critical role in glycaemic control and overall disease management. In addition, QST enables patients to maintain a comprehensive record of their progress. They also allow them to observe daily fluctuations and identify patterns associated with improved or deteriorating health outcomes (Kim et al., 2024). Such insights can support informed decision-making regarding diet, medication, and lifestyle adjustments.

Studies on self-tracking applications note that QST allows users to actively track health metrics that include blood pressure, blood glucose levels, nutritional consumption, and physical activity (Aviraj et al., 2024; De Moya et al., 2021; Kim et al., 2024). Resultantly, patients become more aware of their health, improving how they manage their chronic disease (Aviraj et al., 2024; Kim et al., 2024). Research conducted by Fan and Zhao (2022) on patients with Cardiovascular Disease (CVD) shows that QST enhances the treatment of CVD problems, hence improving quality of life. In addition, these researchers assert that there is currently no evidence indicating that using QST adversely affects chronic disease management. Apolinário-Hagen et al. (2018) concur with this perspective, as they similarly recognise the significance of quantified self-technology in the management of Multiple Sclerosis (MS), noting how it aids in addressing the ambiguities related to the condition.

Monitoring the Impact of Treatment

In chronic disease management, patients and doctors use QST tools to assess the impact of treatment based on medication, symptoms, and diet (Aviraj et al., 2024; Kimura et al., 2022; Zhang et al., 2019; Zivkovic et al., 2024). Treatment impact refers to the quantifiable effects of medical therapies on patients' health and quality of life (Muñoz et al., 2023; Muthu & Vadranapu, 2025). Understanding the impact of treatment helps evaluate drugs, therapies, and the best treatment regimens to give patients (Cruz Rivera et al., 2020). Moreso, monitoring the impact of treatment allows prompt intervention changes, improved patient outcomes (Marzban et al., 2022), and optimised healthcare resource allocation (Mansouri et al., 2020; Simon et al., 2020).

Kooiman et al. (2018) note that glucose-sensing lenses, transdermal monitoring patches, and other wearable sensors allow diabetics to track the impact of treatment. This data can determine if patient treatments work. Mansouri et al. (2020) add that monitoring diabetes patients' treatment effects allows timely insulin dosage adjustments and food advice, boosting patient support. Riggare et al. (2019) and Aviraj et al. (2024) found that QST tracks treatment impact in Parkinson's Disease and diabetes. This can determine which medicines improve patient survival and quality of life. In addition, Kim et al. (2019) emphasised that QST excels at monitoring the impact of treatment in individuals with autism. To do this, it can monitor an autistic patient's settings, causes and effects of challenging events, reveal adverse emotions as well as anxiety levels, which are crucial as they are part of the effective treatment of this disorder, thus resulting in improved therapeutic results.

Tracking of Diseases
The healthcare industry is progressively adopting QST for tracking diseases of patients through mobile health applications (Jakowski, 2022; Zivkovic et al., 2024; Rochmah et al., 2024). Tracking diseases entails observing the prevalence, occurrence, and progression of health conditions and disorders among patients (Jon et al., 2024; Rigdon & Fricker, 2020). Tracking aims to identify patterns, guide public health initiatives, and enhance individual patient treatment. Thus, QST can do this by gathering a patient's data and health surveys through mobile health apps (Shausan et al., 2023). Tracking chronic diseases offers advantages such as prompt epidemic/pandemic identification, efficient healthcare resource allocation, and customised preventative measures (Guralnik, 2023).

In diabetics, tracking blood glucose levels enables medical practitioners to make better and well-informed decisions that patients require (Manuel et al., 2022; Shaban et al., 2024). This assertion is substantiated by a qualitative study conducted over two weeks on autistic individuals in Korea by Kim et al. (2019), which employed a bespoke custom self-tracking platform, namely, OmniTrack, revealing that the tracking-specific metrics in autistic patients facilitate the regulation of negative emotions and anxiety during their interactions with the tracking system. Moreover, Almegbel and Aloud (2021) note that using mobile applications Tabaud, Tataman, and Tawakkalna in their research significantly aided Saudi individuals in tracking the spread of the COVID-19 pandemic. Tracking the dissemination of COVID-19 enabled public health officials to execute vaccination initiatives, prepare healthcare institutions, and, most importantly, alert patients to the progression of the disease. In addition, a quantitative study conducted by Jakowski (2022) corroborates these findings, as it reveals that German athletes who used QST through wearables and smartphone apps experienced similar benefits, such as being able to track their sleep patterns, compared to those who did not. Similarly, Robinson et al. (2024) study in the USA notes that tracking disease symptoms is highly recommended as it leads to better clinical outcomes.

Monitoring Physical Activity and Exercise
Quantified self-technology makes it possible to keep track of physical activity and exercise through a systematic assessment of people's daily steps and workouts (Adeghe et al., 2024). Regular physical activity is a must for patients as it is linked to lower risk factors for chronic diseases, better mental health, and overall fitness (Kalfin et al., 2024). This can be done through wearable fitness trackers, personal activity monitors, smartphone health applications,

motion-sensing devices, and self-reported activity logs (Kooiman et al., 2018). The advantages of this include increased motivation for physical activity, a stronger commitment to staying with fitness routines, and better health outcomes for people (Edney et al., 2024; Kalfin et al., 2024).

Utesch et al. (2022) and Kooiman et al. (2018) used step targets in Germany and the Netherlands to conduct self-tracking studies. They found that patients who used smartphone apps connected to fitness trackers had better physical health and blood glucose control than those who did not track because QST allowed them to measure, document, and quantify their performance. Quantified self-technology also monitored and improved physical activity in post-cardiac surgery (Edney et al., 2024), juvenile idiopathic arthritis (Butler et al., 2024) and elderly patients (Li et al., 2024), which are essential for better health outcomes.

2.4.3.2 Reduced Costs

Reduced costs in healthcare denote initiatives and measures designed to lower the financial burden on patients, providers, and the entire health system (Anawade et al., 2024; Vudathaneni et al., 2024). Thus, QST was found to reduce costs in 2 ways: reduced hospital visits and medical health costs.

Reduced visits to a healthcare facility

Patients employ QST to minimise their wait times in healthcare facilities, as they can self-monitor and do not need to visit the hospital or healthcare facilities physically (Aviraj et al., 2024; Ebekozien et al., 2024; Kimura et al., 2022). This brings about convenience to the patients. Kimura et al. (2022), note that cost-effective outcomes were identified when severe diabetes mellitus patients needed no hospitalisation due to enhanced self-care through self-monitoring and patient and family engagement. Aviraj et al. (2024) and Ebekozien et al. (2024), concur that self-tracking applications offer a platform for patients, particularly in rural and marginalised groups, to manage their health without the necessity of frequent trips to medical institutions. This reduces travel costs and improves their overall quality of life as they do not need to travel constantly.

Reduced healthcare costs

Quantified self-technology shows promise in reducing patient healthcare costs (Kim et al., 2024). Through reminder features, adults with hypertension in Germany and Austria indicated that QST offers promising and affordable options for disease prevention, diagnosis, and treatment and can thus support self-management remotely (Breil et al., 2019). Furthermore, investigations concerning the utilisation of mobile phone technology during the COVID-19 pandemic indicated that remote consultations through virtual clinics have significantly increased, thus mitigating both medical care expenses and visitation costs for patients (Almegbel & Aloud, 2021). For elderly and vulnerable individuals, QST provides valuable alternatives that enable them to prolong their residence in familiar surroundings while preserving their autonomy, as it alleviates the necessity for frequent visitation to healthcare institutions (Pentikäinen, 2019; Wilkowska et al., 2021). Pentikäinen (2019) observes that elderly individuals need not travel to hospitals for vital sign assessments, since these may be conducted at their residences or care facilities. Kim et al. (2024) further state that self-monitoring of blood sugar significantly reduced healthcare costs in South Korea by millions despite the initial upfront costs, demonstrating its usefulness in healthcare. Furthermore, Alberta (2024) notes that reduced healthcare costs create better financial viability for healthcare systems and patients.

2.4.3.3 Adherence to Medication

Adherence denotes the degree to which patients follow and observe the specified directives of their healthcare providers (Kılıç & Güneş, 2024). Adherence to healthcare directives is essential for good health outcomes; yet, almost 50% of patients with chronic diseases do not adhere (Haskard-Zolnierek et al., 2020). Non-adherence results in health decline, elevated hospitalisations, and significant healthcare expenditures (Kılıç & Güneş, 2024). One of the benefits that QST brings is adherence through reminders to take medication and medication refill reminders.

Reminders to take medication

Reminders to take medication are mechanisms intended to encourage patients to adhere to their recommended medication regimens (Siddiqha, 2024). These reminders are essential, as medication non-adherence might exacerbate chronic diseases (Zhao et al., 2022). Quantified self-technology through mobile phone health applications sends reminders and notifications to patients when it is time to take their medicine, assisting them in maintaining adherence (Liu et al., 2020).

People, particularly adults, who are on complex medical regimens that require them to take multiple drugs at different times, may struggle to stick to the medication schedule (Chittem et al., 2022; Turjamaa et al., 2020). Patients are calmer because they rely on the reminder functions of these QST apps. They have a better probability of recovery than those who do not, as they grow resistant to the drug due to non-adherence (Hood et al., 2016). Breil et al. (2019) conducted a study with hypertensive adults in Germany and Austria, which validated this claim by showing that QST presents significant potential in disease prevention, diagnostic procedures, and therapeutic interventions, especially through reminder functionalities. Liu et al. (2020) support this argument by showing that QST use greatly impacts the compliance with medical treatment of patients suffering from cardiovascular diseases. This particular group of patients is classically characterised by their non-compliance with medication prescribed. Furthermore, Hoval and Nevase (2024) allude that these technologies, enabled by mobile applications, provide customised medication reminders and real-time monitoring, thus successfully mitigating non-adherence issues.

Medication refill reminders

Medication refill reminders entail the notifications sent to patients through self-monitoring applications to encourage them to renew their medications before depletion (Aremu et al., 2022; Hakami et al., 2024). These medication refill reminders are crucial since prompt refills guarantee uninterrupted access to critical medications, averting treatment disruptions and lessening the likelihood of problems associated with missing doses (Telang et al., 2023). Hakami et al. (2024) note that self-tracking technology can enhance medication adherence and glucose regulation in persons with type 2 diabetes through medical refill reminders (Hakami et al., 2024). Irfan and Ahmad (2018) and Telang et al. (2023) contend that these intelligent technologies include automated pill reminder systems capable of improving diabetes self-management. To attain this goal, they utilised customised message reminders for medicine refills. The automated pill dispenser monitors medication adherence and transmits consumption data to caregivers and healthcare professionals for the patient's well-being (Irfan & Ahmad, 2018).

In addition, patients necessitate smoothly integrated, passively gathered data that includes various health behaviours to facilitate effective adherence (Bober et al., 2024). Thus, QST tools have the potential to oversee insulin refills, therefore alleviating management difficulties and enhancing the quality of life for young patients (Zeadally & Bello, 2019). Furthermore, automated insulin delivery has reduced the need for carbohydrate counting and meal alerts (Buckingham & Bergenstal, 2024). For elderly persons on complex regimens who frequently forget, automated medicine refills are crucial, as they do not have to worry about refilling. This contributes to enhanced quality of life (Wilkowska et al., 2021).

2.4.3.4 Data Collection and Sharing

Quantified self-technology collects a lot of patient data. This data can be used for trend analysis and insights, to improve patient and physician communication, to offer personalised feedback, and to give patients more knowledge about their disease.

Trend Analysis and Insights

The quantified self is a personal science, as it allows people to gather personal data to understand how they can best enhance their lifestyle by using the data (Call et al., 2024; Leuenberger, 2024). These tools gather a lot of data, producing visual patterns and graphs. This data can be analysed, revealing insights that can be used to make informed decisions (Feng, 2021; Heyen, 2020; Kim et al., 2019). It is up to the user whether to keep this data confidential or share it with others as a source of motivation. Kim et al. (2019) argue that it is very important to gather data on autistic patients, and these data are used for analysis and the identification of certain behaviours and their causes among autistic people. These findings are consistent with the results of other studies that show that the patients who analyse trends from their data are more likely to discuss their behaviour with therapists and get insights on the factors that support or contribute to their habits (Feng et al., 2021; Heyen, 2020; Leuenberger, 2024). This contemplation can foster enhanced self-awareness and understanding of how lifestyle decisions affect general well-being. In addition, Call et al. (2024) argue that the participants in their study acknowledged the pragmatic advantages of self-tracking, including acquiring insights about their health and everyday habits. This perceived utility prompted individuals to participate in self-tracking, as they felt it might result in personal enhancement and improved health results.

The findings of the studies mentioned above further reveal that setting goals to achieve certain trends and insights has both positive and negative implications. The positive health-related outcomes are satisfaction, improved quality of life, and disease management (Tabaei-Aghdaei et al., 2023). Thus, goals can serve as an incentive or stimulant to encourage self-quantifiers to persist in engaging in activities and collecting data until they attain desired results.

Improve Patient and Physician Communication

Another promising opportunity of QST is facilitating improved doctor-patient communication (Almulhem, 2023; Fan & Zhao, 2022; Zivkovic et al., 2024). When patients fail to effectively explain what has been happening to them, when, and how, to their medical practitioner during a consultation, they can easily produce the app results and insights (Dimitrov, 2016). Thus, the app results can be used to supplement and provide evidence of the explanations (Canbazoglu et al., 2016). This information is crucial as it makes the doctor easily understand what triggers certain situations and have a consistent understanding of the impact and effect of the disease on the patient. This was beneficial and highlighted during the COVID-19 pandemic, where QST apps were utilised in the USA to provide real-time communication to medical doctors, hence allowing them to detect early suspected COVID-19 cases, and decrease the number of deaths and confirmed cases of COVID-19 (Almegbel & Aloud, 2021). Similarly, Kim et al. (2019) and Almulhem (2023) highlight the benefit of QST in improving patient-physician communication by sending and showing how the patient is adhering to their medication and if they have incorporated certain lifestyle changes essential for better disease management. Aviraj et al. (2024) observe that permitting patients to input their health data fosters active engagement in their own treatment, which is essential for efficiently managing chronic illnesses. The obtained data were helpful for healthcare practitioners in tracking patient progress and customising therapies. This communication channel enhances healthcare for patients.

Knowledge about the disease

Quantified self-technology helps patients learn more about their condition (Yan et al., 2023; Sergel-Stringer et al., 2024). Mobile health apps offer disease prevention, prediction, and coping strategies. Yan et al. (2023) and Mishra et al. (2019) studies on diabetes and pulmonary disease patients, found that QST improved their understanding of their illness by countering their denial as it progressed and encouraging positive coping strategies. Quantified self-technology also helps people understand the relationship between prescriptions, symptom relief, and side effects and track their condition over time (Mishra et al., 2019). Schroeder et al. (2019) add that QST helps migraineurs understand their condition and predict and avoid headaches. This helps them learn to avoid typical problems, encourage customisation and flexibility, account for burden, negativity, lapsing, and manage uncertainty.

Personalised Feedback

Quantified self-technology is a monitoring tool that is capable of detecting numerous facets of an individual's daily life, such as the number of hours slept, the degree of exercise, and the amount of food consumed, and keeping track of them. Users can receive feedback customised to their lifestyle and health (Gangadharbatla, 2020; Kim et al., 2019). The information can be harnessed to create individualised recommendations and feedback for the users, thus allowing them to make choices that are in accordance with their particular requirements and aspirations (Irace et al., 2024; Leuenberger, 2024). To exemplify, a wearables device for fitness tracking could suggest workouts customised to the individual's fitness level and performance, while a meal-planning app could recommend modifications in meals and snacks that not only comply with the user's nutritional aims but also are appealing to their palate (Wilkowska et al., 2021). Such feedback, on the one hand, promotes a better user-technology relationship and, on the other hand, facilitates users' informed decision-making as it is based on the specific situation (Kytö et al., 2023). Furthermore, custom feedback is a helpful service for users, as it is a significant factor in maintaining their dedication to self-improvement efforts (Ramadaniati et al., 2024).

2.5 Theoretical Approaches Used in the Quantified Self

To answer the research question posed, which is to identify the factors that influence the adoption of QST, it is essential to present the theoretical models and frameworks that existing studies have leveraged. This effort is key because it will contribute to identifying the factors that are considered reasonable in influencing the adoption of QST. Different theories have been adopted by researchers, as presented in Table 2.1. The comprehensive list of all the identified theories leveraged is explained below.

2.5.1 Unified Theory of Technology Acceptance and Use of Technology (UTAUT)

The UTAUT model predicts consumer IT use (Venkatesh et al., 2003). It uses the four central constructs of performance expectancy, effort expectancy, social influence, and facilitating conditions, moderated by gender, age, experience, and voluntariness of use, to determine the limitations of TAM. As shown in Table 2.1, five of the reviewed studies (Almegbel & Aloud, 2021; Apolinário-Hagen et al., 2018; Breil et al., 2019; Kytö et al., 2023; Zhang et al., 2019) utilised UTAUT to examine QST adoption, demonstrating its empirical relevance in chronic disease management and technology acceptance research. Across these studies, performance expectancy and effort expectancy were consistently reported as significant predictors of adoption, while social influence and facilitating conditions varied by context.

However, evidence from the reviewed studies also highlights limitations. None of the five UTAUT-based studies explicitly measured cultural dimensions such as collectivism versus individualism, despite social and family influences emerging as important determinants of adoption in developing-country and collectivist contexts. Similarly, although facilitating conditions were included, contextual barriers such as intermittent internet connectivity, unreliable electricity supply, and mistrust of the healthcare system were not comprehensively modelled. This suggests that UTAUT may not adequately capture the contextual and infrastructural realities that affect diabetic patients' adoption of quantified self-technology in resource-constrained settings. The model's complexity may also create implementation and interpretive challenges (Ammenwerth, 2019), while some studies question its ability to predict actual behaviour beyond behavioural intention (Venkatesh et al., 2016; Williams et al., 2015). The rapid evolution of QST may further render some constructs outdated as user expectations change over time (Batista et al., 2023). Due to UTAUT's weak external validity, Schretzlmaier et al. (2022) added trust, self-efficacy, computer self-efficacy, innovativeness, perceived threats, and perceived risk to the model. Adding behavioural determinants shows the flaws in the technology acceptance and usage theory.

2.5.2 Unified Theory of Technology Acceptance and Use of Technology 2 (UTAUT2)

The UTAUT2 model is an enhancement of the original UTAUT model developed by Venkatesh et al. (2003). It predicts consumer technology acceptance based on intention to use and actual behaviour. In UTAUT2, hedonic motivation, price value, and habit are added to the earlier constructs of performance expectancy, effort expectancy, social influence, and facilitating conditions. The relationships between the constructs are also influenced by age, gender, and experience. As shown in Table 2.1, three of the reviewed studies (Grosová et al., 2022; Jacobs-Basadien et al., 2024; Schretzlmaier et al., 2022) applied UTAUT2 to examine the adoption of QST. These studies found that habit, social influence, performance expectancy, effort expectancy, and perceived enjoyment significantly influenced adoption and continued use. UTAUT2 was therefore useful in explaining consumer-oriented adoption, particularly where enjoyment, affordability, and habitual use are relevant. However, the reviewed studies also reveal limitations. Schretzlmaier et al. (2022) highlight UTAUT2's inability to predict mHealth acceptance because the model does not account for health-related factors perceived as critical by consumers, such as perceived disease threat, health consciousness, trust in healthcare, and health concerns. In addition, none of the reviewed studies explicitly modelled infrastructural barriers such as unreliable internet connectivity, intermittent electricity supply, or affordability constraints common in developing countries. Quantified self-technology may also be adopted for reasons such as self-awareness, self-experimentation, and community participation, which are not fully captured by the model. Thus, although UTAUT2 offers broader explanatory power than UTAUT, its omission of healthcare-specific and contextual factors may limit its applicability in chronic disease management settings.

2.5.3 Extended Valence Theory

The Valence Theory (VT), introduced by Peter and Tarpey Sr. (1975), investigates the impact of valence (benefits, convenience, time, and value) on the perception of the utilitarian logic of a user's interest in a product or service. The theory states that customers arrive at net valence by holistically evaluating the benefits and risks associated with a product or service. Consumers might prefer to use QST because it is easy to use, saves time, and provides health benefits (Dhir et al., 2021). On the other hand, the Valence Theory (VT) is insufficient for understanding behavioural intention in different contexts. It does not capture all the factors related to technology adoption (Ozturk et al., 2017). Humans and human networks are complex phenomena, and technologies must know the numerous forces acting on individuals and their environments.

2.5.4. Self-Determination Theory

According to the Self-Determination Theory (SD-Theory), people have three basic psychological needs: autonomy, competence, and relatedness (Ryan & Deci, 2000). Activities that fulfill these needs will be perceived as intrinsically rewarding, motivating people to engage in them over time (Ryan & Deci, 2000). Autonomy is the desire to be in control. Competence is characterised by being skilled and effective in overcoming challenges to achieve one's goals. Relatedness is the desire for social support and belonging (Ryan & Deci, 2000). Ignoring these demands can demotivate people, leading to technology abandonment (Ryan & Deci, 2000).

As shown in Table 2.1, two of the reviewed studies (Okati-Aliabad et al., 2024; Rupp et al., 2018) applied SDT in the context of QST adoption. These studies suggest that self-determination, motivation, and social support are important in understanding health behaviours such as diabetes self-management and self-regulation. For example, Okati-Aliabad et al. (2024) found that greater self-efficacy, access to resources, and spousal support improved adoption and glycaemic regulation, while Rupp et al. (2018) highlighted the importance of motivation and social acceptance in promoting self-tracking behaviours. However, SDT has limitations. The reviewed studies did not explicitly operationalise all three psychological needs, thus limiting their applicability. Scholars also argue that the theory may overemphasise intrinsic motivation while underrepresenting contextual, infrastructural, and cultural factors influencing adoption (Jason, 2024; Martin et al., 2020; Trigueros et al., 2019). Its reliance on self-reported quantitative measures may further overlook deeper qualitative motivations. Nevertheless, SDT remains useful in explaining the motivational drivers of QST adoption among diabetic patients.

2.5.5 Social Cognitive Theory

Introduced by Bandura (1986), the social cognitive theory (SCT) describes the influence of individual experiences, the actions of others, and environmental factors on individual health. The social cognitive theory describes how individual experiences, the actions of others, and environmental factors influence individual health behaviours. Individuals are motivated and guided by their sociocultural beliefs, behavioural capability, expectations, self-efficacy, self-control, and observational learning (Martin & Guerrero, 2020). SCT-based researchers affirm its significance in explaining how self-efficacy and social support influence the adoption of QST (Utesch et al., 2022; Lu et al., 2021), while others underscore the importance of self-efficacy (Martin & Guerrero, 2020). The theory assumes that changes in the environment will automatically result in changes in the person, which is not always true (Jeng et al., 2022). Wu et al. (2021) note that the theory strongly emphasises observational learning processes while ignoring the biological and genetic factors that may affect personality characteristics independent of experience or expectations. It is unclear how much influence each factor has on actual behaviour and whether one is more influential than the other (Martin & Guerrero, 2020). Furthermore, its broad scope and inability to operationalise and implement its constructs in interventions make it an unholistic theory (Gordillo & Prescott, 2023; Martin & Guerrero, 2020).

2.5.6 Technology Acceptance Model (TAM)

The TAM hypothesises that perceived usefulness and perceived ease of use are critical constructs in explaining individuals' attitudes towards technology acceptance (Davis,1986). Prior research has used TAM and UTAUT to measure consumers’ attitudes and intentions to use QST (Jeffrey et al., 2019). At the same time, TAM is a useful general framework consistent with several studies on the factors influencing older adults' intention to use new technology

(Alicia et al., 2022; Martín-García et al., 2021). It does not reveal other key relevant factors, such as the contextual factors that may influence adoption (Ajibade, 2018). Furthermore, it has been repeatedly stated that TAM cannot be used to measure actual use intentions because it has biases towards cognitive beliefs, lacks the explanatory strength and a balanced perspective required in current research (Ajibade, 2018; Malatji et al., 2020). As a result, researchers have advocated that TAM-based models should not be used alone but should be integrated with other models to be effective (Bryan & Zuva, 2021; Kamal et al., 2020). Furthermore, De Moya et al. (2021) argue that, given its limitations, TAM offers only a limited contribution to the examination of QST adoption.

2.5.7 Theory of Reasoned Action (TRA)

According to the Theory of Reasoned Action (TRA), a person's health actions are determined by their intention to perform a behaviour (Ajzen & Fishbein, 1975). 1) A person's attitude towards the behaviour, and 2) subjective norms regarding the behaviour, predict a person's intention to perform a behaviour (behavioural intention). Subjective norms are formed by a person's social and environmental surroundings and by their perceived control over their behaviour. A positive attitude and positive subjective norms increase perceived control and the likelihood of intentions governing behavioural changes (Ajzen & Fishbein, 1975). In studies of QST, the TRA has been utilised to examine how people with diabetes adopt technology (Zhang & Ma, 2024; Zhang & Mao,2023). These studies acknowledge the effective predictive power of TRA. In contrast, other studies highlight that this theory not only assumes that individuals possess total autonomy over their actions but also fails to take into account contextual factors such as costs and subjective norms (Harakeh et al., 2022; Malatji et al., 2020).

2.5.8 Health Information Technology Acceptance Model (HITAM)

The HITAM model is a model that adds the contrast of health and informative features, along with theoretical constructs engagement, functionality, and aesthetics, to the TAM model. The studies that have used the model accentuate its advantages, one being the ability to identify critical drivers of adoption, such as performance expectancy, effort expectancy, and facilitating conditions (Jeffrey et al., 2019). However, the model has limitations; for instance, it gives insufficient recognition to self-management outcomes (Middlemass et al., 2017), and it poses a challenge to quantify behaviour in observational studies (Malatji et al., 2020). Critics argue that addressing such problems might not be a strong enough reason to use the model concerning structural and financial issues (Malatji et al., 2020). However, these drawbacks have not rendered HITAM ineffective, as it is still regarded as a primary tool in the research of health information technology acceptance, particularly when used along with other models (Mohammad et al., 2024).

2.5.9 Knowledge, Attitudes, Practices, and Beliefs (KAPB)

KAPB represents the viewpoint that comprehending one's life patterns through appropriate health information, positive beliefs, and attitudes towards good health practices is required for understanding one's health behaviour (Sujarwoto et al., 2022). The KAPB model emphasises the importance of practice for improvement, as it takes time and effort to understand the problems with one's current health behaviours before they can be improved (Bates et al., 2020). As a result, the KAPB model is frequently used in health-related fields to provide education for health maintenance and improvement, improve attitudes and beliefs, and motivate action (Lee & Lee, 2020). Research indicates KAPB may insufficiently reflect the intricacies of human behaviour or the scarcity of accessible resources for executing preferred practices (Hiew & Low, 2024). Furthermore, knowledge and attitudes do not consistently align with practices (Mangesho et al., 2021; Patel, 2022). This disconnection may stem from cultural settings, self-perceptions, and conventional knowledge exerting a greater influence on action than mere awareness (Mangesho et al., 2021).

2.5.10 Theory of Planned Behaviour (TPB)

The theory of planned behaviour (TPB) was developed as a model to forecast actions that people have but also lack some control over, such as self-esteem and self-efficacy. The TPB expounds the concept of perceived behavioural control (Ajzen, 1991). Like the TAM, the TPB considers the intention of action; the intention denotes the extent to which specific actions are voluntary and the degree of voluntary effort expended in performing such actions (Ajzen, 1991). Its strength is in its simplicity and clear-cutness, providing a lucid structure for understanding how these factors affect the consumers' technology use decisions (Ajzen, 2020). The researchers will have a straightforward way to determine the relative importance of these factors for adoption prediction by simply measuring them. However, TPB also has limitations (Cooke et al., 2016). The theory assumes that the intentions and the behaviour have a direct correlation, which may not always be true in technology adoption areas, where there might be unnecessary influences or surprises (Jokonya, 2017). In addition, TPB may not completely capture the dynamic and developing nature of technology environments, since perceived behavioural control includes providing resources and abilities to some extent (Putra et al., 2023). The TPB tends to spotlight the individual choice, thus indirectly ignoring the role of social and contextual factors that spur technology adoption in organisations or communities (Chernozub, 2022). The theory's emphasis on conscious and logical decision-making may inadequately account for the impact of emotions, habits, or unconscious factors on technology utilisation.

2.5.11 Diffusion of Innovations Theory

Rogers' Diffusion of Innovation theory explains how innovation is communicated through specific channels over time among members of a social system (Rogers, 2005). Rogers (2010) classified adopters into five groups: innovators, early adopters, early majority, late majority, and laggards. Innovators are enterprising individuals who allow themselves to fail and learn from their mistakes by creating new, interesting ideas and products. Early adopters may not create, but they are aware of the benefits of adopting technology before others. People in the early majority adopt technologies after considering their benefits and drawbacks. The late majority adopts technology long after others have adopted it, and laggards are those who show little interest in upgrading their technology (Rogers, 2005). The DoI theory offers a framework for understanding the dissemination of novel ideas and technologies within healthcare (Talita et al., 2022). It provides insights into the adoption of e-health (Manish et al., 2021) and digital health solutions (Gangadharbatla, 2020; Ledger & Bakhai, 2021). The theory delineates critical aspects affecting adoption, such as perceived advantages, compatibility, and complexity (Sudip et al., 2019). Nevertheless, the DoI theory has shortcomings, including a pro-innovation bias and an oversight of socio-cultural issues (Iqbal & Zahidie, 2021). Research highlights the need to integrate this theory with other theories to develop a more holistic approach (Iqbal & Zahidie, 2021).

2.5.12 Social Exchange Theory (SET)

The Social Exchange Theory (SET) is used to explain why people are willing to take risks and/or give up their data and privacy in exchange for the benefits of technology (Powers, 2009). It is widely acknowledged that to function productively, humans must adhere to a set of mutually accepted norms. This is the foundation of SET, which holds that our interactions are based on the understanding that giving something someone else wants or needs will get us something we want or need (Cropanzano & Mitchell, 2005). The SET focuses solely on rewards, ignoring cultural contexts and cultural variations. According to SET, people appear to be individualistic and reward-seeking (Powers, 2009). Human interaction is reduced to a purely rational process derived from economic theory. According to the theory, people are innately selfish and are willing to end relationships when the costs outweigh the benefits. However, this assumption is not always correct. The theory does not mention the importance of self-sacrifice in determining relationship outcomes. People do not always act in their best interests (i.e., by maximising rewards and minimising costs) (Cahigas et al., 2022). Furthermore, Cropanzano et al. (2017) highlight that despite using this theory in health information technology, the theory has ambiguous constructs and lacks theoretical rigour for formulating predetermined predictions.

2.5.13 Protection Motivation Theory

Protection Motivation Theory (PMT) is a psychological theory used for comprehending health-related behaviours and designing interventions (Flyod et al., 2000; Milne et al., 2000; Rajendran & Shenbagaraman, 2017). The theory includes essential components, such as threat appraisal, where individuals evaluate the intensity and susceptibility of danger and coping appraisal, which entails assessing response efficacy and self-efficacy (Shillair, 2020). The theory asserts that heightened perceptions of severity and vulnerability amplify the drive to engage in protective behaviours, whilst self-efficacy in executing these acts bolsters compliance (Dodge et al., 2023; Mahmud et al., 2022). Thus, the theory explains how humans are driven to safeguard themselves against perceived risks. This theory is extensively utilised in health psychology and behavioural change research, facilitating the creation of effective health campaigns and interventions by identifying the determinants that influence the adoption of protective behaviours (Kowalski et al., 2023), use of wearable healthcare devices (Zhang et al., 2023) and cybersecurity practices (Mou et al., 2022). By measuring these dimensions through questionnaires and evaluations, researchers may customise treatments that target specific anxieties and obstacles, improving the efficacy of health promotion programs. Research has identified limitations in PMT applications, such as a lack of comprehensive theory tests and overreliance on correlational designs (Balla & Hagger, 2025)

2.5.14 Cognitive-affective-social-motivational model

The Cognitive-Affective-Social-Motivational (CASM) model offers an in-depth understanding of health technology adoption, recognising the role of cognitive, emotional processes and social interaction (Hastall et al., 2017). The theory posits that there are two kinds of cognition: the knowledge-related presentations that do not directly affect the emotional state and the appraisal constructs that give rise to emotions (Lazarus, 1991). It is argued that cognitive appraisal, which, in turn, is heavily affected by such individual differences, will cause an emotional reaction, which will subsequently lead to a behavioural response (Uphill & Jones, 2007). The model blends concepts from self-determination theory and social cognitive theory, thus illuminating the roles of self-efficacy, expectation of outcomes, and motivation as the primary determinants of emotional reactions and coping strategies (Compeau & Higgins, 1991; Ntoumanis et al., 2009). While this broad perspective is advantageous, the complexity of the model might also be a reason for its difficult application (Tarhini et al., 2015).

2.5.15 Cognitive-Motivational-Relational (CMR) theory

This theory distinguishes between knowledge-related presentations, which do not directly affect emotions, and appraisal constructs (Lazarus, 1991). Cognitive appraisal induces an emotional response, influencing behaviour (Uphill & Jones, 2007). Individual characteristics also influence it. Its strength resides in its comprehensive approach, recognising that technology adoption is influenced by intellectual, emotional, and social factors (Lazarus, 1991). It also emphasises contextual factors, showing how the environment can affect adoption decisions, and recognises that motives and perceptions change over time (Gill et al., 2021). However, CMR has limitations. The combination of cognitive, motivational, and relational components is hard to identify and quantify, making factor use complex (Uphill & Jones, 2007). The theory's focus on individual judgments may overlook contextual factors like culture and social conventions, which can influence technology adoption. Although favourable, CMR's dynamic nature makes long-term adoption patterns difficult to predict (Yaseen & El Qirem, 2018).

2.5.16 Constructs of the Identified Theoretical Frameworks

Table 2.6 presents the constructs of the theoretical frameworks identified in the adoption of QST as utilised by studies in Appendix J. These constructs enable us to understand the factors that influence the adoption of QST.

Table 2.6: Constructs of Identified Theoretical Frameworks

Theory	**Constructs**
Technology Acceptance Model (TAM)	• perceived usefulness • perceived ease of use

Cognitive-affective-social-motivational model	• perceived usefulness • perceived ease of use • effectiveness • feelings • social images
Protection Motivational Theory	• threat appraisal • coping appraisal • self-efficacy
Unified Theory of Technology Acceptance and Use of Technology (UTAUT)	• performance expectancy • effort expectancy • social influence • facilitating conditions • gender • age • experience • voluntariness of use • behavioural intention • use behaviour
Theory of Planned Behaviour	• attitude • subjective norms • behavioural intention • actual behaviour • perceived behavioural control
Unified Theory of Technology Acceptance and Use of Technology 2 (UTAUT2)	• performance expectancy • effort expectancy • social influence • facilitating • hedonic motivation • price value • habit • age • gender • experience • behavioural intention • use behaviour
Extended Valence Theory (EVT)	• utilitarian value • perceived risk • perceived return • trust • intention to purchase
Self Determination Theory (SDT)	• autonomy • competence • relatedness • intrinsic motivation • extrinsic motivation
Cognitive Motivation Relational Theory	• cognitive appraisal • emotional response

	• behavioral reactions • individual factors
Social Cognitive Theory	• personal factors • behaviour • environment • reciprocal determinism • behavioural capability • observational learning • reinforcements • expectations • self-efficacy
Diffusion of Innovations theory	• relative advantage • complexity • triability • compatibility • observability
Social Exchange Theory	• costs • rewards • outcome
Health Information Technology Acceptance Model	• engagement • functionality • aesthetics • information quality • perceived ease of use • perceived usefulness • perceived disease threat

2.6 Factors That Influence the Adoption of Quantified Self-Technology in Healthcare

This section discusses the factors that influence the adoption of QST , which were identified in this study. These are: age, gender, educational level, awareness of the technology, self-efficacy, access to resources, technological experience, affordability of the technology, subjective norms, social identity, perceived enjoyment, perceived ease of use, perceived usefulness, data privacy concerns, data theft, data misuse, and perceived reliability. The factors are presented individually to preserve analytical granularity and enable detailed examination; they are subsequently synthesised into broader conceptual constructs in the development of the conceptual framework (see Figure 2.7).

2.6.1 Age

Age has been widely examined as a factor influencing the adoption of QST, although findings remain mixed. Several studies suggest that older adults may face barriers related to cognitive, visual, and technological familiarity challenges, which can hinder adoption (Breil et al., 2019; Rupp et al., 2018; Zhang et al., 2019). This is often linked to lower exposure to smartphones and digital health tools among older adults (De Moya et al., 2021; Zhao et al., 2018). In contrast, younger individuals tend to demonstrate greater acceptance and use of QSTs due to higher digital literacy and perceived ease of use (Chen et al; Aviraj et al., 2024). However, this relationship is not consistent across studies. Some research indicates that older adults may be equally or even more willing to adopt self-management technologies when they perceive clear health benefits (Robinson et al., 2024), while others find that age does not significantly influence adoption or self-monitoring behaviours (Adeleke et al., 2024; Jung & Kang, 2021; Wilkowska et al., 2021). These inconsistencies suggest that age alone is not a decisive determinant; rather, its influence is mediated by factors such as digital literacy, perceived usefulness, and health needs.

2.6.2 Gender

Gender has been examined as a potential influence on the adoption of QST, although evidence suggests that its role is largely indirect. Rather than acting as a primary determinant, gender tends to function as a moderating factor, shaping perceptions such as perceived usefulness, self-efficacy, and attitudes towards technology (Breil et al., 2019; Chebolu, 2021; Wilkowska et al., 2021). Some studies report higher adoption among males, often attributed to greater technological self-efficacy and familiarity (Gangadharbatla, 2020; Aviraj et al., 2024), while others highlight females as more engaged users, particularly in health monitoring contexts where tracking behaviours support clinical preparedness (Riggare et al., 2019).

In developing-country settings, gender disparities are more pronounced, with women often facing structural barriers such as limited access to technology, financial constraints, and socio-cultural restrictions (Asi & Williams, 2020; Jaime et al., 2023). Despite these constraints, QST has the potential to support women's health management, particularly in low-resource contexts (Amee et al., 2020; Khadijeh et al., 2023). However, some studies find no significant relationship between gender and adoption behaviours, suggesting that differences in usage may be better explained by underlying factors such as access, digital literacy, and context rather than gender alone (De Moya et al., 2021).

2.6.3 Educational Level

Ramadaniati et al. (2024) suggested that a person's level of education may also affect their perception of QST. Even though most people own a cell phone, a lack of formal education is a hindrance to embracing technology because of a lack of skills to operate the technology and a lack of e-health literacy skills (Adeleke et al., 2024; Eyrich et al., 2021; Rochmah, 2024; Teresa et al., 2022). Without a high school diploma, one may lack the interaction and training to operate health-related technologies such as telehealth, health applications, and health-related websites. This poor digital and e-health literacy may restrict their use of health management technology (Cheng et al., 2023; Eyrich et al., 2021; Williams & Shang, 2023). Similarly, the study by Rochmah et al. (2024) found that patients with tertiary education are 65 per cent more likely to utilise self-monitoring technology than those with lower educational attainment.

A study in Spain found that patients with higher levels of education exhibited greater patient empowerment and were better able to understand strategies for self-adjusting antihypertensive treatments (Martínez-Ibáñez et al., 2023). Another study in India by Chittem et al. (2022) concurs with these findings, as physicians believed that if patients had better educational levels, they would understand that alternative therapies like Ayurveda do not “cure” diabetes, but rather self-monitoring can better manage it and improve quality of life. Affirming these studies were the findings by Adeleke et al. (2024) and Okati-Aliabad et al. (2024), who note that higher educational attainment frequently corresponds with enhanced health literacy. This, in turn, empowers patients to comprehend medical information, grasp the significance of their blood glucose levels, and acknowledge the necessity of regular monitoring for efficient diabetes management. In addition, the level of education was a consideration in research conducted within a Chinese setting, which found that patients with higher levels of education or who were well educated showed better compliance with SMBG and embraced new technology to improve their diabetic condition. The education variable ensured that patients had adequate literacy skills and strong intrinsic psychological forces that encouraged them to adopt SMBG as a behaviour (Mak et al., 2021; Rochmah, 2024; Zhang et al., 2019).

2.6.4 Awareness

Awareness plays a foundational role in the adoption of QST, as individuals are unlikely to adopt technologies they are unaware of, regardless of their potential benefits (Almegbel & Aloud, 2021). Awareness is typically developed through social and informational channels, including word of mouth, app reviews, social media, and structured educational interventions (Farooq et al., 2020; Yoon et al., 2024). Several studies demonstrate that increased awareness through targeted education and digital health campaigns can enhance knowledge and improve adoption rates, particularly in chronic disease management contexts (Alhazmy & Khalil, 2024).

A lack of awareness remains a significant barrier to adoption, with many individuals unaware of the availability or functionality of self-tracking applications for conditions such as diabetes and Parkinson's disease (Mishra et al., 2019; Zhang et al., 2019). This issue is further compounded in some contexts by limited engagement from healthcare practitioners, who may themselves lack awareness of these technologies and therefore do not recommend them to patients (Alaslawi et al., 2022; Dušan et al., 2023; Ramadaniati et al., 2024).

However, awareness alone does not guarantee adoption. Evidence shows that even in contexts where awareness levels are high, actual usage remains low, suggesting a gap between knowledge and behavioural engagement (Lv et al., 2021; Rochmah et al., 2024). This indicates that awareness must be complemented by other factors, such as perceived usefulness, motivation, and access, to translate into meaningful adoption.

2.6.5 Technology self-efficacy (TSE)

The acceptability of QST is influenced by technology self-efficacy (Adeleke et al., 2024; Aviraj et al., 2024; Lv et al., 2021). Technology self-efficacy is a concept derived from UTAUT that refers to an individual's capacity to perform a specific activity (Venkatesh et al., 2003). Rupp et al. (2018) and Lee and Lee (2018) show that individuals with high technology self-efficacy are more interested in using self-tracking devices and thus rate them as easier to use. Breil et al. (2019) and Wilkowska et al. (2021) concur that QST applications are perceived as easier to use by participants with high self-efficacy. Adeleke et al. (2024) recommend training programs to enhance patients' self-efficacy in utilising QST tools for self-monitoring, thus increasing confidence.

In addition, Adeleke et al. (2024) indicated that patients at Bowen University Teaching Hospital had training, enabling them to correctly monitor their blood glucose levels and analyse their data to modify their treatment programs. Aviraj et al. (2024) note that training is needed to increase self-efficacy, as participants in their study received training on how to use the application effectively. This had a positive impact on self-management and compliance with diabetes management procedures. These findings also support those of Grochowska et al. (2021) and Masadeh and Saleh (2023), who found that most patients with diabetes needed this training to improve their self-efficacy. It was found that a lack of training resulted in reduced self-efficacy, a barrier to adoption, and resulted in resistance to change (Farenden et al., 2024; Derecho et al., 2024).

2.6.6 Access to Resources

Access to resources can affect the adoption of QST (Jacobs-Basadien et al., 2024; Schretzlmaier et al., 2022). Resources include access to smartphones, apps for tracking a person's activities, and internet access (Jacobs-Basadien et al., 2024; Schretzlmaier et al., 2022). Moreover, according to Mehbodniya et al. (2021), the adoption of QST to improve diabetic self-care is a promising tool among patients who possess the basic tool-related resources, such as cell phones and internet access. Other research corroborates that the initial necessary tools for adopting QST are continuous glucose monitoring and insulin pumps (Fayyaz et al., 2023; Lv et al., 2021). Moreover, Ebekozien et al. (2024) and Bober et al. (2024) discovered that another crucial challenge, even for diabetic patients, is the availability of the internet; however, this is hindered by contextual factors such as high costs for accessing the internet or being limited by networks that require electricity, although the latter is a necessary basic resource for regular monitoring. These observations align with Zhang et al. (2019), who found that even with basic health management tools such as smartphones, adoption is limited by insufficient internet access, thus undermining the efficacy of QST .

In Czech, Grosová et al. (2022) demonstrated that access to resources is insignificant for the adoption of QST , especially given the proliferation of smartphones and apps. In addition, the lack of adequate access to resources, such as healthcare via the internet, is also confirmed by Zhang et al. (2019) as a barrier to the adoption of QST . Moreover, because there are few efficient tools for QST, patients refrain from engaging in the practice, as exemplified by Mishra et al. (2019). In that respect, Aviraj et al. (2024) discuss and emphasise that patients require access to resources that facilitate their compliance with the routine of self-monitoring.

2.6.7 Technological Experience

The term experience refers to diabetic patients' capacity to utilise QST , stemming from prior use (Jeffrey et al., 2019). It is a moderating variable in models such as the UTAUT model (Venkatesh et al., 2003). Experience with QST can develop from past use of mobile health applications, observation of their use, or formal training in these technologies through smartphone ownership or wearable technology for a specific duration of time (Jeffrey et al., 2019). Having the necessary experience improves patients' perceptions of quantified-self applications and their concerns about their usability, thus increasing the adoption behaviour of these applications (Almulhem, 2023; Apolinário-Hagen et al., 2018; Yan et al., 2023). Wilkowska et al. (2021) state that high experience leads users to perceive the technology as valuable and easy to handle. This finding aligns with Apolinário-Hagen et al. (2018) and Almulhem (2023), who state that experience plays a vital role in positively shaping patients' behaviour towards the adoption of technology. Furthermore, Breil et al. (2019) state that the experience of previous users of a system plays a vital role in determining its adoption.

Nevertheless, Wilkowska et al. (2021) show that experience is not a major factor in the adoption of QST among German users. Although these participants in the study had limited experience with Multiple Sclerosis self-tracking applications, their usage remained high.

2.6.8 Affordability of the Technology

The affordability of quantified self-technology relates to the costs of procuring glucometers, glucose strips, the device (smartphone), and paid-for app features (Zhao et al., 2021). The affordability of the technology is closely linked to the cost construct of the UTAUT theoretical model (Venkatesh et al., 2003). Technology users seek to embrace cost-effective solutions; if expensive, it will not be accepted (Adeleke et al., 2024; Almegbel & Aloud, 2021; Schretzlmaier et al., 2022). Adeleke et al. (2024) assert that pricing insulin and SMBG devices is pivotal. The high cost of these devices may dissuade individuals, particularly those with limited financial resources, from acquiring these indispensable commodities. Schretzlmaier et al. (2022) also found that 88% of their research population said they would utilise a self-management app provided it was affordable. Nonetheless, if the expense is substantial, it will hinder acceptability and obstruct adoption. Kim et al. (2024) observe that, despite the initial costs associated with quantified self-technology, the perceived advantages and enhanced quality of life rendered affordability an insignificant concern for patients.

Chittem et al. (2022) found that financial constraints can hamper the effective use and acceptance of QST in India. The diabetic patients were found to avoid buying glucose strips and glucometers for SMBG, indicating that they are expensive and unnecessary expenditures. Thus, patients prioritised buying medication, which they considered a necessity, over SMBG, which was seen as a luxury and not a necessity. Consistent with these findings, Faraj et al. (2024) note that the adoption rate of mobile health applications for diabetic self-management ranges from 7.0% to 47.0%, with cost identified as a significant barrier. Dehnavi et al. (2021)

further note that affordability issues and the absence of economic assistance impede the adoption of this revolutionary technology.

In contrast, Mak et al. (2021) did not find the costs associated with QST use, such as glucose strips, to be barriers to SMBG. Similarly, Almegbel and Aloud (2021) found that the affordability of the technology is not a concern among people in Saudi Arabia. This is so because they can access their health ministry's paid or free health applications. This aligns with another study conducted in China, which indicates that diabetes management applications are provided at no cost. Consequently, the cost is not a substantial consideration for them (Zhang et al., 2019).

Researchers assert that the cost factor must be assessed before implementing any QST initiatives, as it has different implications for individuals based on their employment status, family income, and country (Almegbel & Aloud, 2021; May et al., 2021; Zhao et al., 2021). These researchers further note that in some countries, mobile health applications may be available for free or at a minimal fee. In contrast, in other countries, users need to purchase them, which has a different effect on adoption depending on the context.

2.6.9 Subjective Norms

Subjective Norm impacts the behavioural intention to adopt a technology (Venkatesh et al., 2003). It indicates an individual's view of external influences on technology adoption (Okati-Aliabad et al., 2024; Schretzlmaier et al., 2022). Subjective norms from the user's community, family, medical professionals, friends and relatives influence technology adoption intentions (Chen et al., 2021; Chittem et al., 2022; Okati-Aliabad et al., 2024). Empirical research shows that social pressures drive the use of QST (Chen et al., 2021; De Moya et al., 2021). Through word of mouth, internet platforms, and recommendations, Saudi users' positive behavioural intention to adopt QST for chronic disease monitoring is formed by community members, families, and close friends (Almegbel & Aloud, 2021). Similarly, Jacobs-Basadien et al. (2024) found that diabetes patients were more likely to utilise the app with support from family, friends, and doctors. Okati-Aliabad et al. (2024) also found that the patient's spouse greatly affects diabetic self-management. An informed partner may help the patient improve self-care compliance, whereas a partner with less education and technological knowledge may not, worsening health outcomes.

Research utilising people with multiple sclerosis as the study population found that, despite their reliance on the World Wide Web for medical information and advice, their healthcare provider remained the most trusted source and influencer regarding technology use (Apolinário-Hagen et al., 2018; Zhang et al., 2019). Almegbel and Aloud (2021) corroborate these findings, indicating that subjective norms influence the acceptance behaviour of older users. They prefer quantified self apps recommended by a healthcare expert. Integrating the self-monitoring application with their physicians enhanced their sense of fulfilment and productivity. Carrera et al. (2024) argue that adopting diabetes self-management tools remains fundamentally dependent on doctors' guidance, collaborative treatment, familial support, and appropriate nutrition. A supportive family network can encourage patients to adhere to their self-care routines, including medication adherence, dietary modifications, and regular physical exercise. This assistance can help patients overcome obstacles to proficient self-management (Okati-Aliabad et al., 2024; Ramasawmy et al., 2024; Woodward et al., 2024).

In contrast, in Hong Kong, Mak et al. (2021) found that family motivation and support are not key concerns for adopting health technologies. In a separate study, every participant diagnosed with Multiple Sclerosis (MS) had not been introduced to the notion of QST health applications by their healthcare providers. They depended on and esteemed their physicians' advice (Apolinário-Hagen et al., 2018).

2.6.10 Social identity

Social Identity denotes an individual's self-concept from affiliation with diverse social groupings (Pedrero et al., 2022). For a diabetic patient, social identity is an interaction of self-perception and societal perception, involving their identification within the broader context of diabetes and how this affiliation influences their experiences (Koudenburg et al., 2024). This identity cultivates a sense of belonging, enhances self-esteem, and offers emotional and practical support through shared experiences and ideas (Daynes-Kearney & Gallagher, 2024). Call et al. (2024) found that members of the LivedAnalytics group frequently experienced a sense of isolation in their self-tracking pursuits because they saw their hobbies as "unusual" to those around them. The community provided a venue for individuals to engage with like-minded peers, fostering a sense of belonging and collective identity. This social connection motivated participants to embrace self-tracking activities, as they experienced support and comprehension within the group. Supportive social gatherings can furnish informational, emotional, and appraisal support (Myneni et al., 2020; Pérez-Aldana et al., 2021). Patients have the opportunity to exchange experiences, strategies, and practical insights regarding the effective utilisation of self-tracking applications and devices, the resolution of common complications, and the interpretation of the data they compile (Al-Dwaikat et al., 2021 ; Frey et al., 2021). This environment, conducive to peer-to-peer learning, has the potential to furnish actionable strategies that resonate more profoundly than abstract directives provided by healthcare professionals (Hazime & Burner, 2024). Chronic disease management often engenders feelings of isolation and distress; however, the challenges and triumphs that others face cultivate a sense of community and mitigate feelings of loneliness (Higa et al., 2021; Song et al., 2018).

Individuals with diabetes may encounter stigma stemming from unfavourable preconceptions and prejudice when they diverge from accepted group standards (Speight et al., 2024). Diabetic patients are usually stigmatised (Turnbull et al., 2020) for being obese (Metzendorf et al., 2024) and for refusing alternative therapies to manage their diabetes (Chittem et al., 2022). This stigma can result in social isolation, bias, and a reduced feeling of self-esteem, which subsequently affects their mental health. Chittem et al. (2022) found that the social circles of diabetic patients may be negatively affected, as they recommended alternative therapies to self-monitoring, like Ayurveda. They believed that these therapies could "cure" diabetes instead of these monitoring apps, thus impeding adoption. Similarly, Ghorat et al. (2024) and Althubyani et al. (2024) found that the utilisation of traditional herbal medicine and traditional beliefs in the management of diabetes is widespread within the social circles of diabetes patients, thus obstructing the successful adoption of technology.

In addition, Chebolu (2021) emphasises that an individual's religion and societal culture, which are part of their social identity, influence their actions and thoughts. In this respect, individuals may reject self-tracking technology if it conflicts with their religious beliefs and cultural values (Ajana, 2020; Almegbel & Aloud, 2021).

2.6.11 Perceived Enjoyment

Perceived Enjoyment, also known as Hedonic motivation, is the pleasure and fun associated with using technology (Venkatesh et al., 2003). Perceived Enjoyment is associated with the adoption of QST and use intention (Grosová et al., 2022; Schretzlmaier et al., 2022). As the enjoyment and entertainment value associated with QST adoption grow, the greater the acceptance of the technology among diabetic patients (Grosová et al., 2022; Zhang et al., 2023).

Schretzlmaier et al. (2022) found that 63% of mHealth users enjoyed using an app, leading them to check blood glucose more frequently. Jacobs-Basadien et al. (2024) found that users enjoyed using an m-health application; they reported a positive user experience and a high success rate in capturing self-tracking data. Furthermore, Fanaroff et al. (2024) note that gamification elements enhanced enjoyment when cardiovascular patients tracked their physical activities (Fanaroff et al., 2024). Contrary to these findings, Grosová et al. (2022) found that perceived enjoyment was an insignificant factor in the adoption of QST , as users did not enjoy using self-tracking apps even though they continued using them. In addition, in a study conducted by Lupton (2019), one of the research participants reported that self-tracking was not fun but rather a burden, thus demotivating them to track their diabetes.

2.6.12 Perceived Ease of Use

Perceived Ease of Use (PEOU), originating from the Technology Acceptance Model 1985), determines the adoption of QST . Users evaluate QST based on the user experience, including user interface design, feedback mechanism, complexity, learning curve/cognitive load, availability of training and support, compatibility and convenience, which subsequently influences their overall attitude and desire to embrace the technology (Aviraj et al., 2024; Zhao et al., 2021; Adeleke et al., 2024).

Breil et al. (2019) assert that information and training delivered by healthcare practitioners may enhance ease of use. Moreover, researchers corroborated the importance of effort expectancy for aged individuals with particular requirements (Apolinário-Hagen et al., 2018; Schretzlmaier et al., 2022; Zhao et al., 2018). The researchers observe that older individuals like user-friendly personalised applications with adjustable text sizes to accommodate varying visual capabilities. Furthermore, Adeleke et al. (2024) also found that perceived ease of use is a crucial factor among the elderly who face cognitive issues that could affect their ability to monitor their blood glucose levels. Thus, interfaces need to be designed considering user accessibility for diverse users.

In addition, Aviraj et al. (2024) found that a user-friendly interface and simplified data entry enhance adoption rates. Macdonald et al. (2018) note that inadequately designed interfaces and manual data entry are obstacles that exacerbate a technology's usability. Facilitators of efficient technology use include access to reliable technology, automated data entry, graphical representations with prompt feedback, and assistance from healthcare professionals.

On the contrary, other researchers, such as Zhang et al. (2019) and Rupp et al. (2018), did not identify perceived ease of use as a significant influence on the use of diabetes management applications. The discrepancy arises from the research sample, which comprised young, well-educated individuals who stated they do not perceive technology as challenging to use.

2.6.13 Perceived Usefulness

Perceived Usefulness (PU) is the degree to which a user believes that technology will enhance their overall effectiveness (Davis, 1985). Research on diabetic self-tracking applications indicates that patients' belief in the potential usefulness of QST tools enhances their willingness to utilise them (Apolinário-Hagen et al., 2018; Call et al., 2024; Zhao et al., 2021).

Zhao et al. (2021) found that QST can be perceived as useful if it has the necessary functionality and provides new services to users. A diabetic app is useful if it provides glucose tracking, reminders, dietary intake, exercise notifications, and goal setting. In addition, it is useful if it provides high-quality information consistently (Jeffrey et al., 2019). This concurs with similar studies on diabetic patients, which found that the propensity to utilise diabetes management applications increases when patients perceive them as useful (Apolinário-Hagen et al., 2018; Zhang et al., 2019). Consequently, the perceived utility manifests in the functioning and information quality, personalisation, interactivity, and satisfaction with using the product (Apolinário-Hagen et al., 2018; Zhang et al., 2019).

Call et al. (2024) also note that community dialogues about the value of data and the exchange of experiences enhanced the perceived usefulness of self-tracking. In addition, research highlights that including personalised features in an app that provides feedback tailored to the individual's unique situation enhances usefulness (Chen et al., 2024; Gosetto et al., 2023). Kooiman et al. (2018) and Bertolazzi et al. (2024) highlight that the information provided by these technologies should be explicit and beneficial to users so that they are more inclined to use the technology. High-quality information allows diabetics to make educated health decisions. Conversely, participants noted that if they encountered false or misleading information, they would be annoyed and would never trust anything else the app provided. This will further inhibit their willingness to interact with the technology.

Desveaux et al. (2018) found that an absence of certain contextual features may hinder adoption. Furthermore, Althubyani et al. (2024) note that cultural dietary practices and food-related beliefs may influence diabetes management. However, strong precautions are needed, as traditional foods and dietary customs may conflict with diabetic dietary guidelines, complicating adherence to a nutritious, proven diabetic diet.

2.6.14 Data Privacy Concerns

Data privacy concerns affect consumers' attitudes and behaviours when considering adopting QST (Ajana, 2020; Chen et al., 2021; Hutton et al., 2018; Schretzlmaier et al., 2022). Managing data ownership, dissemination and secondary use beyond its primary purpose is complicated (Kahn & Terry, 2024). Data privacy laws change frequently, making data ownership and control more difficult for users (Call et al., 2024; Gangadharbatla,2020). Personal health data collection, storage, and dissemination raise concerns about user autonomy and informed consent (Ma et al., 2023). When patients' privacy is infringed, the health information gained may stigmatise them, discouraging them from using QST (Brinson & Rutherford, 2020). Thus, data privacy concerns can hinder the adoption of QST (Gangadharbatla, 2020; Hutton et al., 2018).

Zhang et al. (2019) found that privacy concerns slightly limited the adoption of QST , as participants stated they were aware of privacy laws that protected their health data. In contrast, a USA-UK study found no security and data protection issues impeding adoption (Ajana, 2020). Lupton (2021) found that people did not contemplate how software businesses and government agencies could use their data. Participants said they had not fully examined the ramifications of using a tracking app and had accepted the terms and conditions without much inspection. This shows widespread data privacy ignorance. Despite this research showing that data privacy concerns do not affect monitoring application use, strong privacy protections are needed. Technology businesses must enforce strict privacy standards while consumers use their products. Stakeholders can boost user confidence and QST adoption by addressing privacy issues.

2.6.15 Data Theft

Data theft constitutes an obstacle to the implementation of QST, as concerns about protecting personal health information may discourage prospective users (Chen et al., 2021). Data theft occurs when illegal access is gained to sensitive information, including biometric data, health records, and lifestyle preferences. This fosters scepticism about wearable devices and health-tracking applications (Kapoor et al., 2020).

Hackers use system weaknesses to steal medical data (Rai, 2024). Due to its sensitive nature, hackers target quantified self data, including biometric and health records (Wieczorek et al., 2022). If sensitive medical data is stolen, it can cause financial and physical harm (Rai, 2024). Self-tracking devices collect sensitive body data that users may want to keep private (Jean François De Moya et al., 2021). Studies show that customers are becoming more aware of the dangers of digital health technology, leading to reluctance to reveal personal information (McGraw and). Others found that data theft issues prevented the adoption of QST (Ajana, 2020; de Moya et al., 2019).

Thus, preventing data theft is crucial to building confidence and implementing quantified self-technology. Robust encryption methods, limited data collection, robust authentication, and regular security audits and system updates can prevent data theft (Hameed et al., 2024; Kaur et al., 2024; Zhou et al., 2019).

2.6.16 Data Misuse

Diabetics can distrust QST due to data misuse. Data misuse pertains to using personal health data for marketing or profiling, raising ethical questions about consent and autonomy (Leuenberger, 2024). Companies can misuse patient data by selling it to third parties for profit (Chiruvella & Guddati, 2021; Haq et al., 2021). Research shows customers worry about discrimination and privacy infringement when insurance companies and employers use their data (Call et al., 2024; Chebolu, 2021; De Moya et al., 2021). Businesses and third-party apps are often opaque about how they collect and use quantified self data. Users may unknowingly consent to data practices they didn't understand. Fitness tracking data may be used for targeted health insurance advertising, raising concerns about discrimination and exploitation (Lupton, 2020). A lack of data control reduces confidence and discourages the deployment of QST (De Moya et al., 2020). De Moya et al. (2021) note that users who distrust QST will not utilise it because it will exploit their data.

Nevertheless, in the USA and the UK, the research findings indicate that data misuse is not a substantial problem, as participants exhibited no apprehension regarding the utilisation and dissemination of life-logging data with third parties; thus, their views towards the adoption of

QST remained unaffected (Ajana, 2020). Similarly, Lupton (2021) findings revealed a lack of concern about data abuse, the possibility of using patient data by third parties, and the risks associated with data misuse. In addition, the participants revealed that they trust companies overseeing their data. They expressed that these companies know that their data are confidential and only utilise it for research.

The perceived risk of data misuse can lead to a substantial decline in user engagement with QST , as consumers may abandon these technologies entirely to safeguard their data (Lupton, 2021). Therefore, developers and stakeholders need to establish clear data governance procedures and develop ethical frameworks and robust regulations that instil confidence in users regarding the ethical use of their data (Winkler et al., 2023; Yuninda et al., 2022).

2.6.17 Perceived reliability

Perceived reliability is the extent to which users believe new technologies will work accurately and consistently (Barua et al., 2018). This construct is from the UTAUT model (Venkatesh et al., 2003). Reliability is essential for encouraging users' adoption of technology-based services, as it positively influences user satisfaction with self-service technology (Kytö et al., 2023; Leuenberger, 2024). Almegbel and Aloud (2021) confirmed the influence of perceived reliability on mHealth adoption. Their findings show that Saudi users expect mHealth apps to operate thoroughly and consistently.

Unreliability can stem from an app's failure to perform correctly, hence not fulfilling its intended purpose, thus leading to misdiagnosis, hindering adoption (Gangadharbatla, 2020; Almegbel & Aloud, 2021). Other research demonstrates that people stop using QST when it does not precisely depict their activities or requires manual input (Khakurel et al., 2019; Zhao et al ., 2018). According to Leuenberger (2024), consumers are more likely to employ self-tracking devices if they believe their data is accurate and dependable. When information is reliable, people are more likely to trust technology's insights and suggestions, increasing its use. Data reliability is vital for effective decision-making. Consumers are more likely to make informed health and lifestyle decisions if they trust self-tracking device data. Conversely, Jeffrey et al. (2019) observe that perceived reliability does not affect mHealth app adoption.

2.7 RESEARCH GAPS IDENTIFIED

The subsequent section discusses the implications of the results in terms of practice, methodology, and theory. This study's findings identified five (5) research gaps.

2.7.1 Research Gap1: Gap in Practice

In developing nations, it is well acknowledged that people with diabetes find it challenging to monitor their condition regularly (Karachaliou et al., 2020; Nouhjah & Jahanfar, 2020). This situation is associated with adverse health impacts, a high risk of complications, and low quality of life (Barsukov & Demina, 2023; Kasole et al., 2019). This challenge is mainly due to the problems faced by diabetes patients when using standard methods of continuous monitoring (Sonmez et al., 2022). Though the means are basic and important, they are often based on less frequent visits to hospitals, irregular measurements of glucose levels, and maintaining records through glucometers, spreadsheets, and logbooks, which previously validated problems concerning maintenance, patient compliance, and the inability to supply necessary and effective, instantaneous, and up-to-date information concerning necessary lifestyle and medicinal corrections (Barsukov & Demina, 2023; Kasole et al., 2019). The extant literature indicates that various elements present significant hurdles concerning the effective use of standard means to monitor diabetes, such as the lack of accessible healthcare, low levels of health literacy, low availability of healthcare professionals, healthcare costs, and the inability to implement the means into people's everyday lives (Farzana et al., 2020; Keresi et al., 2022; Nouhjah & Jahanfar, 2020(Keresi et al., 2022)).

This reliance on traditional approaches often leads to irregular data collection, impeding patients' ability to understand their blood sugar trends and make informed decisions about their healthcare (Anhalt, 2016; Barnard-Kelly et al., 2024). Effective self-management is essential for individuals with diabetes to attain blood glucose control and avert long-term complications, especially in developing countries where healthcare resources and access to care are frequently constrained. Thus, innovative strategies to enhance self-management and improve patient outcomes are necessary.

2.7.2 Research Gap2: Contextual Gap

Most research has focused on people from privileged social groups in developed countries (China, Germany) who track their health indicators. The analysis also found that research in Africa is lagging. Little is known about how Africans engage in self-tracking or oppose it.

Furthermore, little is known about how the elderly diabetic patients with low literacy levels, emanating from this continent, engage or do not engage with QST. Future research may examine an African emerging country with healthcare resource constraints, as its infrastructure may not be as well established and the context may differ, yet diabetes prevalence is rising (Mutunhu et al., 2023). In addition, patterns in African user behaviour towards technology adoption suggest that the continent is prepared to adopt any technology that proves useful and helps lower healthcare costs (Ijeh et al., 2024; Wisdom et al., 2024). It is essential to contextualise QST to address country-specific issues and to drive strategic innovation. Socio-cultural and economic factors vary per nation; each study must be contextualised accordingly (Bahukudumbi et al., 2024; Poulsen et al., 2024; Thomann et al., 2022). For example, a country like Zimbabwe in Africa may have a different health response than a European country like Sweden. Furthermore, the GDP per capita of these countries, cultural norms, political conditions, and the social well-being of these countries may differ. Thus, there is still a gap in the literature that requires scholarly attention.

2.7.3 Research Gap3: Bias towards Quantitative Studies

The empirical research examined in this study indicates a bias in data collection methods favouring quantitative approaches over the less prominent qualitative approach. This evaluation indicates that most research (48 out of 69) exhibited a bias in favour of quantitative methodologies over qualitative and mixed-methods approaches. Numerous studies have gathered quantitative data that is suitable for descriptions and forecasts but inadequate for explanations (Cresswell & Creswell, 2018). However, the literature comparing results from interviews and questionnaires concludes that qualitative data are richer and more insightful than quantitative data, as they can answer the why and how questions. questions and not merely the How much? questions that are answered by quantitative research (Ames et al., 2024; Denny & Weckesser, 2022). The relatively low level of adoption among patients calls for more rigorous qualitative research in this area to better understand this population's perspectives and preferences (Feng et al., 2021). Considering these limitations, some valid and pertinent factors may have been missed. Qualitative evidence is required to accurately summarise self-quantifiers' experiences and preferences to inform targeted adoption of QST.

2.7.4 Research Gap4: Gaps in Theory

In this study, only a small proportion (21 out of 69) of the studies utilised a suitable theory to theorise the adoption of QST. Thus, most studies did not ground their research on theory.

Despite the recognition of TAM, UTAUT, Valence Theory, DoI, Social Cognitive Theory (SCT) (Bandura,1986), Theory of Planned Behaviour (TPB) (Ajzen, 1991), Self Determination Theory (SDT) (Ryan & Deci, 2000), Cognitive-Motivational-relational theory (Lazarus, 1991) as essential, these theories of technology adoption have limitations in explaining the structures and foundations that facilitate the adoption of QST (Jin et al., 2022). They are biased towards either micro or macro levels of analysis by emphasising either the voluntary actions of individuals or the determining aspects of the social system (Kauffman & Techatassanasoontorn, 2011; Orlikowski, 1992; Trigueros et al., 2019). Furthermore, they possess limitations that restrict their relevance to the context of QST adoption for diabetes (Dulaud et al., 2020). These frameworks inadequately address context-specific complexities of QST adoption for diabetes management in developing nations, including infrastructural barriers such as intermittent electricity supply and unreliable internet connectivity, socio-economic constraints such as family financial interdependence, and user-related challenges such as low digital literacy and limited awareness (Bawack & Jean, 2018; Fazlyn et al., 2020). These frameworks have been used in developed nations. Importantly, the aforesaid frameworks, namely TAM, UTAUT2, and SDT, generally overlook the specific benefits that certain technologies, especially in health, may provide to an individual (Almansour et al., 2022; Bawack & Jean, 2018). At least in part, users need to be aware of or should have been made aware of the benefits of using the technology to appreciate its usefulness. The exclusive geographical focus of these theories on developed nations makes their application to developing nations a worrisome feature (Ammenwerth, 2019). Hence, they may not be very applicable across various local contexts due to differing socioeconomic, environmental, cultural, and infrastructure conditions that significantly affect technology adoption (Bahendeka, 2023; Fazlyn et al., 2019; Goyal et al., 2020). Further, studies indicate that the use of these long-established theories can constrain enquiry and foster prejudiced views (Muthukrishna & Henrich, 2019; Schaubroeck, 2013).

Moreso, these theories, specifically the Social Cognitive Theory, TAM, and UTAUT, have mainly been used to inform overall intervention design or to interpret study results rather than to support hypotheses (Jiang & Cameron, 2020). Consequently, most of these studies cite theory to inform interventions, tool design, or measure development, but do not use theory to explain the relationships under investigation. Thus, these theoretical backgrounds were common among studies focusing on self-tracking behaviours, motivations, goals, and use of continuance (Jiang & Cameron, 2020; Feng et al., 2021;Yfantidou et al., 2023; Lentferink et al., 2017). These findings reveal no common theoretical framework for self-quantification intervention and adoption. Hence, the lack of theoretical foundations grounding research leaves a lot of unanswered questions. Therefore, there is a need to develop new substantive research theories that may contextualise the quantified self-phenomena to better relate to context-specific demands. A review of the body of literature demonstrates that a new framework can deliver more and offer comprehensive solutions. Given these considerations, further theory-focused research is still needed to strengthen the theoretical and conceptual underpinnings and broaden our understanding of self-tracking and the quantified self.

2.7.5 Research Gap4: Longitudinal Gap

Most of the studies reviewed in this research employed cross-sectional designs to examine QST adoption, use intentions, or immediate outcomes. While such studies provide useful insights into user perceptions and adoption factors at a particular point in time, they do not adequately explain sustained usage behaviour, long-term engagement, or continuance intentions over extended periods. This creates a longitudinal gap in the literature, particularly in developing countries, where infrastructural, economic, and behavioural factors may evolve over time and influence continued use. Furthermore, the long-term impact of QST on diabetes self-management, adherence, and health outcomes remains underexplored. Therefore, there is a need for longitudinal studies to investigate how adoption behaviours evolve over time and whether users continue engaging with QST beyond the initial adoption stage.

2.7.6 Research Gap Filled By This Study

This study identified five research gaps from the reviewed literature. These gaps reflect areas where further empirical, methodological, and theoretical contributions are required. Thus, the analysis of the literature revealed that in underdeveloped nations, it is well-documented that individuals encounter difficulties in properly managing their diabetes, resulting in inadequate glycemic control and heightened risk of complications (Karachaliou et al., 2020; Nouhjah & Jahanfar, 2020). This difficulty mostly stems from diabetic patients' inconsistent adherence to traditional monitoring methods, which need regular use of glucometers, manual recording of data in notebooks and logbooks and visits to the hospital (Barsukov & Demina, 2023; Sonmez et al., 2022). This burdensome procedure may result in discrepancies in monitoring and eventually impact health outcomes.

Numerous hindrances have been identified by key research as a result of traditional diabetes monitoring, including limited access to health resources, low health literacy, the influence of socio-economic factors, and the absence of health professional support (Barsukov & Demina, 2023; Kasole et al., 2019). These limitations and setbacks can easily be overcome by implementing the use of contemporary information and technology-based self-tracking tools, like quantification self-technology, which provide advantages such as comfort, stability, confidence, and real-time data.

The shift from traditional techniques to this modern IT-based technology is not without its own difficulties; among the concerns are digital illiteracy, limited internet access, socio-cultural problems and data privacy issues (Adhikari et al., 2021; Keresi et al., 2022). These problems generate a gap in knowledge, hindering the rapid adoption of self-tracking systems by diabetics in underdeveloped nations (Farzana et al., 2020; Nouhjah & Jahanfar, 2020). Furthermore, a literature analysis on adopting self-tracking for chronic illness management identified many adoption models; however, these models were deficient in cultural sensitivity, context-specific characteristics, and the incorporation of social support systems for long-term sustainability. This study proposes a contextually relevant framework (research gap 4) for the adoption and sustained use of self-tracking technologies for diabetes management (research gap 1), aimed at overcoming these research gaps using a developing country's context, i.e. Zimbabwe (Research Gap 2), leveraging on qualitative data collection methods (research gap 3). The World Bank (2021) reports a low GDP per capita of US$1128.00 for Zimbabwe and a high GDP per capita of US$59797.00 for Singapore. Based on the GDP per capita, it could be concluded that Zimbabwe is a developing country while Singapore is a developed country. Thus, the Zimbabwean context is unique because its infrastructure is not sufficiently developed, yet the incidence of diabetes is on the increase, presenting an opportunity for its diabetic patients to benefit from this novel technology to be studied (Mutunhu et al., 2023; Mutunhu et al., 2022).

The identified research gaps are directly aligned with the research aim and objectives of this study. Specifically, the practice gap (Gap 1) and contextual gap (Gap 2) informed the overall research aim of proposing a framework suited to developing-country settings. The methodological gap (Gap 3) justified adopting a qualitative approach to gain deeper insights into users' experiences and perspectives. The theoretical gap (Gap 4) informed the development of a contextually grounded framework that integrates socio-economic, cultural, and infrastructural factors. Finally, the longitudinal gap (Gap 5) highlights opportunities for future research beyond the scope of the present study. Collectively, these gaps guided the formulation of the research objectives, particularly the identification of the factors that influence them (Objective 1) and the empirical examination of how these factors operate in practice (Objective 2).

2.8 The Proposed Conceptual Model

This study identified a research gap within the reviewed scholarly literature linked to the ineffective management of diabetes by diabetic patients in developing countries, leading to poorer health outcomes, yet there exists a novel technology, such as QST, that these patients can leverage to help better manage their diabetes, as evidenced by prior theoretical and empirical studies. In response, this research proposes a conceptual framework that, when evaluated or implemented, can provide a comprehensive understanding of the factors that foster and hinder the adoption of QST in a developing nation by examining both micro and macro levels that previous theoretical models have not adequately addressed. Rather than depicting hypothesised causal or predictive relationships among constructs, the framework presents key conceptual domains derived from the literature that influence adoption and provides a foundation for future empirical and quantitative testing of these interrelationships. The present study, therefore, contributes theoretically to the literature by formulating the conceptual model presented in Figure 2.7 below.

The components of the proposed conceptual model are grounded in the synthesis of the preceding sections. The factors influencing adoption identified in Section 2.6 were examined individually and subsequently consolidated into broader conceptual domains, namely user characteristics, technology preparedness, social norms, perceived benefits, usability, and security concerns. These domains are informed by the theoretical perspectives discussed in Section 2.5 and reflect recurring patterns across the reviewed studies. In addition, the model responds to the research gaps identified in Section 2.7 by incorporating context-specific considerations relevant to developing-country settings.

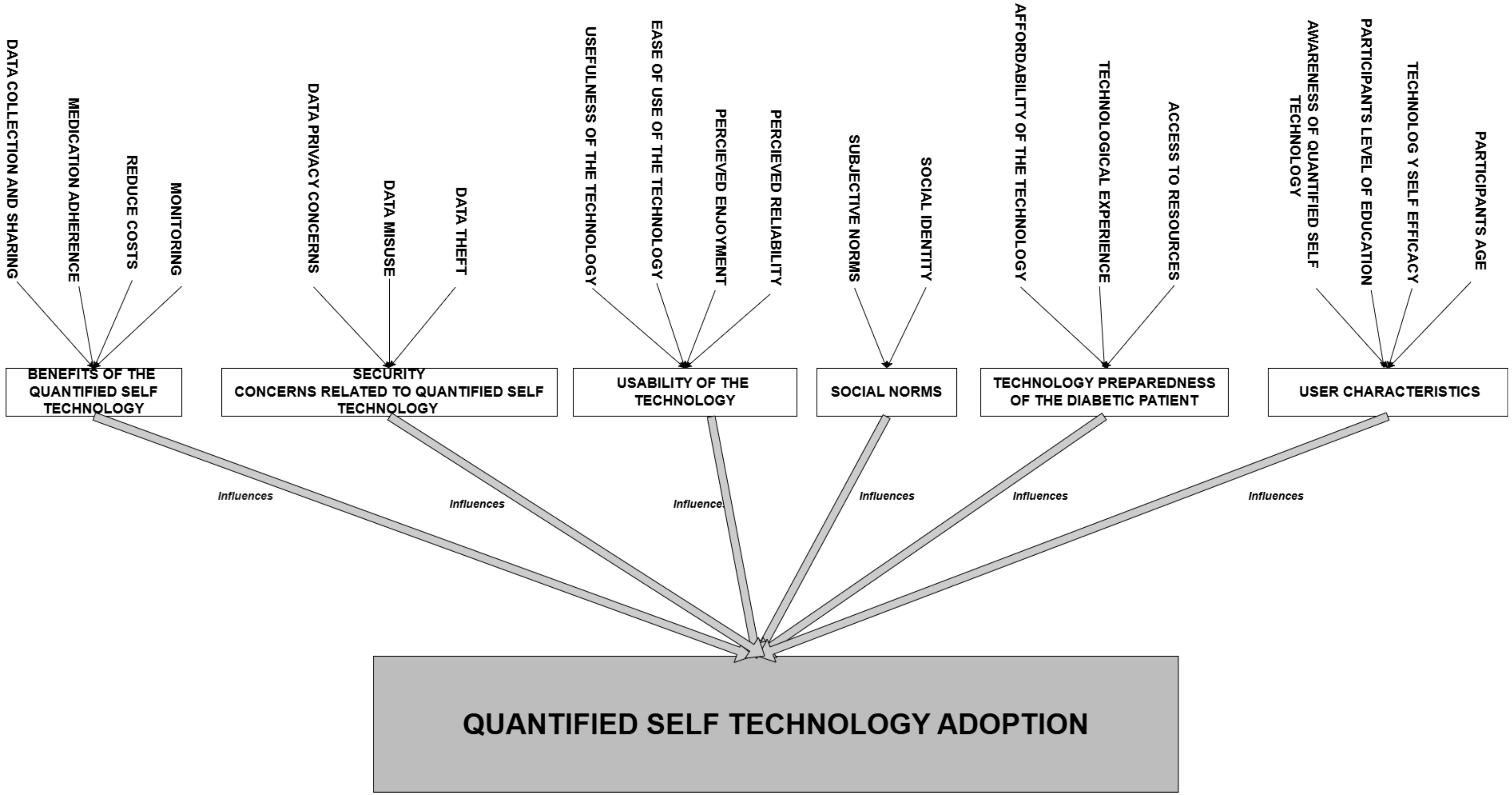

Figure 2.7: Proposed Quantified Self -Technology Conceptual Model

The key themes of the research's findings were examined to develop this conceptual model. According to the literature review, the phenomenon of "quantified self-technology " is people-driven (e.g., a diabetic person) and outcome-driven (Perceived Benefits e.g. better diabetes disease management). To interpret the reviewed data, themes were thus generated by combining the previously identified findings into themes and subthemes. As a result, for diabetic patients to adopt QST, six primary themes were identified as catalysts for adoption: User Characteristics, Technological Preparedness of the Diabetic Patient, Usability of the technology, Social Norms, Perceived Benefits of the technology, and Security Concerns related to QST.

2.8.1 User Characteristics

User characteristics denote the attributes and features of diabetic persons engaging with QST. These attributes may be demographic, psychological, or behavioural in nature. This study found that user characteristics, including participants' age, educational level, and level of awareness of medical technology, were the most influential factors in the adoption of QST.

Participant Age: Age may impede the adoption of QST among older persons. In contrast to younger persons who readily embrace technology, older adults often have more difficulty using new technology due to physical and cognitive limitations. It is therefore important to know how varied users are affected by their age before they adopt QST.

Education Level: The level of education among participants is intricately linked to their optimism over technology utilisation. Educated patients can effectively utilise technology to control their condition; hence, they will adopt new technology more. This is so because they understand how technology can benefit them, and they have enhanced digital literacy. It is important to investigate how education creates a digital divide amongst diabetics, impeding effective adoption.

Awareness of Technology: Awareness of technology might profoundly influence the adoption of QST, as diabetic patients without knowledge of the technology are unlikely to utilise it despite its benefits. Those who do not know about this technology will continue to use traditional methods of monitoring diabetes unless someone tells them about it. The implementation of QST is impeded by a deficiency of awareness regarding these applications. Before any adoption occurs, it is important to know whether the desired users are aware of it, rather than assuming they are. Giving people technology they do not know about might be a futile exercise.

Technology Self-Efficacy: The ability to use the technology without assistance from other people is crucial. People with high self-efficacy are more likely to use the technology as they know how to install it and navigate around it. Users with low self-efficacy are prone to face challenges and failure to resolve them leads them to abandon the technology. Diabetics must be trained in using QST before adopting it, so they can fully benefit from the app and maximise its features.

2.8.2 Technology Preparedness

Technology preparedness pertains to how equipped diabetic patients are to use technology. Diabetic patients proficient in technology through experience, who have access to resources and can afford the associated costs, are more likely to use it.

Technological Experience: Prior practical engagement with similar QST applications will make diabetic patients either use the technology or not. With prior experience, diabetic patients are empowered on what the technology is about, how they will benefit from it, and whether it is complicated. Technological experience is crucial for the adoption of technology as it lays a foundation for technology acceptance.

Access to Resources: Access to resources refers to the availability of all tools and resources necessary for diabetics to use QST effectively. Lack of access to resources like smartphones and internet access may hinder the adoption of QST despite the diabetic's willingness to engage with the technology.

The affordability of the Technology: Quantified self-technology incurs expenses related to its procurement, upgrades, and upkeep. This is a significant problem for diabetics who may not have alternative access to the complimentary or subscription-based health applications offered by their governments.

2.8.3 Usability of the Medical Technology

Usability is essential for QST adoption as it influences diabetics' engagement. In this study, perceived ease of use, perceived usefulness, perceived reliability, and perceived enjoyment influence usability.

Perceived Ease of Use: Perceived Ease of Use is essential for achieving a positive user experience in QST adoption. The elderly like customised user-friendly applications with adjustable font sizes for improved visibility. Suppose the technology is complex to use and lacks user-friendly interfaces. In that case, diabetics may not adopt it as they will face many challenges while using it.

Perceived Usefulness of Technology: For QST to be useful, it must provide useful information on how the diabetic can manage their condition. It must also have the necessary functions, such as monitoring glucose trends and providing recommendations to control it. Diabetes, a lifestyle disease, requires diabetics to monitor what they eat and exercise often. If the technology can provide these functions, it will be adopted.

Perceived enjoyment: Diabetic patients do not want to be reminded that they have a chronic condition constantly. The technology must provide fun features while fostering use to manage diabetes. When technology is seen as work and "serious business" all the time, it may not be adopted. Games must be incorporated into these apps to make them more appealing.

Perceived Reliability: The adoption of QST is affected by perceived reliability. If the QST always provides inaccurate information, it is no longer useful to the diabetic. Furthermore, unreliable information might cause problems, as the diabetic may calculate the wrong insulin dosages. Furthermore, reliability is concerned with the effective functioning of the technology. Diabetics must use technology they know they can depend on anytime and anywhere. If this is not the case, it might hamper the adoption.

2.8.4 Benefits of the Medical Technology

The benefits of employing QST may motivate individuals to use it. Four main benefits that diabetics may want from QST include monitoring, adherence to medication, data collection and sharing, and reduced costs.

Monitoring: Quantified self-technology can monitor blood glucose levels and physiological parameters. This knowledge can assist individuals in enhancing self-awareness and management. Furthermore, it can help patients monitor the impact of treatment and track their disease as it progresses. When QST does not provide these benefits, especially in chronic disease management, it will not be utilised.

Adherence to Medication. Quantified self-technology devices, such as smartwatches, smartphones, or specialised medication reminder applications, can be configured to issue prompt medication administration and auto-fill medication reminders. Reminders can be established according to designated schedules or intervals to ensure users administer their drugs at the recommended times. Timely and consistent medication taking is necessary for effective diabetes management.

Data Collection and Sharing: Quantified self-technology collects a lot of data from the patient. This data becomes beneficial to the patient if it starts bringing personalised recommendations to the patient and generating trends that can give deeper insights into diabetes. Furthermore, through this data, diabetics get to know about their disease and understand what triggers it. In addition, the patient can share the collected data with their doctors, facilitating the improvement of communication between patients and doctors. When patients submit their QST data, doctors may gain a more comprehensive view of the patient's health and treatment responses, and chronic ailments, and enhance health-related decision-making.

Reduced Costs: Users of any QST use it with the hope that it will cut down on certain healthcare expenditures. Remote monitoring makes patients less likely to get sick and be admitted to the hospital. This reduces the need for consultations and hospitalisation costs associated with diabetes complications.

2.8.5 Social Norms

Social Norms, a concept of UTAUT, denote the extent to which a user's technological behaviour may be swayed by subjective norms, which are the perceptions of peers, family, and friends, or social identity, which is the influence of social groups.

Subjective Norms: Subjective Norms significantly impact the intention to use, since some individuals rely on the opinions of their friends and families. A supportive family will encourage the diabetic to adopt the technology, whilst a non-supportive family will make the diabetic have reservations about the technology.

Social Identity: Diabetic patients, like any other people, want to have a sense of belonging; hence, they join groups that share a meaning with them. These groups have a culture and rules to which they are accustomed. A group that supports the use of QST will foster continued use. However, groups that shun it may orchestrate social penalties, such as rejection or stigma, leading to the diabetic not adopting QST. The prominence of sociocultural elements underscores the intricate relationship between social dynamics and the adoption of quantified self-technology.

2.8.6 Security Concerns Regarding Medical Applications

The security concerns associated with quantified self-technology medical applications may adversely hinder their adoption if crucial elements remain ambiguous. This study identifies data privacy, theft, and misuse as the primary security concerns in QST deployment.

Data Privacy Concerns: Quantified self-technology collects highly sensitive personal information about an individual's body, potentially disclosing aspects of the individual that the person may want to keep confidential. This fear of data privacy violations may prevent users from adopting QST. Unaddressed and unresolved questions about data privacy seriously undermine individuals' perceptions of and willingness to use QST. It is of utmost importance to put in place robust measures to protect privacy; data suggests that perceived privacy concerns do not deter users from pursuing monitoring apps.

Data Theft: Unauthorised use of data gathered through QST and applications can be exploited by malicious users and hackers. In such breaches, data theft and the theft of sensitive health information can occur. When QST and applications use personal health information (PHI), the loss of that PHI can be used for activities like fraud. Research indicates that individuals with diabetes generally dismiss technology and favour hospital diagnoses when they lack faith in the technology.

Data Misuse: There is a need to get consent from diabetics to utilise their data. If these data are misused and given to third parties for unethical use or financial gain, diabetics will not use them. Quantified self-technology needs to be transparent on how users' data are stored, how they are used, who owns them, and who has access to them. When these aspects are not met, diabetics will be sceptical about using the technology.

These main blocks, together with the supporting concepts, will help create an environment in which the adoption of QST by diabetic patients is a priority in the health sector and society at large.

2.9 Summary of Chapter

This chapter presented a systematic literature review to synthesise, analyse, and critically discuss key concepts related to QST and the factors influencing its adoption. The review identified six core factors shaping adoption and highlighted persistent gaps in practice, methodology, and theory. In response to these gaps, particularly the theoretical gap, a conceptual framework for the adoption of QST was developed based on the synthesised themes. While acknowledging the limitations of existing theoretical models, the proposed framework offers a contextually grounded basis for understanding adoption in resource-constrained settings. Building on this framework, the next chapter outlines the research methodology and design used to empirically investigate these factors among diabetic patients.

Chapter 3 : The Research Design and Methodology

3.1 Introduction

Building on the conceptual framework developed in Chapter 2, this chapter outlines this study's research philosophy, research strategy, methodological choices, data collection instruments, data analysis techniques, research rigour, and ethical considerations. To structure and guide the research process, the study draws on the research onion framework proposed by Saunders et al. (2019). Figure 3.1 depicts an adapted version of the research onion, highlighting the methodological components relevant to this study.

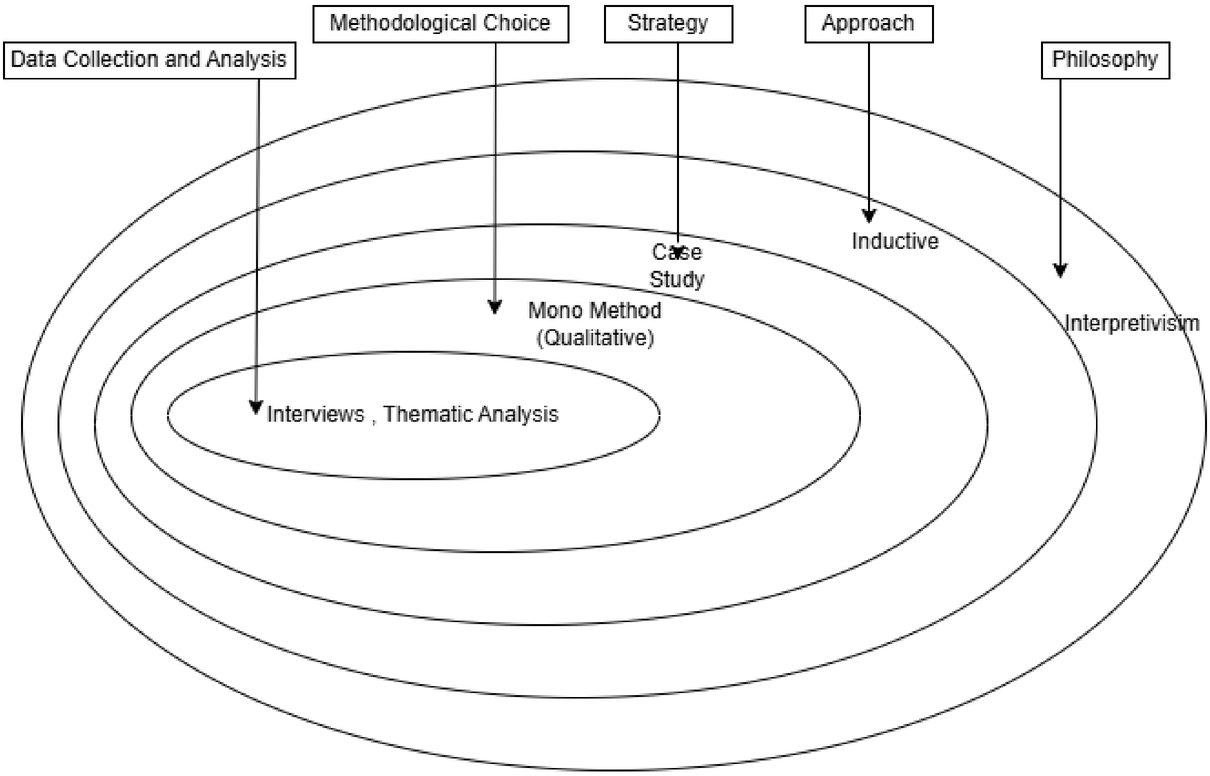

Figure 3.1: An adaptation of the Saunders et al. (2019) Research Onion model

3.2 Research Philosophies

Research philosophies convey the assumptions, principles and beliefs about how knowledge about a specific phenomenon should be gathered, analysed and used (Saunders et al., 2019; Walliman, 2021). Thus, this research explored three main research philosophies: positivism, interpretivism, and critical realism. These philosophies have unique assumptions, research strategies, methods of data collection, and limitations (Cresswell, 2014).

3.2.1 Positivism

Positivism applies principles of natural science to observe social reality and generate generalisable laws (Saunders et al., 2019). It typically relies on existing theories to develop hypotheses, which are then empirically tested to extend or refine theory (Crotty et al., 2020). Positivism emphasises objective reality and often employs quantitative methods such as statistical analysis to identify patterns, test relationships, and ensure replicability and generalisability (Guba & Lincoln, 1994; Walliman, 2021). It assumes that reality exists independently of human perception and can be understood through observation, experimentation, and comparative analysis (Oates, 2006).

However, critics argue that positivism's emphasis on objectivity and generalisability may overlook the context-dependent and subjective aspects of human experience (Guba and Lincoln, 1994). While quantitative and mixed-methods approaches can effectively measure attitudes, perceptions, and behavioural intentions, they may not fully capture the depth, meanings, and lived experiences associated with complex social phenomena (Mack, 2010). In the context of this study, understanding the factors influencing diabetic patients' adoption of QST required a rich, contextual exploration of personal experiences, beliefs, and sociocultural influences.

Therefore, positivism was not adopted as the primary philosophical stance for this study. Its focus on objective observation and hypothesis testing may have limited the exploration of diabetic patients' lived experiences, personal interpretations, and social circumstances influencing their interactions with QST. Since diabetes management is highly personal and shaped by emotional, cultural, and contextual factors, an interpretivist approach was considered more appropriate for revealing deeper insights into users' motivations, challenges, and experiences.

3.2.2 Critical Realism

Critical realism grounds its philosophy on reality (Ray & Fay, 1988). To understand reality, we must go through specific experiences, events, and feelings (Ray & Fay, 1988). We then use these experiences as a starting point for our backwards reasoning to determine how reality might have contributed to or caused them. Therefore, the primary goal of critical realists is to explain the processes and causes by which deep social structures influence our day-to-day lives (Fleetwood, 2005). Thus, critical realism aims to reconcile positivism and interpretivism by affirming an independent reality while acknowledging the influence of social conceptions on it (Elder-Vass, 2022). Critical realism holds that reality cannot be directly observed because it is external and independent; hence, a subjective approach to reality (Saunders et al., 2019). Its strength resides in providing a nuanced perspective that integrates empirical evidence and human experience. Furthermore, it allows the researcher to criticise the results of a study based on already-existing facts (Orlikowski & Baroudi, 1991). Thus, critical realism involves recognising conflicts, contradictions, social injustices and power dynamics, while enabling individuals to eradicate these sources of domination and alienation (Vinet & Zhedanov, 2011). Critical realists have been applauded for their aim to address social inequalities and empower individuals. Even though the intention is to equalise people, this is complex, as it requires much time to observe and reflect on reality (Hammersley, 2014).

Despite its merit in explaining the underlying mechanisms of social phenomena, critical realism may be inappropriate for this research on diabetic patients adopting QST. Critical realism prioritises the interaction between structure and agency over the subjective experiences and meanings that diabetic patients attribute to technology daily. Oates (2006) alludes to the difficulty in firmly demonstrating causal linkages due to the complexity of social structures. Furthermore, because critical realism emphasises uncovering causal processes, objective facts, and the creation of patterns, it may neglect the complex lived experiences of patients with diabetes and the interpretations essential to understanding QST.

3.2.3 Interpretivism

Interpretivists believe that the world as we know it is a figment of our imagination (Myers, 2013). This does not mean that the world is non-existent, but we experience it personally through our beliefs, perceptions and culture (Lan, 2018). Thus, interpretivist researchers are part of the research process; their role is to reveal the different ways people experience the world. The differences in these beliefs result from differences in cultures, circumstances, institutions, and time. Consequently, this creates different meanings and social realities about our world (Saunders et al., 2019). Thus, this enables the development of richer meanings that can be used in knowledge creation to understand human beliefs and actions in real-life contexts (Orlikowski & Baroudi, 1991). This philosophy does not seek to validate or invalidate a theory. However, it concentrates on investigating and explaining the factors that influence the social environment and how individuals see reality (Vinet & Zhedanov, 2011). Thus, interpretivism was deemed suitable for this research as it enabled us to understand the different views and beliefs of diabetics regarding QST within their natural settings and the interpretations they make of it. People with diabetes have different beliefs due to differences in cultural settings, circumstances, unique contextual conditions, and time. Consequently, this creates different meanings and social realities about the QST. In addition, the beliefs and perceptions of diabetic patients enabled the development of richer meanings that can be used to understand how they leverage QST to improve their health outcomes. Thus, an interpretive approach, prioritising the comprehension of subjective meaning and social construction, aligns more effectively with the research objectives, facilitating a profound examination of diabetic patients' perspectives rather than concentrating predominantly on objective structures that affect adoption.

However, even with strengths such as the focus on complexity, richness and multiple interpretations, interpretivist philosophy faces critique, including subjectivism (Orlikowski & Baroudi, 1991). Subjectivism can lead to research bias when inductive methods are used (Orlikowski & Baroudi, 1991; Saunders et al., 2019; Mack, 2010). Furthermore, it is difficult to generalise from data generated by interpretivists, as it reflects one's viewpoint and values (Orlikowski & Baroudi, 1991). The lack of statistical backing further undermines the reliability and trustworthiness of the data for this philosophy (Lee & Baskerville, 2003).

Notwithstanding, researchers in the qualitative space, such as Lee and Baskerville (2003), argue for the relevance of interpretivism, noting that its subjective narratives are as appropriate as the experimental and mathematical models used in positivist studies to validate, refine, or reject a hypothesis. Furthermore, this research overcame the shortcomings of interpretivism by applying rigour and trustworthiness as guided by Lincoln and Guba (1985) principles of credibility, transferability, dependability and confirmability. Trustworthiness emphasises the degree of trust in the study rather than its validity, which is the emphasis of positivism. Confirmability: emphasise the correlation between the findings and the analysed data, ensuring the conclusions of the investigation can be substantiated. Dependability: the capacity to track the study process or documented data, enabling others to continue the investigation. Credibility: the assessment of the research problem's clarity and the precision of the study's results. Transferability: ensuring that the findings are applicable and can be generalised to others, so the results remain relevant. These are explained in detail in Section 3.12.

Despite these shortcomings, this philosophy was the most appropriate for supporting the development of the QST framework for managing diabetes. Thus, interpretivism was the chosen research philosophy for this study. The next section presents the assumptions of this study.

3.3 Philosophical Assumptions

This study examined three fundamental philosophical assumptions: ontology, epistemology, and axiology (Guba & Lincoln, 2005; Saunders et al., 2019). Subsequently, the characteristics of these philosophical assumptions were examined, leading the researcher to make research assumptions for this study. The subsequent sections discuss the philosophical assumptions of interpretivism concerning this study.

3.3.1 Ontology

Ontology deals with the essence of the phenomena under inquiry by looking at the nature of social entities within the research setting (Ahmed, 2008). Ontological positions vary, ranging from objective (realist) perspectives to subjective (interpretivist) understandings of reality (Bryman, 2020). In this study, an interpretivist ontological stance is adopted, which assumes that social reality is constructed subjectively through individuals' lived experiences and social interactions(Bell et al., 2018). With these characteristics in mind, the ontological assumptions of this study were that diabetic patients construct meanings based on their personal experiences of managing their condition. Therefore, the factors influencing the adoption of QST are context-dependent and shaped by individual perceptions, making them difficult to generalise across settings.

3.3.2 Epistemology

Epistemology is a philosophical grounding for making decisions based on knowledge and beliefs (Busher & James, 2009; Saunders et al., 2019). Epistemology is about insight and clarifying how we know what we know. Epistemology highlights that knowledge of the real world arises from individuals' interactions through shared meanings, perceptions, experiences, and anecdotes (Höijer, 2008). Hence, the relationship between the inquirer and the known is called knowledge. Thus, epistemology is crucial because it enhances the researcher's confidence in their data (Kivunja & Kuyini, 2017; Sol & Heng, 2022). With these characteristics in mind, the epistemological assumption of this study was that knowledge is gained through understanding the lived experiences of diabetic patients. An inductive approach to developing the theory was used to acquire this knowledge. Furthermore, the knowledge gained through this study is not universal laws but rich, deep insights.

3.3.3 Axiology

Axiology pertains to the researcher's ethical, religious, and aesthetic beliefs (Brown & Dueñas, 2020). In all phases of the research process, the researchers' values, judgments, or calibre are deemed valuable (Saunders et al., 2015). With these characteristics in mind, the axiological assumptions of this study were that the researcher respected the diabetic patient's diverse cultural beliefs and avoided assumptions and stereotypes in her interactions. Participants were to sign an informed consent form before any data collection. Furthermore, qualitative methods of increasing research rigour were applied to minimise bias and risk.

3.4 Research Approach

Deductive, inductive, or abductive research approaches are commonly used within a research strategy (Barada, 2013). Deductive approaches are theory-driven as they begin with the hypothesis, followed by a strategy to test this hypothesis, whilst inductive approaches are data-motivated, i.e., they begin with data collection from specific observations, make a tentative claim, and then conclude after analysing and exploring this data (Barada, 2013). Abduction combines induction and deduction approaches (Saunders et al., 2019).

While this study was informed by existing theoretical perspectives, it placed greater emphasis on understanding the lived experiences and perceptions of diabetic patients regarding QST adoption. Accordingly, the study adopted an inductive research approach, which is appropriate for exploring context-specific factors and generating insights grounded in participant experiences. This approach aligns with Saunders et al. (2019) who advocate for inductive reasoning in qualitative research guided by an interpretivist philosophy.

3.5 Research Strategy

Research strategies such as case study research, action research, grounded theory research and ethnography have been associated with qualitative interpretivist research methods by various researchers (Creswell & Poth, 2016; Maxwell, 2018; Primecz, 2020). These research strategies are presented below and their applicability and suitability to this research are evaluated.

3.5.1 Ethnography Research

Ethnography involves studying and analysing a specific group of people within their culture and understanding how certain ethnic groups behave over a longer period (Reeves et al., 2008). Researchers who use this methodology will fully immerse themselves in the research participants' culture to understand how the group's culture influences the participants (Arnout et al., 2020; Qutoshi, 2024). Qualitative data are gathered through direct observation of and interaction with persons who belong to that culture (Twycross & Shorten, 2016). The information is then presented from their point of view (Jones & Smith, 2017). Although this research strategy is relevant to qualitative research, ethnography was unsuitable for this study. Ethnography generally concentrates on the collective cultural practices and social interactions within certain ethnic groups, which is not the emphasis of this research. Although recognising that cultural influences may affect technological adoption, ethnicity is not a major variable of examination in this study. This research investigates the experiences of diabetics from Bulawayo province and their utilisation of QST for diabetes management, emphasising their common technological practices rather than their individual cultural or ethnic identities.

3.5.2 Grounded Theory Research

Grounded theory is a method for creating a theory about a social issue (Corbin, 2017). Studies using a grounded theory approach gather and analyse data before developing a theory grounded in the findings (Mohajan & Mohajan, 2022; Noble & Mitchell, 2016). In addition to identifying issues in social settings, this theory also aims to characterise how people resolve those issues (Malik, 2023). The only source of data for grounded theory is information gathered throughout the research process; thus, it is grounded in the data (Charmaz & Belgrave, 2015). The initial research question is frequently modified and revised over time when new data are learned about the subject. In this way, the participants shape the study (Glaser & Strauss, 1967). Hence, Grounded Theory is used when no theory exists (Glaser & Strauss, 1967).

Grounded theory is inappropriate for this research because it is intended to generate new propositions derived from facts gathered from participants. In addition, it assumes there is no pre-existing conceptual framework. In contrast, this research uses an established conceptual framework developed in Chapter 2 to guide the study. The primary objective was not to generate a new theory from scratch, but to explore, refine, and contextualise factors influencing the adoption of QST within the existing framework. Consequently, a theory-guided thematic analysis approach was considered more appropriate, as it allowed the study to remain anchored in existing theoretical foundations while remaining open to new themes emerging inductively from the data. Employing grounded theory may have diverted the inquiry from the specific constructs and relationships underpinning the conceptual model.

3.5.3 Action Research

Action research is a participatory and iterative research strategy involving stakeholders' active engagement in the research process to cooperatively identify issues and formulate solutions within a particular community (Dorant, 2020). It often concentrates on tangible challenges within particular communities or organisations, highlighting pragmatic change and enhancement through iterative cycles of planning, action, observation, and reflection (Casey & Coghlan, 2021). The primary objective is not to provide universally applicable information but to confront a specific problem or enhance a particular activity within a designated context (Cornish et al., 2023; Gaskins et al., 2023). Thus, an intervention may be developed and improved in action research to address a localised issue (Hayes, 2018; O'Cathain et al., 2019). However, stakeholder involvement at each stage may lead to stakeholder ownership and empowerment (Dorant, 2020).

Nonetheless, action research is inappropriate for this study because this research primarily seeks to investigate individual diabetic patient experiences and behaviours associated with QST adoption, rather than promoting collaborative problem-solving within a community. Moreover, the emphasis on rapid practical results in action research may hinder a more thorough comprehension of the factors affecting diabetes patients' utilisation of self-tracking technologies. In addition, this research is not about immediately addressing an urgent, localised issue within a particular clinic or community group. Moreover, no intervention needs to be improved, which can lead to any stakeholder owning it.

3.5.4 Case Study Research

A case study examines a unique instance of action in its real-life context, when boundaries concerning the phenomenon and context are not apparent, to provide a deeper understanding of the phenomenon (Mizukoshi, 2023). It is used to explore existing theories while critiquing them by posing new questions (Mizukoshi, 2023). Hence, it can answer the 'how', 'why' (Yin, 2014). and "what" (Hew & Hara, 2007) research questions. In addition, case studies are useful for describing, comparing, evaluating, and comprehending various aspects of a research problem (Crowe et al., 2011). The case study research design is also useful for testing the applicability of scientific theories and models in the real world (Yin, 2014). Thus, with a case study, you can study actual people in real settings so that you understand their beliefs without making assumptions. Moreover, it benefits from prior theoretical developments and the ability to develop or refine theory.

There are two types of case studies: a single case study and a multiple case study (Mizukoshi, 2023). Cresswell (2014) suggests a single case study if the focus is on one issue or concern, and one bounded case is selected for examination. Furthermore, he suggests a single case study if (a)the situation being studied is unique such as being previously inaccessible;(b) when the case serves as a critical test of current theory; (c) when the case represents an uncommon or unique circumstance; (d) when the case represents a representative or typical case; or (e) when the case serves a revelatory or longitudinal purpose. Cresswell (2014) suggests multiple case studies if different sites are selected for examination, and Bhattacherjee (2012) views the multiple-case design as preferable for theory testing.

3.5.5 Chosen Research Strategy

Given the characteristics of each research strategy and a closer examination of our study, it was befitting to utilise a case study research strategy because a case study can help us gain an in-depth understanding of the factors that influence QST adoption by diabetic patients. This will result in the development of a framework for the adoption of QST for managing diabetes.

Moreover, the study was a single case study based on the following characteristics: managing diabetes using QST is a unique circumstance; this research has seven (7) how research questions and two (2) what research questions as highlighted in Chapter 1, Section 1.4; this study explored different theories in Chapter 2 and then developed a conceptual framework that will direct the data collection and analysis procedure. In addition, the researcher built rapport and trust with diabetics, thus enabling the researcher to get a contextual understanding while collecting rich, meaningful information.

3.6 The Case Study Research Strategy

This section presents how the case study research strategy was adopted in this study. Thus, the study setting, units of analysis, case study design, and data collection techniques are delineated.

3.6.1 The Study Setting

A hospital in Bulawayo was chosen as a typical public hospital with diabetic patients. The hospital, established in 1958, is in Bulawayo Province, Zimbabwe. It offers a broad spectrum of healthcare solutions 24/7 and 365 days per year, including continuous care for diabetic patients (Adams, 2008). In 2022, it was reported that more than 40 diabetes-related cases were reported per day at this hospital (Ndlovu, 2022). The hospital was chosen due to its provision of services that are representative of those available at any other hospital nationwide. This academic referral government hospital serves patients from low to medium socioeconomic backgrounds, accommodating diabetic patients from diverse backgrounds (Mutowo et al., 2015; Nyakutombwa et al., 2021). Moreover, the demographics of hospitalised diabetics constitute a representative sample of the diabetic population in the country in terms of gender, socioeconomic position, and educational achievement. Thus, the hospital from which the data was obtained exemplifies a standard case of a hospital in Zimbabwe.

The case study of a single hospital enabled us to comprehensively analyse the distinct contextual elements that significantly influence diabetic patients' willingness to embrace QST. This concentrated emphasis enabled us to explain the 'how' and 'why' of the research questions in depth, which may be unattainable in a multi-site, multi-country study employing qualitative approaches.

3.6.2 The Unit of Analysis

The unit of analysis denotes the primary focus of a study and what researchers want to conclude about upon completion of their study (Morin et al., 2021; Zilber & Meyer, 2022). Units of analysis are determined by the particular occurrence under observation, for which data are methodically gathered and examined (Morin et al., 2021). Thus, it establishes the study's focus and the topic of inquiry and influences data collection, analysis, and the interpretation of results (Damşa & Jornet, 2021; Morin et al., 2021; Säljö, 2021). The unit of analysis must be theoretically informed and must be concentrated and consistent with the fundamental aim of the study, facilitating a more profound comprehension of the links and dynamics involved (Dohn, 2021; Yin, 2014). What determines the unit of analysis is the study's research questions. Thus, the unit of analysis can refer to the subject (what) or entity (who) under examination and can be people-focused or structure-focused (Patton, 2015; Sedgwick, 2014). Resultantly, the unit of analysis in a study can be the people, countries, objects, geographical units, elements, technologies, social interactions or organisations (Morin et al., 2021; Chambliss & Schutt, 2024). By distinctly distinguishing these components and focusing the units of analysis on the observed phenomenon, one can efficiently collect and analyse data that directly aligns with the research questions (Damşa & Jornet, 2021).

The main research question of this study (Chapter 1, Section 1.4) sought to guide the development of a framework that informs the adoption of QST for managing diabetes in developing countries. The first sub-research question focused on identifying the factors that influence adoption, while the second explored how these factors affect adoption in practice. To address these questions, the primary unit of analysis in this study was diabetic patients' perceptions and experiences of adopting QST.

These perceptions and experiences were examined through the constructs identified in Chapter 2 and reflected in the investigative research questions, namely user characteristics, technology preparedness, social norms, perceived benefits, usability, and cybersecurity risks. These constructs served as analytical lenses through which participants' views and experiences were explored to inform the development of the proposed framework.

3.6.3 The General Design of Case Studies

Figure 3.2 illustrates the four different case study designs as alluded to by Yin (2014). All design types desire to analyse the contextual conditions concerning the "case". The dotted lines between the case and the context indicate that there is likely to be a sharp distinction between these two (Yin, 2014). The matrix further demonstrates how distinct design scenarios are reflected in single- and multiple-case studies and how there may be one or multiple units of analysis within these two variations. Thus, the four resulting case study designs are: Type 1) single-case (holistic) designs, Type 2) single-case (embedded) designs, Type 3) multiple-case (holistic) designs, and Type 4) multiple-case (embedded) designs (Yin, 2014).

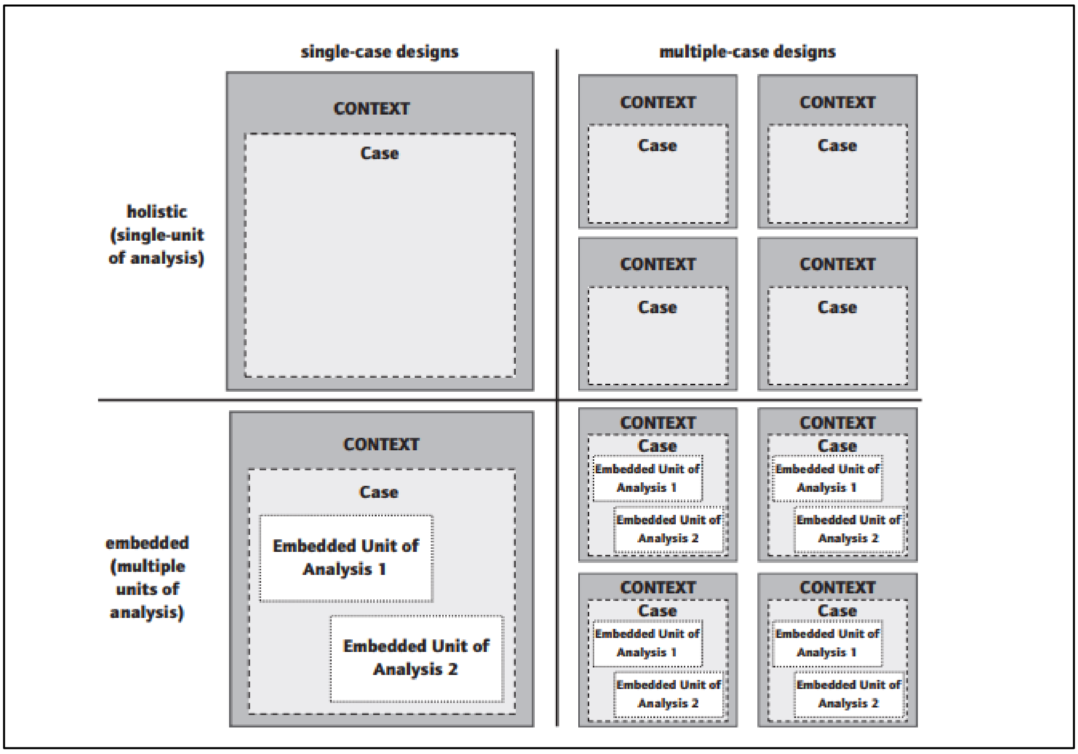

Figure 3.2:The design of case studies (Yin, 2014)

The holistic design is beneficial when there are no apparent logical subunits or the pertinent theory supporting the case study is holistic (Yin, 2014). The embedded design can be a useful tool for narrowing the scope of a case study investigation. In an embedded case study, multiple analytical units may be used in the same study (Yin, 2014).

In this study, the unit of analysis was selected based on the conceptual framework components, hence multiple analytical units. Thus, this research is a single case study (embedded) design and is depicted in Figure 3.3.

3.6.3.1 The Single Case Study (Embedded) Design of Diabetic Patients

Figure 3.3 below illustrates the single case study (embedded) design adopted in this study, adapted from Yin (1967). The figure depicts the overall case and the embedded units of analysis within it. This design provides a structured approach for examining multiple dimensions of the phenomenon within a real-life context.

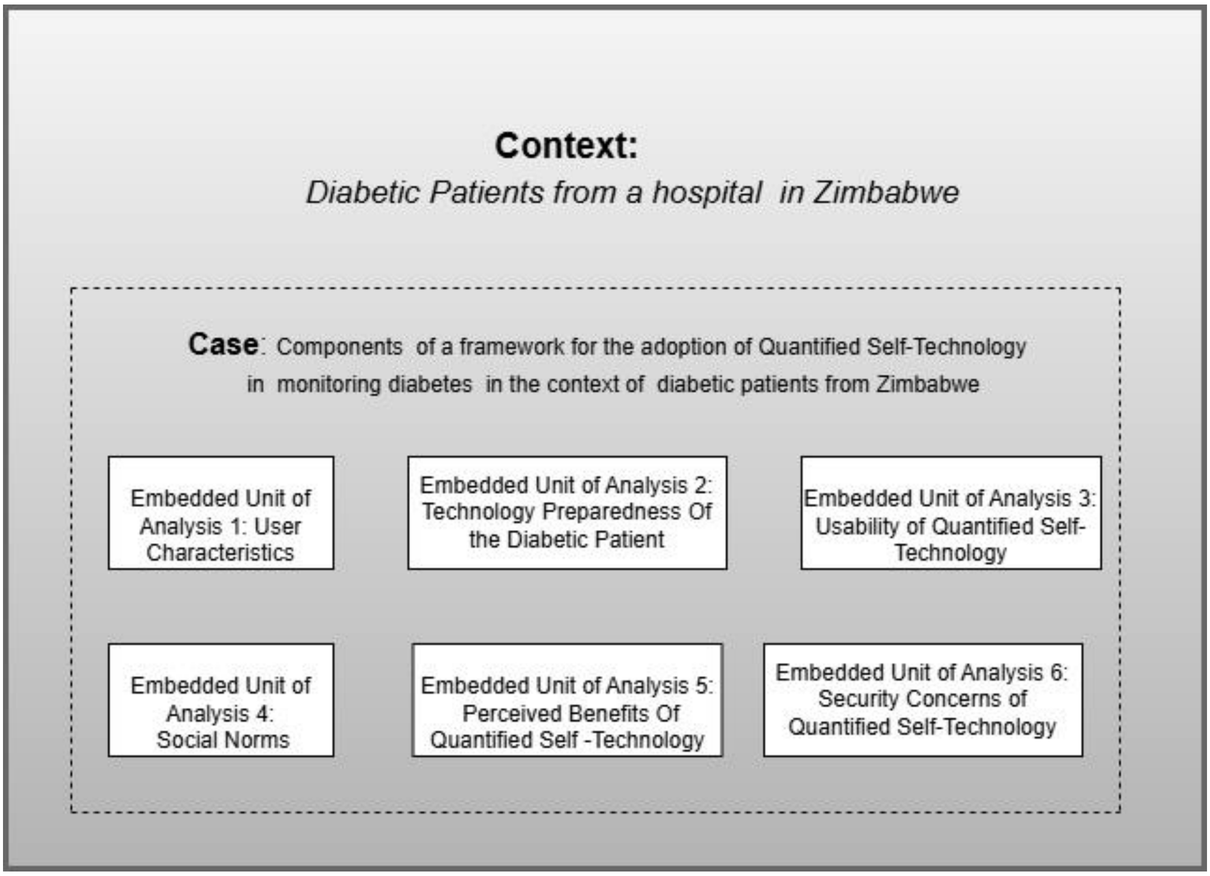

Figure 3.3: Single case study (embedded) design adapted from Yin (1967)

3.7 Methodological Choice

Researchers can choose from three methodological choices: mono-method, mixed-method, and multi-method (Saunders et al., 2019). The mono method employs only one type of data, qualitative or quantitative. The mixed-methods approach is called so because it employs both qualitative and quantitative methods. Multimethod is a technique that employs multiple approaches within a single paradigm (e.g., more than one qualitative or more than one quantitative approach). This study employed a mono-method approach. The research is classified as a mono method because it collected a single data type: qualitative data. Using a qualitative method allows one to see and hear what people do instead of just asking them about what they claim to do (Barada, 2013). Thus, the qualitative research method is linked to the interpretivist philosophy (Saunders et al., 2019). Unlike quantitative research, qualitative research focuses primarily on non-numerical data and examines it (Cresswell, 2014). Cresswell (2014) posits that the qualitative method develops a more thorough theoretical perspective through inductive methods.

In this study, a qualitative research method was appropriate, as it helped us understand the experiences, norms, values, and perceptions of diabetic patients regarding the use of QST in their diabetes self-care. The rich qualitative data that emerged revealed novel insights and new perspectives on the adoption of QST, offering clarity and expanding understanding of existing theories, thus further helping to develop a new framework.

3.8 Data Collection

A case study research protocol was used to guide the data collection process. A case study protocol is a formal document that delineates the complete procedures for gathering the empirical data in the research (Yin, 2014). The technique is a-successful method for enhancing the dependability of case studies. Yin (2014) outlines that the protocol must encompass the study's objectives, and data collection procedures, including the identification of probable data sources, the specific inquiries that the case study researcher must consider during data collection, potential evidence sources for addressing each inquiry, the ethical considerations, a provisional outline of the report and other logistical reminders. Table 3.1 presents the data collection protocol for this study. The table matches the main components of the conceptual framework with the data collection methods and data sources.

Table 3.1: The data collection protocol, adapted from Chipangura (2016)

Data Collection Step	**Source of Evidence**	**Conceptual Framework Component**	**Procedure & Data Collection Instruments**	**Evidence Sought /Contribution**
Participant Recruitment	Diabetic Patient	User Characteristic	-self-selecting sampling (discussed in Section 3.8.1.1) -purposive sampling (discussed in Section 3.8.1.2)	To collect user characteristics Contacts details Logistics for Interview
Interviews	Diabetic Patient	User Characteristics	-Face-to-face interviews (discussed in Section 3.8.5)	-To determine how user characteristics influence the adoption of quantified self-technology
		Social Norms		To determine how social norms influence the adoption of quantified self-technology by diabetic patients
		Security Concerns		To determine how cybersecurity risks influence the adoption of quantified-self-technology.
		Perceived Benefits		To determine how the perceived benefits influence the adoption of quantified self-technology

		Usability		-To determine how usability influences the adoption of quantified self-technology

Figure 3.4 shows the data collection process, and it is discussed below:

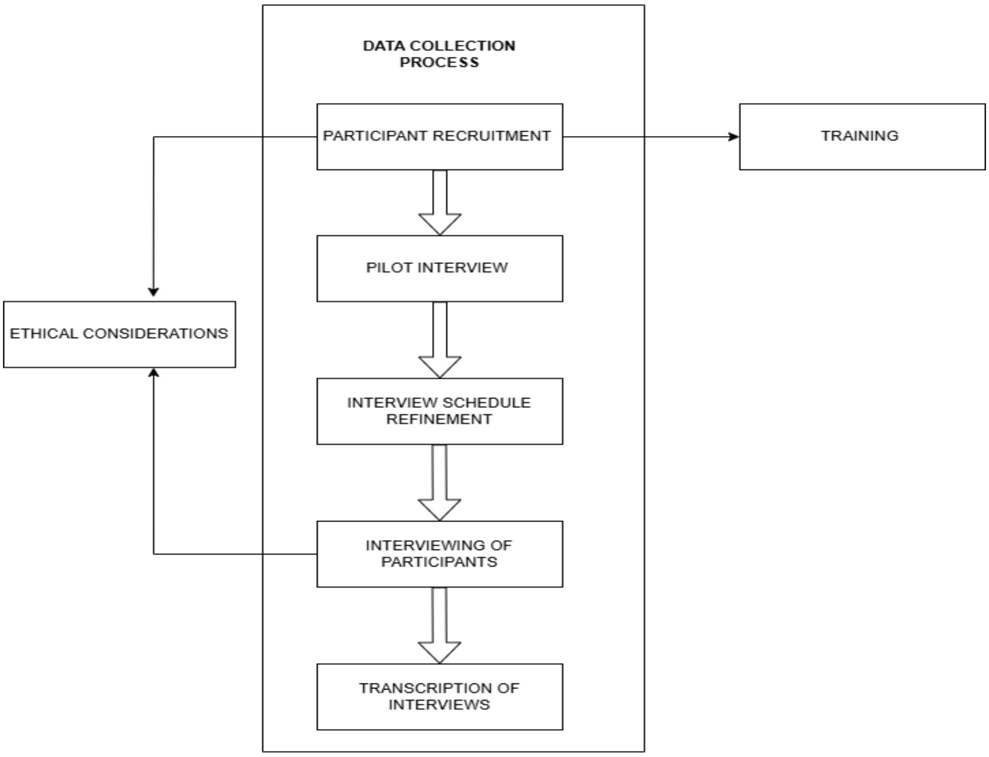

Figure 3.4: Outline of the data collection process

The data collection process of this study commenced with participant recruitment. After participant recruitment, pilot interviews were conducted. These interviews helped refine the interview schedule. Participants were then interviewed. Throughout this process, ethical standards were maintained. After the interviews, the audio recordings were transcribed. The data collection process is discussed in depth from Section 3.8.1 to Section 3.8.7.

3.8.1 Participant Recruitment

To facilitate participant recruitment, a hospital in Bulawayo was contacted to promote and disseminate a recruitment form to diabetic patients who visit the hospital for diabetes medical consultations. The researcher sought permission from the hospital to conduct her research (Appendix C). The request for permission letter outlined the research objectives and stated that the research had been approved and granted ethical clearance by the UNISA College of Health and Agricultural Sciences (Appendix D). The researcher was granted a gatekeeper's letter by a hospital in Bulawayo (Appendix E) authorising her to conduct her research. The researcher gave the hospital a participant invitation letter (Appendix F) inviting interested diabetic patients. The hospital distributed the participant invitation letter to its diabetic patients (method unknown to the researcher). Participation in the research was voluntary, and individuals who consented to be involved in the study contacted the researcher through email, WhatsApp, or phone. This defined the sample and the sampling methods to be used.

3.8.2. The research sample and sampling methods

Sampling involves choosing a subset of the whole population that is representative of the population from which it was selected, to allow the researcher to acquire information about the subject that is of interest in the study (Baride, 2003). For qualitative research, non-probability sampling such as purposive, convenience, or snowball sampling is used (Nurhayati, 2020). For this study, participant recruitment was through purposive sampling, in which participants self-selected to participate.

3.8.2.1 Self-Selecting Sampling

Self-selecting sampling is a non-probability sampling method that involves the research subjects actively choosing to take part in the study (Bhardwaj, 2019; Fox, 2010). In other words, the researcher relies on the participants' voluntary participation in the study rather than actively recruiting them (Sharma, 2017).In qualitative research, where it is important to comprehend a particular group of people's perspectives, self-selecting samples are frequently employed (Maestripieri et al., 2019). The strengths of self-selection sampling are that since the potential research participants are the ones who contact you, this can reduce the time necessary to search for appropriate units (or cases) (Fox, 2010).In addition, the potential units or cases are likely to be committed to participating in the study and are more willing to provide more insight into the phenomenon being studied (Sharma, 2017). However, there are also drawbacks to this method. Since the potential research subjects (or organisations) volunteer to participate in the study, there is likely to be a degree of self-selection bias (Cheung et al., 2017). Research also suggests that individuals who volunteer for technology adoption studies typically possess a prior interest in the subject, aspire to enhance scientific knowledge and assist others with analogous conditions, and seek to deepen their understanding of their own condition or acquire insights from the research process, regardless of the absence of guaranteed therapeutic benefits (Lehdonvirta et al., 2021; Robinson et al., 2023). Owing to self-selection, the study participants may have been driven by one or more of these motivations. This can either lead to the sample not being representative of the population being studied or exaggerating some particular finding from the study (Rutherford, 2005; Sharma, 2017).

Nonetheless, self-selection could not be eliminated in this recruitment context. Self-selection techniques were used to align with the hospital's ethical guidelines, which mandated that patient involvement in research must be voluntary and that the hospital is not responsible for recruiting patients for research. However, purposive sampling with specific inclusion criteria mitigated most of its limitations.

Thus, participants self-selected by contacting the researcher by telephone, WhatsApp, and email. The researcher used this technique as a concise screening process to ascertain participants' eligibility according to the predefined inclusion criteria discussed in Section 3.8.2.3, obtain the participants' contact information, and plan logistics for training and face-to-face interviews.

3.8.2.2 Purposive sampling

Purposive sampling is used on a strategically chosen, limited number of people with knowledge about an issue of which little is known (Nurhayati, 2020). Furthermore, purposive sampling is suitable in qualitative studies, as it will allow you to get in-depth and rich insights about the phenomenon of interest (Murnane et al., 2016). In addition, purposive sampling is effective in targeting a narrow demographic and the possibility of obtaining profound, contextually relevant information (Ceneciro, 2025; Klar & Leeper, 2019; Memon et al., 2024). This study purposively selected diabetic individuals from a hospital in Bulawayo province as the target population. Purposive sampling was employed to screen self-selected participants using a defined inclusion criterion. It enabled the direct recruitment of individuals with the specific condition of interest (diabetes), essential for facilitating a more profound understanding of the adoption of QST within this population (Ayobi et al., 2017; Murnane et al., 2016). In addition, purposive sampling was considered ideal for this study since it enabled the examination of individual lived experiences and subjective impressions of technology within a specific group (diabetic patients), which is crucial for comprehending nuanced behaviours and attitudes (Campbell et al., 2020).

To mitigate possible shortcomings, including selection bias and an over-reliance on a specific subset of diabetic patients (Denieffe, 2020), efforts were undertaken to ensure a diverse population of diabetic patients was selected within the chosen hospital through the following inclusion criteria :

3.8.2.3 Inclusion Criteria for Purposive Sampling

The first inclusion criterion for a diabetic patient to be part of this study was that they needed to have a confirmed diagnosis of Type 2 diabetes from the chosen hospital in Bulawayo. The second inclusion criterion was that they needed to own an internet-enabled smart mobile device. Without a smart mobile device, it was impossible to use the QST. The next inclusion criteria were based on their age category. Diabetic patients had to be in the age category of 18 to 65 years. Elderly patients under the care of a caregiver were also included; however, consent from both the caregiver and the diabetic patient was required. In this study, only one participant was under the care of a caregiver, but not for diabetes care purposes. Anyone who was below the age of 18 or above 65 years of age was excluded from the study. Limiting the age range to 18-65 years allowed for a focused and manageable research scope. This age range includes individuals in various life stages, including young adulthood, middle age, a significant portion of the adult population, and early stages of older adulthood, i.e., the retirement threshold group (Weck & Afanassieva, 2023; Yap et al., 2022). In addition, the research wanted to understand the experiences, challenges, attitudes, or specific needs of diabetic patients within this range (Berkowsky et al., 2017). Narrowing the age range to 18-65 years also helped the researcher gain insights into the unique characteristics and concerns of younger, middle-aged and elderly adults living with diabetes (Pang et al., 2021). In addition, interviewing patients in the 18-65 age range provided valuable insights into their motivations, barriers, and strategies for effectively managing their diabetes.

Those who qualified were then provided with a participant information sheet delineating the study's objective, a high-level definition of QST in layman's terms, specifically as a mobile health application for health management, outlined the voluntary nature of participation and the option to withdraw at any time without repercussions, ensured data processing confidentiality and anonymity, and specified the anticipated duration of the interview. The researcher intentionally kept the information in this document neutral and general, concentrating on the study's objective without endorsing the technology or overstating its advantages. No financial incentives or other rewards were provided to sway participation. This information was intended to assist prospective participants in determining their involvement and highlight the relevance of their experiences to the study.

3.8.2.4 Determining the sample size

Patton (2015) emphasises that there exists a lack of universally accepted guidelines that dictate sample size. Since there is no consensus among qualitative researchers on the adequate sample size, researchers follow various guidelines to assess whether their research sample is adequate. An analysis of the literature found that a varied number of researchers have used a sample size ranging from 10 participants to 42 participants (Adapa et al., 2018; Kervinen et al., 2025; Olatinwo, 2019; Rapp & Tirabeni, 2020). Thus, 42 participants met the self-selection inclusion criteria. However, only 35 were finally interviewed in the face-to-face semi-structured interviews. Table 3.2 shows why this is so:

Table 3.2: Participant Recruitment Process

	Diabetics to be Interviewed	**Number**	**Remaining**
1.	Diabetic Patients self-selected	42	
2.	Diabetic Patients who did not own or did not have access to a smartphone, participants expecting payment.	2	40
3	Participants who cancelled interviews: for unknown reasons, did not honour set dates, and some kept on postponing the interviews to unknown dates, mobile number no longer in use, mobile number not going through after three attempts at different intervals	5	35
4.	Final Interview Participants		**35**

The composition of this sample is presented in Table 3.3.

Table 3.3: Demographic Profile of Participants

Pseudo Code	**Age**	**Gender**	**Highest Education Level**	**Years with Diabetes**
P1	46-65	female	secondary	<1
P2	36-45	female	tertiary	6-10
P3	18-35	female	secondary	<10
P4	36-45	female	tertiary	2-5
P5	18-35	male	tertiary	6-10
P6	46-65	male	tertiary	6-10
P7	46-65	female	secondary	<10

P8	36-45	male	tertiary	6-10
P9	36-45	male	tertiary	2-5
P10	36-45	female	tertiary	2-5
P11	46-65	female	tertiary	6-10
P12	46-65	female	secondary	2-5
P13	46-65	male	secondary	6-10
P14	18-35	female	tertiary	6-10
P15	18-35	male	tertiary	6-10
P16	46-65	male	secondary	6-10
P17	46-65	female	tertiary	2-5
P18	36-45	male	tertiary	2-5
P19	18-35	female	tertiary	6-10
P20	18-35	female	tertiary	>1
P21	36-45	male	tertiary	6-10
P22	46-65	female	secondary	<10
P23	18-35	male	tertiary	2-5
P24	36-45	male	tertiary	6-10
P25	36-45	male	tertiary	2-5
P26	36-45	female	primary	<10
P27	18-35	female	Tertiary	>1
P28	46-65	female	tertiary	2-5
P29	46-65	female	primary	2-5
P30	18-35	male	tertiary	6-10
P31	46-65	female	primary	2-5
P32	46-65	female	tertiary	<10
P33	18-35	female	tertiary	<1
P34	36-45	female	tertiary	2-5
P35	36-45	female	secondary	6-10

The sample reflects diversity in age, gender, and educational background, with a slightly higher representation of female participants. Most participants had lived with diabetes for several years, suggesting a level of experience relevant to understanding self-management practices.

After participant recruitment, the next step was training the participants. Training was not part of the data collection but was done for the reasons outlined in the subsequent section (Section 3.8.3).

3.8.3 The Training Process

Participants were given the “mySugr” QST application to install on their mobile devices. Those who did not mind incurring broadband costs were provided a link to the Google Play Store or App Store to download the app. The researcher was responsible for installing the app on the smartphones of diabetic patients who could not do so. The application was chosen because it is free, the highest-rated and popular diabetes application (Singh et al., 2025).mySugr application has over 6 million registered accounts worldwide.

Diabetics were asked whether they needed training on app use and installation. Guided by the university's ethical considerations, training had to be done to make technology inclusive to everyone, regardless of their technological capabilities. The literature also states that to ensure maximum app usage, researchers must conduct training sessions with participants to familiarise them with the app's features, functionalities, and effective use (Brown & Kim, 2019; Osterhoff et al., 2020). Training ensures that all patients, regardless of their technological proficiency, can utilise the application effectively, thus fostering equitable access to digital health resources (Beck et al., 2024; Yeung et al., 2023). Training facilitates empowerment among all patients, especially those from marginalised communities, by endowing them with the necessary competencies to manage their health autonomously, consequently mitigating health disparities (Arsad, 2023; Liu et al., 2020; Okolo et al., 2024). Thus, training was done so that technology was inclusive to all and to ensure the participants were using the right app correctly.

The training session was conducted with each voluntary diabetic patient at their convenience and chosen place. The training was a one-to-one process and was also done as and when participants became available. The researcher maintained open lines of communication with participants throughout this phase to address any questions, concerns, or challenges they may have related to app usage, guided by the recommendations of (2022; Audibert et al., 2022; Beck et al., 2024). The researcher also offered support through email, in-app messaging, or virtual meetings to ensure they feel supported and motivated, as suggested by (Ek et al., 2018; Al-Majarfi, 2022). The researcher also clearly communicated the participants' expectations and objectives for using the app. It is important to note that not all participants required training, as some indicated they had high technology self-efficacy. Of the 42 initially recruited participants, three did not want training for unknown reasons, nine did not require training because they felt they had self-efficacy, and 30 were trained.

3.8.4 Designing The Interview Tool

The researcher needed to collect and analyse data relating to QST adoption to answer this study's research questions. Qualitative data collection methods were the most appropriate in this interpretive research (Saunders et al., 2019). Table 3.4 below shows the design of the semi-structured interview tool for this study. It contains the construct of the conceptual framework, the interview question that was asked of the diabetic patient, references where such a question (similar/closely related) has been asked before by prior literature, and the objective of the study that is answered by that particular question/s.

Table 3.4:Semi-Structured Interview Tool

CONSTRUCT	**INTERVIEW QUESTION**	**OBJECTIVE**	**References, where such a question was used in literature**
User Characteristics - Participants Age -Technology Self-Efficacy -Level of Education -Awareness	1. Can you tell me how long have you had diabetes and how you have been managing it? How do you manage your diabetes? Which IT tools do you use to manage your diabetes? • What information technologies do you use to help you manage your diabetes?	To determine how user characteristics influence the adoption of quantified self-technology	(Jeffrey et al., 2019)(Tajudeen et al., 2022)(Ajana, 2020) (Bults et al., 2023)(Birkmeyer et al., 2021)(Schueller et al., 2021) (Jeffrey et al., 2019)(Turnbull et al., 2020) (Philip et al., 2023) (Peng, Kanthawala, et al., 2016)(Wangler & Jansky, 2023)(Tajudeen et al., 2022)(Rico, 2015)(Bults et al., 2023)(Peng, Kanthawala, et al., 2016)
Technology Preparedness -Access To Resources -Technological Experience -Affordability of the Technology	2. Using technology requires you to be computer literate and have the necessary resources, can you tell me, how did you prepare/teach yourself to use this app? • What help did you receive with setting up the app on your mobile device?	To determine how the technology preparedness influences the adoption of quantified self-technology	(Tajudeen et al., 2022)(Ong et al., 2014)(Bults et al., 2023) (Fazlyn et al., 2020) (Anderson et al., 2016)(Philip et al., 2023)(Wangler & Jansky, 2023)
Usability -Perceived Enjoyment -Usefulness of the Technology	3. Can you explain how are you using the technology to manage your diabetes? Which tools do you mostly use?	To determine how usability influences the adoption of quantified self-technology	(Anderson et al., 2016)(Philip et al., 2023)(Wangler & Jansky, 2023)

Usability -Perceived Reliability -Ease of use of the Technology	4. Which challenges do you face when using the app and what support would be necessary for you to effectively use this app?	To determine how usability influences the adoption of quantified self-technology	(Jeffrey et al., 2019) (Anderson et al., 2016)(Tajudeen et al., 2022) (Bussmann, 2020) (Tajudeen et al., 2022)(Ong et al., 2014)(Dehnavi et al., 2021b)(Vinnikova et al., 2020) (Bults et al., 2023)(Khakurel, 2018) (Fazlyn et al., 2020)(Hangaard et al., 2022)
Perceived Benefits -Monitoring -Reduce costs -Medication Adherence -Data Collection and Sharing	5. In what ways is the use of the app supporting/helping you to manage your diabetes? • How has the app changed/influenced the way you manage your diabetes?	To determine how perceived benefits influence the adoption of quantified self-technology	(Jeffrey et al., 2019)(Mtshali, 2020)(Tajudeen et al., 2022) (Ong et al., 2014) (Dehnavi et al., 2021b)(O'Neill et al., 2022) (Bults et al., 2023)(Yuan, et al., 2016) (Tajudeen et al., 2022) (Rico, 2015)(Almulhem, 2023)
Social Norms -Social Identity -Subjective Norms	6. With respect to members of the community/family/friends where you live, what are their perceptions on the use of technology to monitor diabetes? Are they supporting you?	To determine how social norms influence the adoption of quantified self-technology	(Ong et al., 2014)(Mtshali, 2020) (Dehnavi et al., 2021b) (Bults et al., 2023)(Brown et al., 2020) (Anderson et al., 2016) (Almulhem, 2023)
Security Concerns **-**Data Theft -Data Misuse -Data Privacy Concerns	7. How would you feel if the information you have shared in this interview is shared with other people? Why?	To determine how cybersecurity risks influence the adoption of quantified self-technology.	(De Moya et al., 2021; Zhao et al., 2018; Rupp et al., 2018; Chebolu, 2021) (Bults et al., 2023)(Zhou et al., 2019)(Fox & Connolly, 2018) (Koohang et al., 2021)
	8. Is there anything else I have not mentioned that you would like to talk about?		

3.8.5 Pilot Interviews

A feasibility study conducted before the main study is known as the pilot study or a pretest of the research instrument (Drew et al., 2024; Lowe, 2019). Once the researcher has chosen what or whom to investigate, what to assess, and how to gather the data, they should conduct a pilot study (Shrestha et al., 2024). In essence, testing the research instrument (interview guide) is necessary to identify potential issues before data collection begins (Bhattacherjee, 2012; Drew et al., 2024). It is crucial to identify elements to remove from the research instrument after the target participants in the pilot study have reviewed the instrument (Bhattacherjee, 2012). In addition, crucial information not previously included as part of the investigation may emerge (Dźwigoł, 2020). The results of the pilot research should enable one to estimate the predicted non-response rate. When appropriate, it may be necessary to include techniques to lower that percentage (de Guzman & Diño, 2020). In addition, pilot studies can enhance research designs, data-gathering methodologies, and interviewing strategies (Harerimana et al., 2024; Kunselman, 2024; Shrestha et al., 2024).

Against this background, this research conducted a pilot study to test its research instrument, which was the interview guide. The pilot study was done on five diabetic patients. The following emerged from the pilot interviews that led to the refinement of the interview schedule:

- The flow of questions needed to be changed as some questions needed to be asked first before others.
- Reduce the number of questions, as some add no value to the research, lengthening the interview process.
- Do not use the term “self-quantification, self-monitoring, or self-tracking,” but rather the term mobile health application.
- Do not use the term “self-efficacy/tech savvy”; use computer literacy.
- Do not use the term “security breach or privacy concerns” as it is interpreted as layman's security such as padlocks, burglar bars, and security alarms rather than its information technology meaning.
- A last question asking if there is anything else they want to add is needed.

After considering these considerations and refining the interview schedule, the next step was conducting the interviews.

3.8.6 Semi-Structured Interviews

Semi-structured interviews are data collection methods that ask questions within a preplanned thematic framework (Kumar, 2019). They combine the advantages of structured and unstructured interviews, yielding rich, meaningful explanations. This study chose semi-structured interviews as the main data collection source. Face-to-face semi-structured interviews were conducted to help participants feel more comfortable with the interviewer and establish a close relationship. A close and trusting relationship encouraged disclosure into frequently guarded worlds, which is incomparable in self-reports. Furthermore, the interviewer could guide the interview, explain, and explore arising issues, and probe for further information if required (Megel & Heermann, 1994). Thus, interviews were appropriate to understand the quantified self-technology phenomenon. The interview schedule guide answered by diabetic patients is presented in Table 3.5 and attached in Appendix H.

Table 3.5:Interview Schedule

1. Can you tell me how long you have had diabetes and how you have been managing it? • What information technologies do you use to help you manage your diabetes?
2. Using technology requires you to be computer literate and have the necessary resources. Can you tell me how you prepared/taught yourself to use this app? • What help did you receive with setting up the app on your mobile device?
3. Can you explain how you use technology to manage your diabetes? Which tools do you mostly use?
4. Which challenges do you face when using the app, and what support would be necessary for you to use this app effectively?
5. In what ways does the app support/help you manage your diabetes? • How has the app changed/influenced how you manage your diabetes?
6. With respect to members of the community/family/friends where you live, what are their perceptions on the use of technology to monitor diabetes? Are they supporting you?
7. How would you feel if the information you shared in this interview were shared with others? Why?
8. Is there anything else you would like to discuss that I have not mentioned?

3.8.6.1 The Interview Procedure

Qualitative data for this study was collected cross-sectionally from May 2024 to July 2024 (12 weeks). Data collection for a cross-sectional study is done once. In contrast, a longitudinal data study is done over a lengthy period (Saunders, Lewis, et al., 2019). Participants had used the app for 6 months. For every face-to-face interview (35 interviews), the researcher first scheduled an appointment by telephone with the willing participants to conduct the interview when the participant was free.

The researcher started the interview by giving brief introductions about themselves, the purpose of the research, and the intended outcomes. Furthermore, this time was used to explain the ethical procedures the researcher is adhering to, such as voluntary participation, the confidentiality of all the information, anonymity, and the participants' free will to withdraw from the study at any given point (explained in Section 3.11). Ethical documents, such as clearances and informed consent for conducting the study, were also presented during this time and signed. Moreover, the researcher asked for permission from the participants to record the interview on a voice recorder. The researcher told the participants that she would use aliases when recording so that they could speak liberally without fear of their identities being disclosed.

The English language was the mode of communication. However, where participants required a native language translation for certain terms, the researcher did so as she can speak the Zimbabwean native language. Five participants often required translation into the isiNdebele language. Interview sessions with diabetic people lasted approximately 60-90 minutes each.

3.8.7 Transcription of the Interviews

The interviews that were conducted were subsequently transcribed (refer to Appendix I for an example of a transcribed interview). The initial stage encompassed the utilisation of an open-source software application named "Transcribe.app" to facilitate the automatic transcription of the audio recordings. This software incorporated time stamps in the transcription whenever a new interview question was posed. Such a feature enabled the researcher to revisit the audio recordings at designated timestamps to clarify or substantiate any transcription ambiguities and derive meaning from the content. Following this procedure, the researcher engaged with five transcripts that comprised a blend of English and the indigenous Ndebele language. The transcription software could transcribe only the segments in English. Consequently, the researcher listened to each audio recording and translated the Ndebele segments into English. It is important to note that the transcription of interviews was an ongoing process. As soon as the researcher finished the interview, she would transcribe, whilst many things said during the interview were still "fresh" in her mind. With 35 finalised transcriptions, an average of 10 pages per transcribed document and a comprehensive total of 368 pages of transcripts were produced.

With 35 finalised transcriptions, the researcher reached out to the participants to confirm the accuracy of the transcriptions, also known as "member checking". Member checking involves sharing interpretations or findings of the data with research participants, which augments the research's credibility and bolsters the collected data's trustworthiness (Lee & Baskerville, 2003). However, they applaud the approach of doing this technique after transcribing to provide the trustworthiness of the data (Candela, 2019; Santos & Silva, 2017; Urry et al., 2024). Thus, the researcher randomly selected nine participants in the member-checking process. This number was informed by research that highlights that there is no definite value on the number of participants that should be part of checking, but it can be 20 to 30 percent of the participants (Candela, 2019; Urry et al., 2024).

3.9 Qualitative Data Analysis

The researcher examined the different qualitative data analysis techniques listed by Lester et al. (2020) and Hendren et al. (2023) that is suitable for the study, such as thematic analysis, grounded theory, and narrative analysis. Although several qualitative analytical approaches were considered, this study adopted Braun and Clarke's (2006) reflexive thematic analysis as the primary method of data analysis. This approach was selected for its flexibility, suitability for theory-guided analysis, and ability to accommodate both deductive (framework-informed) and inductive (data-driven) theme development. Given that this study is guided by a conceptual framework while remaining open to emergent insights from participant data, reflexive thematic analysis was considered the most appropriate method for capturing the depth, complexity, and contextual nuances of participants' experiences.

3.9.1 Grounded Theory of Analysis

When little is known about a subject, grounded theory is a helpful method to generate a theory (Corbin & Strauss, 2015; Kawulich, 2015). It views data collected, analysed, and incorporated into a proposed theory as closely related (Charmaz & Thornberg, 2021). It is inductive and assumes no pre-conceived framework (Glaser & Strauss, 1967). The process requires a lot of objectivity, creativity, and critical thinking from researchers. Furthermore, grounded theory offers systematic methods for collecting, analysing, and interpreting data through its coding techniques (Charmaz & Thornberg, 2021). Open coding is the analytic process by which theories and attributes are discovered in the data. This step is done after the initial data collection because of the need to separate data into discrete parts and evaluate them for similarities and differences (Corbin & Strauss, 2015; Glaser & Strauss, 1967).Axial coding: After open coding, relationships amongst categories from the previous stage are identified with their subcategories. This stage will ensure the researcher considers how categories were linked. This type of coding aims to create more precise and complete explanations about a phenomenon (Corbin & Strauss, 2015). Selective coding is the final coding step where the categories are integrated and refined into a theory. The refining process consists of techniques such as appraising the scheme for internal consistency and research gaps in logic, filling in inadequately built categories and reducing excess ones, and finally, scheme validation (Corbin & Strauss, 2015; Glaser & Strauss, 1967)

Grounded theory prioritises a process of continuous comparison and theoretical sampling, intending to construct a theory from the foundation rather than evaluate or enhance an existing one. Although it can be advantageous for examining intricate social processes, it may not correspond with the pre-existing conceptual framework (developed in Chapter 2). Given that this research seeks to comprehend certain factors affecting the adoption of quantified self-technology, the emphasis of grounded theory on generating theoretical insights from unrefined data may distract from the established patterns this research seeks to investigate, hence making it unsuitable for this research.

3.9.2 Narrative Analysis

Narrative analysis is a qualitative research method focusing on understanding and interpreting stories or personal accounts to uncover how individuals construct meaning from their experiences (Smith & Monforte, 2020). Narrative analysis focuses on the language people use to interpret their stories. It involves examining the structure, content, and context of narratives, allowing researchers to explore themes, identities, and cultural meanings (Carless & Douglas, 2017). The benefits of narrative analysis include its ability to provide deep insights into personal and social contexts, revealing how people construct meanings in their lives (Brett, 2016; Chambliss & Schutt, 2024). It fosters empathy and understanding by highlighting diverse perspectives. However, its shortcomings include potential subjectivity in interpretation, reliance on the quality of the narratives collected, and challenges in generalising findings due to the often unique and context-specific nature of individual stories (Carless & Douglas, 2017; Edwards, 2016) and the inability to result in the identification of themes (Hendren et al., 2023).

While narrative analysis can highlight complex human experiences, it requires careful consideration of its limitations (Neupane & Gnawali, 2023).

Narrative analysis is inappropriate for this study as it predominantly emphasises individual narratives and personal experiences. Although it offers profound insights into individual interpretations of experiences, it may fail to adequately represent the overarching patterns or themes that arise throughout a wider population. This research seeks to investigate the factors affecting technology adoption, an analysis technique that prioritises individual narratives may neglect the systemic and contextual elements that facilitate behavioural change.

3.9.3 Thematic Analysis

Thematic analysis is a method used to infer the meaning of words (Braun & Clarke, 2006). Patterns in qualitative study data can be found, categorised, analysed, and interpreted with the aid of thematic analysis (Vaismoradi et al., 2013). It is a technique that transcends mere data summarisation to uncover repeating patterns of significance within a dataset (Fuchs, 2023). These patterns can disclose significant information on the topic under investigation, offering useful insights into participants' viewpoints, experiences, and interpretations (Clarke & Braun, 2017). Hence, recurring themes can be found in the data. These significant themes highlight important data findings. In addition, a coding frame, also known as a category, is frequently the result of thematic analysis (Kraska et al., 2020). After identifying these codes, themes can then be identified and reviewed.

Thematic analysis is particularly appropriate for this study as it directly responds to the research question posed by identifying factors that influence QST adoption through data pattern analysis. It aligns with the existing conceptual framework (developed in Chapter 2), facilitating both deductive and inductive systematic identification and interpretation of themes and subthemes within qualitative data. Moreover, thematic analysis underscores the significance of context, which is essential for comprehending how social, cultural, and individual aspects affect diabetes patients' decisions to embrace QST. In addition, thematic analysis provides a robust framework for understanding the nuanced comprehension of the variables that influence adoption among persons with diabetes.

3.10 Analysis procedure for this study: Braun and Clarke Thematic Analysis

After analysing the three techniques, the researcher decided to utilise Braun & Clarke (2006) thematic analysis. Braun and Clarke's analysis technique delineates a systematic, sequential procedure for executing theme analysis, augmenting rigour, and transparency. It pushes researchers to actively discover and develop themes while contemplating their results' theoretical and contextual ramifications. It underscores that theme analysis transcends mere data summarisation, focusing instead on its interpretation. Braun and Clarke's Thematic analysis technique comprises six phases: Data Familiarisation, Generating Initial Codes, Searching for Themes: Reviewing Themes, Defining and Naming Themes, and Producing the Report. Thus, the overall data analysis strategy is presented in Figure 3.5.

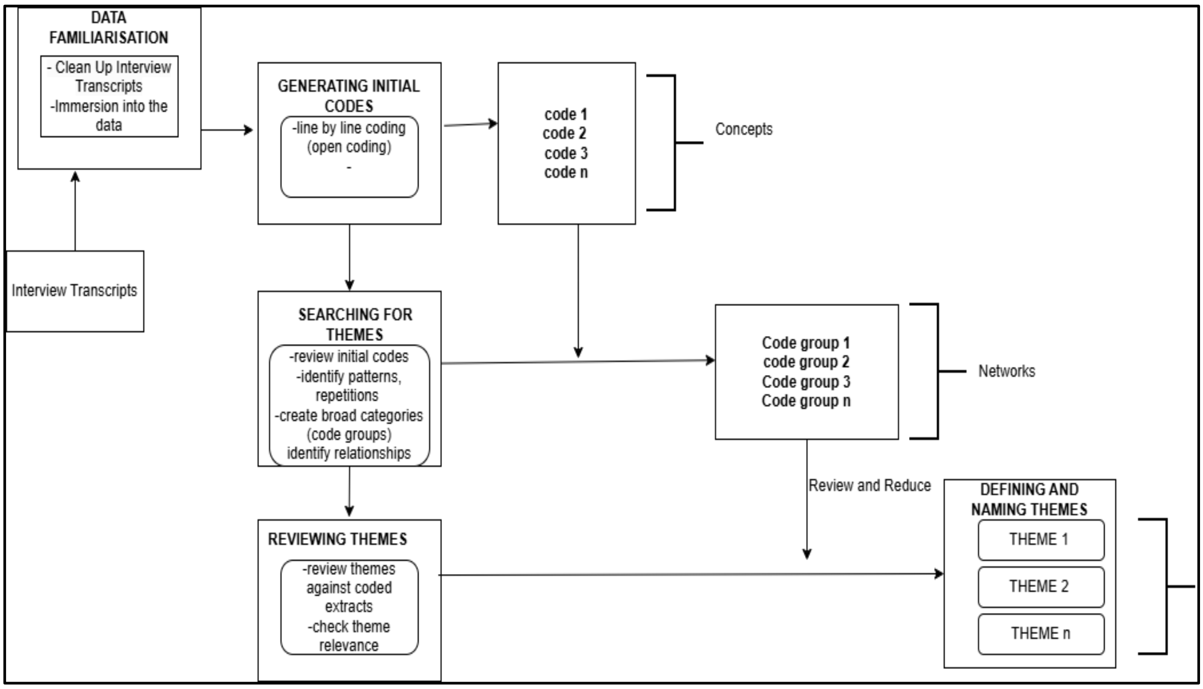

Figure 3.5: Overview of the data analysis strategy of the study

3.10.1 Phase 1: Familiarisation with the Data:

Initially, the researcher immersed themselves in the data by reading and re-reading the cleaned interview transcripts. This step helped the researcher understand the content and context, allowing her to identify initial ideas for potential themes. This was done by uploading all the anonymised thirty-five (35) interview transcripts in standard Microsoft Word format to ATLAS.ti version 24.2.1.32227 software and reading them through. The university provides the full licensed version of this software to the students. Figure 3.6 depicts the familiarisation process.

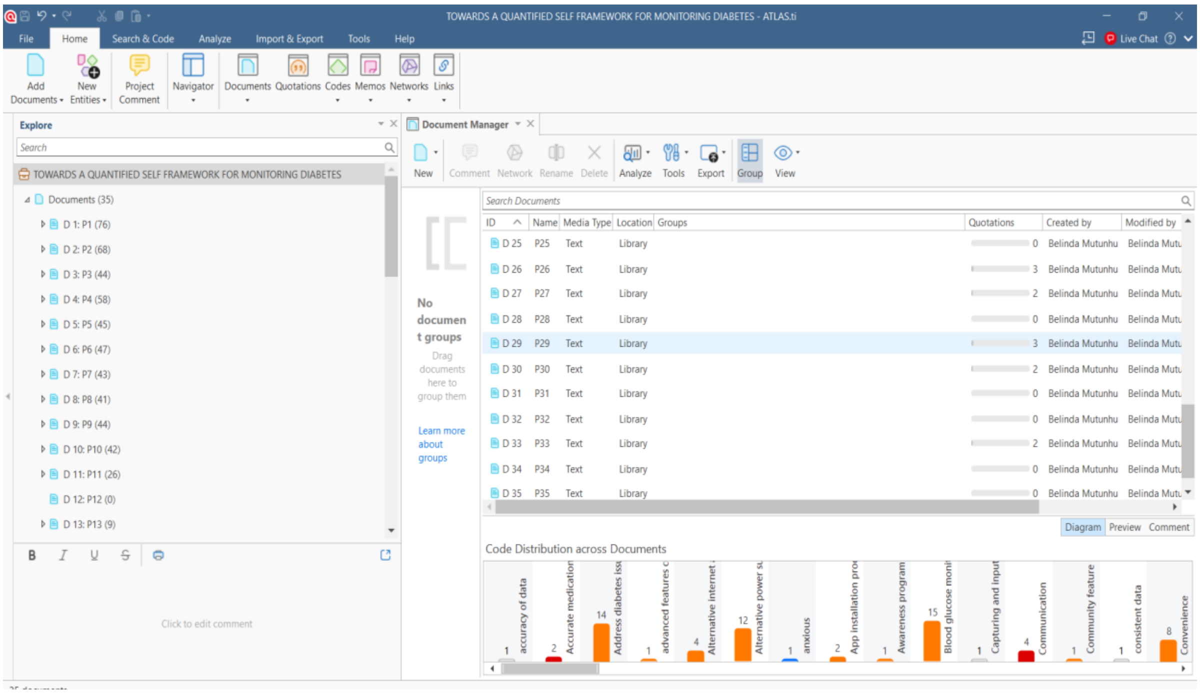

Figure 3.6: Data Familiarisation: Screenshot of the 35 Atlas.ti uploaded transcriptions

3.10.2 Phase 2: Generating Initial Codes:

This step involved coding the data systematically using Atlas.ti. This is also known as open coding. Coding is a process that divides data into manageable parts and designates or labels those portions. Codes may be established before data collection or coding (Miles et al., 2019). A code may consist of a singular word or a collection of words. Coding offers a degree of abstraction that categorises similar concepts based on their representation of a pattern to construct a concept (Naeem et al., 2024).

The researcher initiated the coding process with open coding. This involved meticulously reading the data, line by line, from Transcription 1 to Transcription 35, during which the researcher identified and assigned descriptive labels (codes) to different segments of the text, without preconceived categories. At this stage, the aim was to break down the data into manageable pieces by assigning a name to each data fragment. The process was inductive and grounded in the data, with the primary objective of staying as close as possible to the participants' words. Each code was descriptive and captured a specific idea, action, or event mentioned in the data. This coding procedure enhanced the comprehension of participants' lived experiences and the intricate dynamics of their engagements with QST. This preliminary phase allowed the researcher to separate data into discrete parts and evaluate them for similarities and differences. This is depicted in Figure 3.7

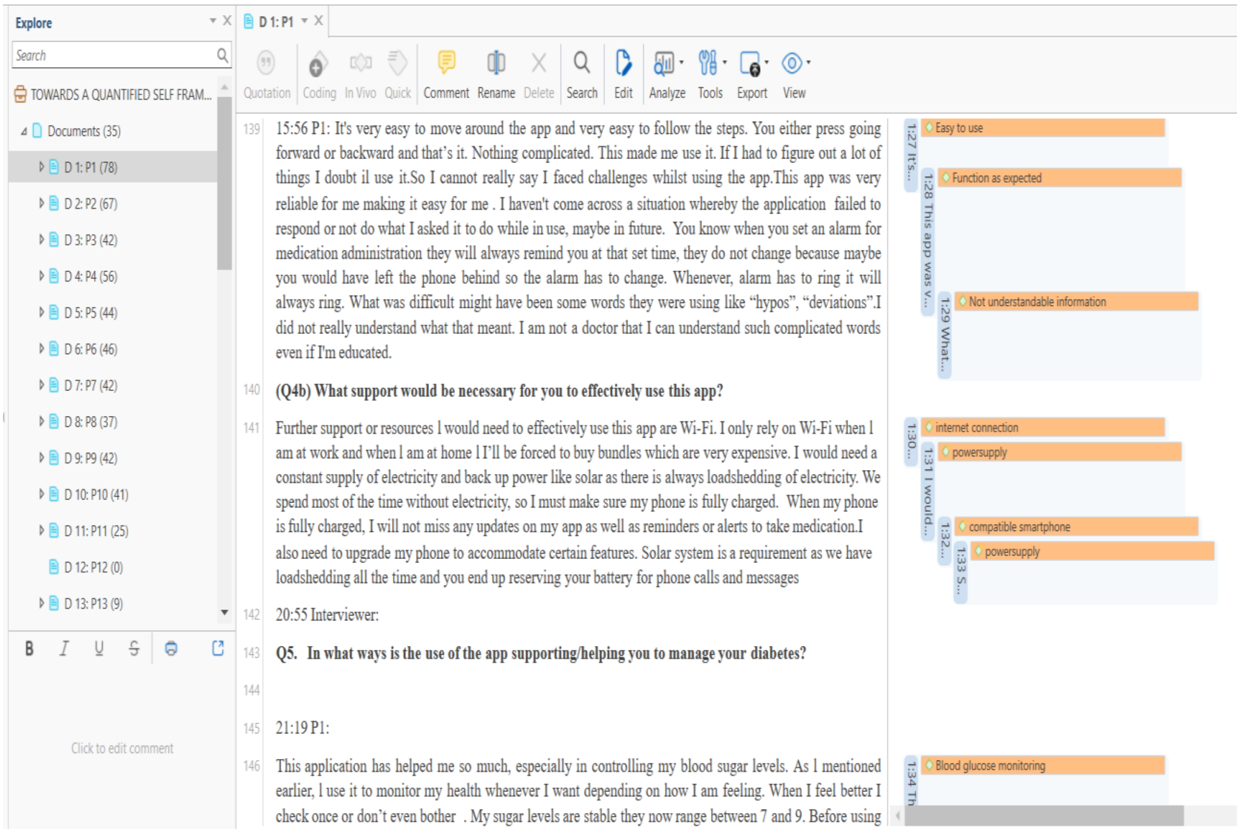

Figure 3.7: Screenshot of generating initial codes

Figure 3.7 displays the generation of initial codes. For the first document to be coded, a text was highlighted and a new code was applied; for subsequent documents, a text was highlighted and either a pre-existing code was applied, or a new code was created and then applied.

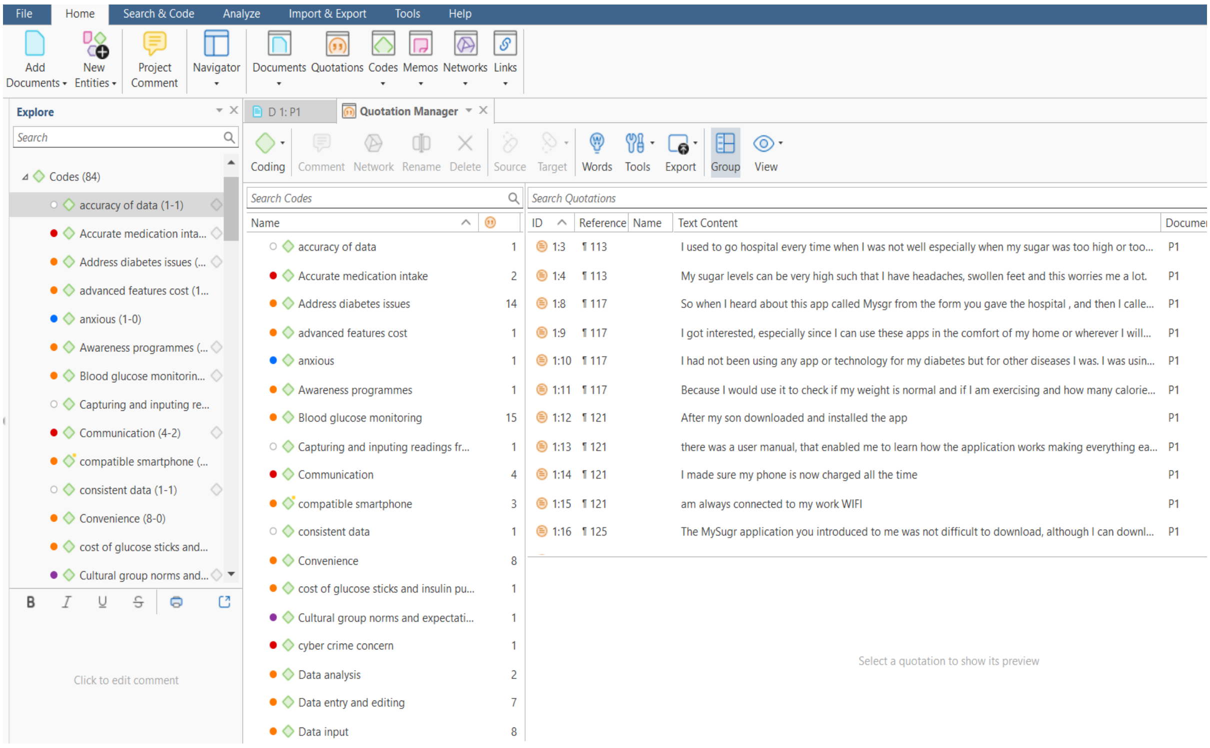

Figure 3.8: Codes identified

At the end of generating initial codes, the researcher had a large set of codes that described various aspects of the data in a straightforward manner. Thus, at the end of the initial code generation, 84 codes emerged and 550 quotations, as depicted in Figure 3.8. Furthermore, at this stage, the researcher had to evaluate the concept of data saturation.

3.10.2.1 Sample Adequacy and Information Power

Baker et al. (2012) posed a question regarding the number of qualitative interviews deemed sufficient for a study. The answer to this question was responded to multiple times with the answer 'it depends' by 8 out of the 17 researchers surveyed. This matter holds significance as all researchers are obliged to determine when a satisfactory volume of data has been acquired. On the other hand, other researchers note that the concept of saturation and the notion that the sample should be sufficient for carefully investigating the relevant themes is the general answer to this question (Lincoln & Guba, 1985). Prior research has indicated that qualitative research usually reaches saturation at (9–17) interviews (Hennink & Kaiser, 2022; Vasileiou et al., 2018). However, Braun and Clarke (2021) argue that saturation is not necessarily a goal in reflexive thematic analysis, as meaning is not fixed and themes are actively developed by the researcher rather than simply discovered in the data. Similarly, Naeem et al. (2024) note that ambiguity persists regarding the conceptualisation, attainment, and reporting of saturation, thus necessitating context-specific and methodologically coherent approaches in qualitative inquiry. In line with reflexive thematic analysis, the objective of this study's data collection was not to achieve saturation, but to engage participants in a manner that enabled them to move beyond surface-level responses and freely express their perceptions and experiences regarding QST adoption. Therefore, the sample size was justified using the concept of information power, as proposed by Malterud et al. (2016), which posits that the adequacy of a sample depends on the richness, relevance, and quality of information obtained in relation to the study aim, rather than on achieving a predetermined number of participants. Although saturation was not the primary objective, the coding process indicated a progressive decline in the emergence of new codes, with the last new code identified at participant 20. Beyond this point, subsequent interviews largely reinforced existing patterns rather than substantially extending the study's conceptual scope. Figure 3.9 illustrates this decline in new code generation, with the flat trend from participant 21 to 35 indicating informational redundancy rather than serving as definitive proof of saturation.

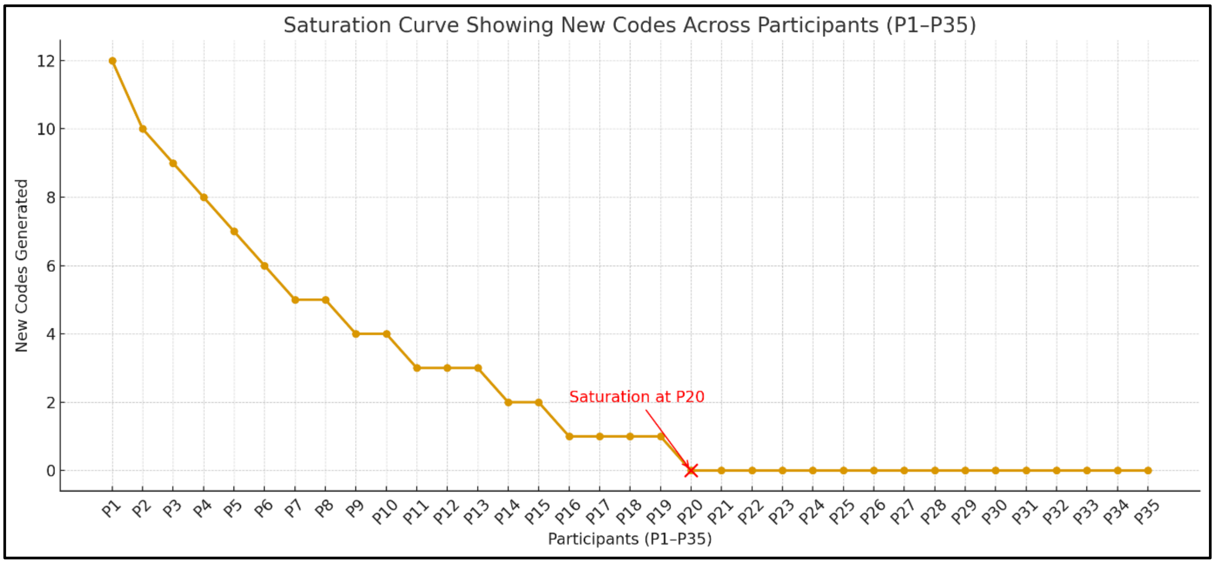

Figure 3.9: Data saturation

Participants interviewed beyond the twentieth participant were not excluded, as they continued to provide rich contextual insights and illustrative quotations that strengthened the thematic analysis and enhanced the credibility of the findings.

3.10.3 Phase 3: Searching for Themes:

After generating initial codes, the next phase was to search for themes. This is a critical transition in qualitative data analysis, where the researcher moves from descriptive labelling to a more conceptual understanding of the data. This process involved reorganising, refining, and synthesising the initial codes into broad categories that capture the deeper meaning behind the data. It also involved transitioning from descriptive labels to more abstract and conceptual categories. The basis for the categories was grounded in the patterns and relationships observed in the data, as well as the researcher's interpretive insights into the participants' experiences. Tools like code groups, network views, and memos in ATLAS.ti played a critical role in helping the researcher to organise, refine, and document this process. This process allowed for a deeper understanding of the data, moving beyond surface-level descriptions to uncover the underlying themes and connections. Thus, searching for themes was done in four steps:

Step 1: Review of Initial codes

In ATLAS.ti, this involved reviewing these codes carefully and paying attention to patterns, repetitions, and relationships between the codes. As the researcher reviewed the list, she began grouping similar codes based on shared meanings or underlying concepts. This process of clustering codes into categories or code groups helped to identify which codes were closely related and could potentially form the basis of a second-level category.

Step 2: Identifying themes and patterns

The foundation of the searching for themes phase lies in recognising themes and patterns in the data that are not immediately apparent in the initial coding phase (open coding). After reviewing the initial codes, the researcher noticed patterns that hinted at broad categories. Thus, in ATLAS.ti, these broad categories were termed code groups. Hence, 19 code groups emerged. For instance, several initial codes related to participants expressing how useful the technology was to them. These were grouped under a higher-order category like "Perceived Usefulness of the Technology" as they reflected the usefulness of the technology.

At this stage, the researcher paid particular attention to:

1. **Repetition:** Codes that appeared frequently across different participants or often pointed to common code groups.
2. **Relationships**: Some codes seemed to occur together frequently, suggesting a connection.
3. **Conceptual similarities**: The researcher grouped codes that seemed conceptually similar, even if they used different words. For example, codes like "family support",

“emotional support" and "financial support” became subcodes of a code named “support”.

As the researcher grouped related codes, she moved from descriptive labelling (open coding) to a more interpretive and conceptual level of analysis. Throughout this phase, the researcher used memos in ATLAS.ti to document her insights, interpretations and thought processes and infer from them when reflecting and comparing the concepts. Using quotations and memos helped track the thought process and reflect on the decisions.

Step 3: Creation of code groups or categories

Once the researcher had identified common themes and patterns in the data, the next step was to create categories that represented these broader concepts formally. In ATLAS.ti, this involved creating code groups, which allowed the researcher to organise and manage the data more systematically. Each code group or category was formed by grouping related initial codes that shared a common meaning or were part of the same conceptual framework code group. For example, the code group for "Ease of use of the technology" included codes related to navigation challenges, manual use, user-friendliness of the technology, understandability of the technology and generally how easy it was to use the technology by the participants. The basis for these categories stemmed from several key considerations:

1. Context: Some categories emerged from the specific context of the data. For instance, if the data was about a particular concern on the use of their health data, categories like "Data Breach" naturally arose from the participants’ discussions of their experiences.
2. Frequency: While not the sole criterion, codes that appeared frequently in the data indicated areas of importance to the participants. These frequent codes often form the core of a category. For instance, the participants consistently discussed "monitoring" which became a significant category.
3. Interpretive insight: Some categories were based on the researcher’s interpretation of the data. For instance, while codes like "reduced hospital visits" and “reduced medical consultations” were linked, the researcher’s interpretive insight helped to combine them into a broader category of "cost saving," which reflects a deeper understanding of the issue.

At this stage, the researcher refined the labels for the categories, making them more abstract and conceptual. Instead of using highly descriptive labels, she moved towards labels that captured the essence of the issues that the participants were discussing. Figure 3.10 presents these code groups.

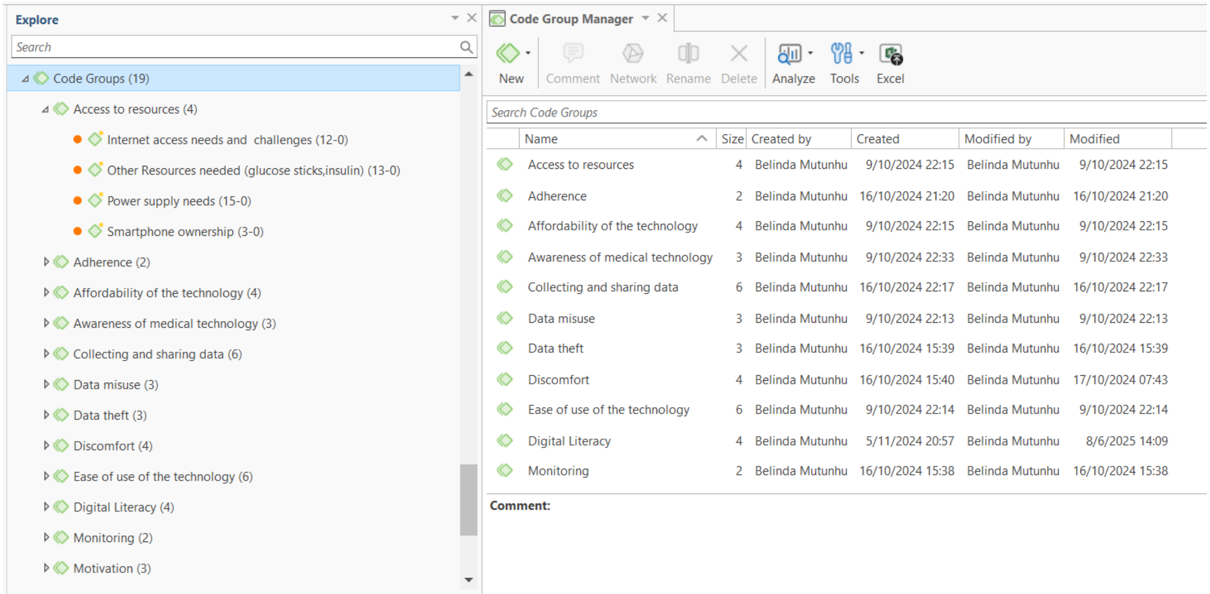

Figure 3.10 : Code groups created from codes

Step 4: Linking codes and categories

Searching for themes phase also involved identifying the relationships between the categories. In ATLAS.ti, the ‘Network View’ tool was particularly useful in this phase. This tool allowed the researcher to visually map out how distinct categories were connected. At this point, the coding process became more interpretive as the researcher explored not just individual categories but also the connections between them. This interpretive process was a hallmark of searching for themes phase, where the goal was to describe the data and understand the underlying relationships and processes.

In some cases, the researcher merged categories that were closely related. For example, initially, the categories "affordability" and "cost concerns" were separate. However, after reviewing the data, the researcher realised that these were part of a larger theme related to "affordability of the technology." Merging these categories allowed the researcher to focus on broader, more meaningful patterns in the data. Thus, 20 networks were formed as shown in Figure 3.11.

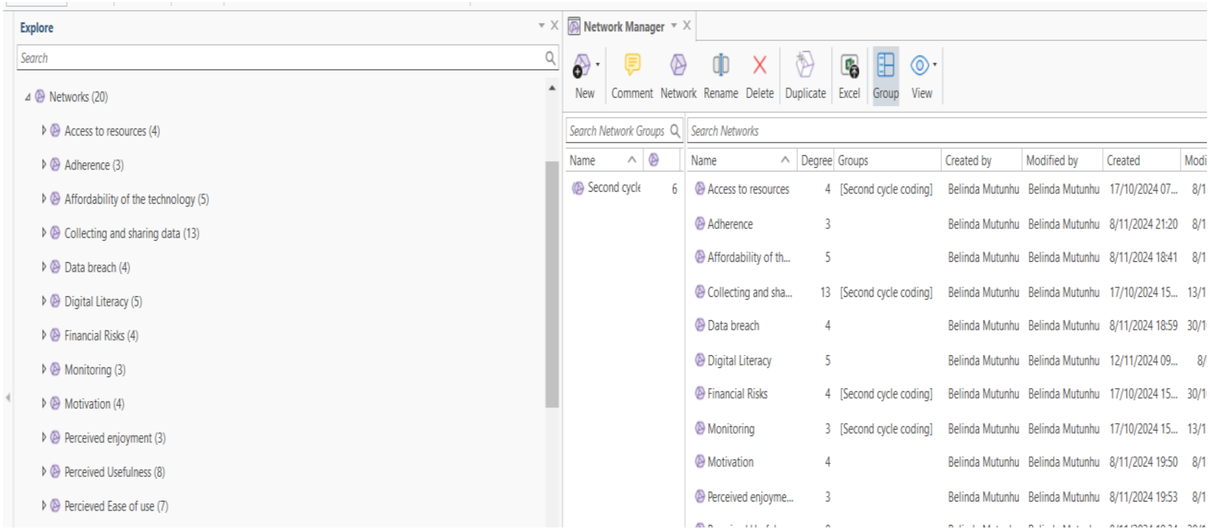

Figure 3.11: Screenshot of the networks identified in ATLAS.ti

Figure 3.12 provides a screenshot of a network diagram that shows how initial codes were grouped.

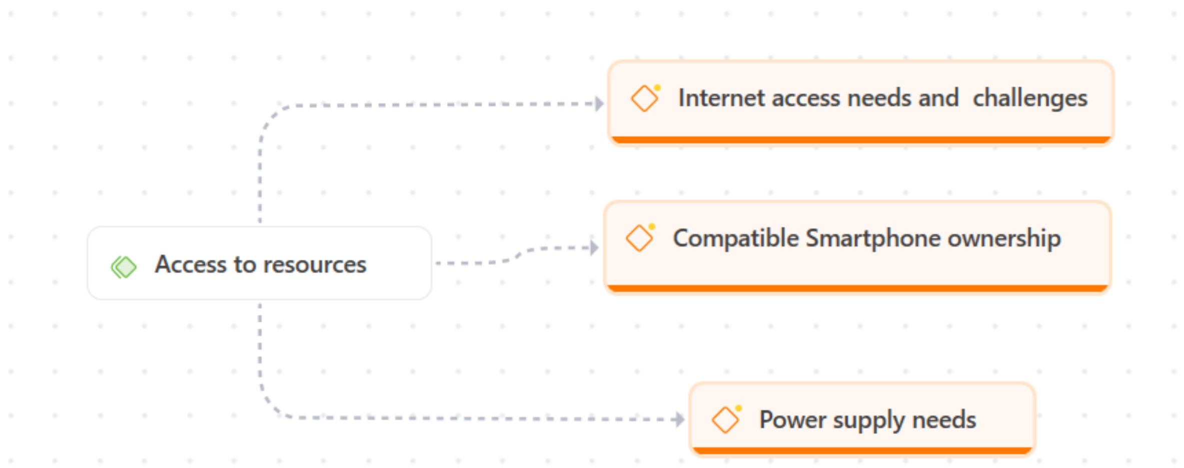

Figure 3.12: Searching for themes: Access to resources network diagram

The broader categories were then grouped into more precise themes. Here, the researcher engaged in a meticulous process of reflection, deliberation, and a systematic approach to categorising the concepts generated during the searching for themes phase. However, Atlas. Ti could no longer group these code groups into precise themes, as the software is created to assume that code groups are mutually exclusive. The researcher had to utilise Microsoft Excel to group the 20 code groups identified in Figure 3.13 into more definite themes. The themes were derived from the synthesis of similar concepts and their potential interconnections, emphasising the overarching narratives that reflect the diabetic patients' viewpoints guided by the conceptual framework developed in Chapter 2. This process enabled the researcher to articulate these notions into a higher-order concept, thus presenting a more integrated and profound comprehension of her ideas in a significant manner.

NETWORK	THEME
Access to Resources	Technology Preparedness
Technology Anxiety	Technology Preparedness
Training	Technology Preparedness
Affordability of the Technology	Technology Preparedness
Digital Literacy	User Characteristics
Technology Awareness	User Characteristics
Self Efficacy	User Characteristics
Financial Risks	Cybersecurity Risks
Data Breach	Cybersecurity Risks
Privacy Breach	Cybersecurity Risks
Perceived Usefulness	Usability of quantified self-technology
Perceived Enjoyment	Usability of quantified self-technology
Perceived Ease of use	Usability of quantified self-technology
Monitoring	Benefits of mySugr quantified self-technology application
Motivation	Benefits of mySugr quantified self-technology application
Data Collection and Sharing	Benefits of mySugr quantified self-technology application
Cost Saving	Benefits of mySugr quantified self-technology application
Adherence	Benefits of mySugr quantified self-technology application
Social support	Social norms
Social Influence	Social norms

Figure 3.13: Code groups to Themes

3.10.4 Phase 4: Reviewing Themes:

The researcher then reviewed the themes to ensure they accurately reflected the data. This involved two levels of review: first, reviewing the themes against the coded extracts to check if they supported the theme; second, reviewing the entire dataset to ensure that the themes were relevant, comprehensive, and fully captured the data. Thus, 6 main themes emerged in this phase.

3.10.5 Phase 5: Defining and Naming Themes:

Six main themes were derived which are:

1. User Characteristics
2. Technology Preparedness
3. Social Norms
4. Benefits of mySugr quantified self-technology
5. Usability of quantified self-technology
6. Cybersecurity risks

Once the themes were finalised, the researcher defined and named each theme. This involved articulating the essence of each theme and determining how it contributed to answering the research question. The researcher ensured that each theme was distinct and captured a specific aspect of the data. Each theme consists of components, which are defined as one or more interconnected networks. Each network consists of either (i) interrelated codes or (ii) one or more sub-networks. Each sub-network consists of related codes, which are derived from quotations extracted from the interview transcripts.

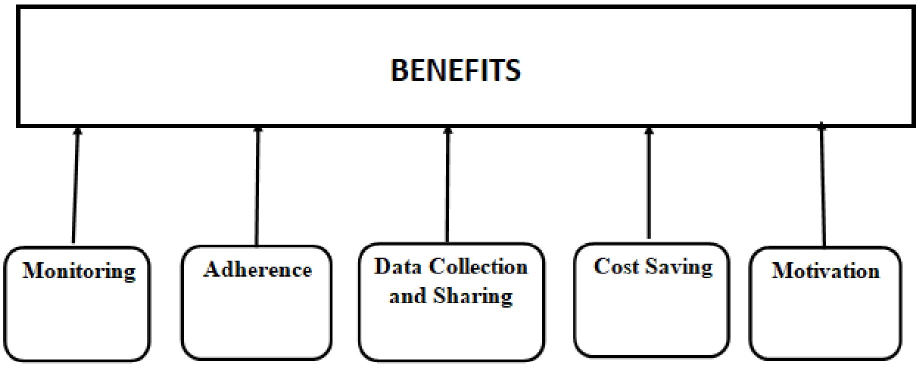

Figure 3.14: Benefits of mySugr quantified self-technology

Figure 3.14 shows a theme derived from subnetworks. The theme of the benefits of mySugr quantified self-technology was derived from the synthesis of five code groups and their potential interconnections: monitoring, adherence, cost saving, data collection and sharing, and motivation.

3.10.6 Phase 6: Writing Up:

Finally, the researcher integrated the themes into the final report, providing rich, detailed descriptions of each theme along with supporting quotes from the data. This section included an analysis of how the themes related to each other and to the overarching research question. The Setup-Quotation-Comment was used to do this.

3.10.6.1 Setup-Quotation-Comment (SQC) for theme explanation

The six themes identified are explained through an adaptation of the Setup–Quotation–Comment (SQC) methodology outlined by Weaver-Hightower (2019). The components of each theme are the networks, which are composed of codes or sub-networks. Each code is accompanied by corresponding quotations derived from the interviews. The SQC methodology is used as follows:

- Setup – A preliminary paragraph preceding each quotation offers contextual information regarding the quotation and its relevance to the theme. An additional sentence may then introduce the quotation.
- Quotation – A quote extracted from one or several interviews. The quotations may be associated with a code, subsequently linked to a network, and ultimately connected to a theme. The pseudonym of each participant (P1, P2 up toP35) is indicated following each quotation. It is important to underscore that the names of the participants remain undisclosed in this research and cannot be traced back to the pseudonyms utilised in this thesis.
- Comment – The paragraph that follows each quotation or collection of quotations. This paragraph functions to encapsulate or underscore certain significant aspects of the preceding quotation. When pertinent, this paragraph may also serve as the preparatory context for the subsequent quotation.

These results are presented in the next Chapter.

3.11 Ethical Considerations

3.11.1 Ethical Approval and Institutional Permissions

As the researcher of this study, I have read the University's Policy and Procedures on Research Ethics and Procedures on Managing and Preventing Acts of Plagiarism, and I understand their content. My supervisors and I have considered and discussed the ethical issues that may arise from this research and ways to mitigate them, guided by Kumar (2019).

The current study involves participants aged 18 to 65 years. Permission to conduct the research was obtained from the University of South Africa College of Agriculture and Health Sciences Ethics Committee before any data collection was done i.e. NHREC Registration #: REC - 170616-051, Ref #: 2023/CAES_HREC/1791. The ethics approval is attached as Appendix F. Having obtained permission from the university, the researcher also sought permission from a hospital in Bulawayo. The researcher sent a letter to the hospital director seeking permission to use its diabetic patients as the study population (Appendix C). The hospital responded by issuing the researcher with a gatekeeper's letter (Appendix D). The researcher had to submit a participant invitation letter to the hospital to obtain its research participants (Appendix E).

Here, the participants had to contact the researcher if they were interested in participating in the study. This was informed by the university's ethics policies as well as the hospital's ethics and data protection policies. The hospital was not to divulge patients' personal identifiable data to third parties. Hence, only the participant had the right to divulge their own personal identifiers.

3.11.2 Informed Consent and Voluntary Participation

Consent was also sought from diabetic people who participated in this study. The written informed consent was provided in English and was required from each participant (Appendix G). The consent indicated that it was voluntary, with no incentives, and that no coercion or pressure was exerted. Furthermore, the researcher explicitly explained to the respondents the reason the QST research is being conducted, how the information will be used, and the type of information we seek to obtain. Thus, the researcher justified the research's relevance by explaining to the participants (people with diabetes) the importance of adopting QST for monitoring diabetes. This will boost their confidence levels in being part of the study. The researcher also signed a declaration stating that the information was explained to the participants beforehand.

3.11.3 Language and Comprehension of Consent

Although the consent forms were provided in English, the researcher ensured that all information was verbally explained in a language familiar to the participants, where necessary. This ensured that participants fully understood the purpose of the study, their rights, and the implications of participation before providing consent.

3.11.4 Recruitment Process and Power Dynamics

To minimise potential coercion or power imbalances, a self-selection recruitment strategy was adopted. The hospital did not directly recruit participants, and no patient information was shared with the researcher. Instead, interested participants voluntarily contacted the researcher after receiving an invitation. This approach ensured that participation was free from institutional pressure or perceived obligation.

3.11.5 Participant Vulnerability and Risk Management

The study involved participants living with diabetes, who may be considered a vulnerable group. However, the research posed minimal risk as it did not involve clinical interventions or access to sensitive medical records. Additional care was taken to ensure that participation did not cause emotional, psychological, or social harm.

3.11.6 Right to Withdraw and Debriefing

Participants were informed of their right to pause or withdraw from the study at any stage without any consequences. Following the interviews, participants were provided with an opportunity to ask questions and were offered feedback on the study findings upon completion.

3.11.7 Emotional Distress and Support Measures

Given the sensitive nature of discussing diabetes-related experiences and complications, where emotional discomfort or distress was observed, the interview would be paused or discontinued, and, where necessary, participants would be referred to appropriate healthcare personnel or counselling support. Participants were provided with feedback throughout the study and offered the option to receive in-depth feedback as soon as the results had been analysed.

3.11.8 Confidentiality and Data Protection

The interviews were held face-to-face, and pseudonyms were used to maintain anonymity. Thus, no names were recorded in interviews. This ensures a certain level of confidentiality. In addition, the researcher and supervisors adhered to the guidelines on using and storing personal information as outlined in the Protection of Personal Information Act (POPIA).

3.12 Research Rigour

Research rigour determines the quality of research findings so that other researchers can accept them. Thus, the rigour of research findings is attained by providing credible, dependable, confirmable, and transferable research findings (Lincoln & Guba, 1985). Ahmed (2024) further notes that these four techniques listed by Lincoln and Guba (1985) are the foundations of the trustworthiness of any qualitative study. Thus, to achieve rigour in our study, the following was done:

3.12.1 Credibility

Credibility is the presentation of accurate descriptions and interpretations (Megel & Heermann, 1994). There has to be impartiality and objectivity in the findings, ensuring that the findings are not affected by any biases (Carcary, 2020). Carcary (2020) further elaborates on guidelines on how to achieve credibility in qualitative research. They note that to achieve credibility, the researcher must have a prolonged engagement with the participants to build rapport; do reflexivity, where the researcher acknowledges their own biases; and do triangulation i.e., employ multiple data sources to verify their findings. To achieve credibility, the researcher built a close association and engagement with the research participants during training. This created prospects for examining structures that cannot be verbally articulated (Sarrigeorgidis & Rabaey, 2003). Furthermore, the researcher gathered her data through a systematic literature review, where she reviewed journal articles and peer-reviewed conference papers to understand the research study setting. The researcher also constantly acknowledged her own biases and preconceptions through a process of reflection, especially during the coding stages. This increased the credibility of this research.

3.12.2 Dependability

Dependability refers to the consistent and steadfast quality of study findings across time (Carcary, 2020). Carcary (2020) notes that the researcher must document their approaches, data gathering techniques, and data analysis techniques. They also need to provide an audit trail that records the researchers' research procedures and decisions during the research study. Thus, in the first parts of this methodology chapter, the researcher outlined how this qualitative study employs an interpretivist paradigm. The research strategy was determined to be a case study where the research participants are diabetic patients. Interviews were used to collect data, and the data were analysed using thematic analysis. The audit trail for this study is provided in Chapter 6, Section 6.3.

3.12.3 Transferability

Transferability is the production of the same and accurate results if the research is conducted that to do this, the researcher has to provide thick descriptions by detailing the research context and the study participants. This will enable others who want to conduct similar research to determine whether the findings apply to their settings and situations. Thus, the research in the methodology chapter details that the research participants are diabetics from a government hospital in Bulawayo province, situated in a healthcare resource-constrained developing country, Zimbabwe. Although the results cannot be generalised, they may be applicable to countries in sub-Saharan Africa and other developing countries with low-resource and high-diabetes-prevalence settings. However, further validation across a spectrum of settings is necessary. The deep insights through quotations and the overall findings of this study are illustrated in chapters 4 and 5. The researcher also coded data transcripts, which were used to give a systematic justification and a rational description of the findings.

3.12.4 Confirmability

Confirmability ensures that the research findings are a true reflection of the perceptions and lived experiences of the respondents and not figments of their imagination or the researcher's bias. To avoid this bias, the results need to be corroborated by others, and thus Carcary (2020) suggests methods such as peer debriefing, where the researcher engages closely with experts or colleagues to review their interpretations and findings to minimise bias; do member checking, i.e., allowing participants to review the accuracy of the study findings; and reflexive journaling, where the researcher maintains a journal to reflect their thought process and biases during the study. Thus, to ensure confirmability, the researcher constantly had meetings with their research supervisors to seek expert consensual validation, engaged her colleagues in developing the conceptual framework, returned the findings of this study to some research participants, and asked their colleagues to peer review their coding procedure. The researcher also published journal articles and peer-reviewed conference papers, where various reviewers gave feedback that strengthened the study. The researcher also attended workshops and postgraduate symposiums to present her work. Furthermore, the researcher kept a journal where she documented everything pertaining to her study. Memos were also used to document the research ideas and thought processes during coding.

3.13 Data Management

In this study, physical and electronic data were obtained. Physical data was in signed informed consent forms and field notes. Electronic data was in the form of audio recordings and transcribed data. The physical data was scanned to get an electronic copy, then put in a file and locked in a cabinet. All electronic documents were first anonymised and then stored on the researchers' laptops in an encrypted folder. They were further backed up in the researchers' iCloud account.

3.14 Summary of Chapter

This chapter presented the methodological foundations of the study, including the research philosophy, design, data collection, and data analysis techniques, as well as ethical considerations and data management procedures. Guided by the research gaps identified in Chapter 2, particularly the methodological gap, the study adopted an interpretivist paradigm and qualitative research approach to capture the lived experiences of diabetic patients. These methodological choices were aligned with the conceptual framework developed in the preceding chapter and provided a basis for empirically investigating the factors influencing the adoption of QST. The next chapter presents the findings derived from the qualitative data collected using these methods.

Chapter 4 : ANALYSIS OF THE RESULTS AND FINDINGS

4.1 Introduction

Building on the methodological approach outlined in Chapter 3, this chapter presents the findings derived from qualitative data collected from diabetic patients through interviews. The analysis was guided by the research questions introduced in Chapter 1 and the conceptual framework developed in Chapter 2**.** The main research question of this study is, "How can a framework be developed to inform the adoption of quantified self technology for managing diabetes in developing countries? To answer the main research question, sub-research questions were posed: "*What are the factors that influence the adoption of quantified self-technology for managing diabetes?"* and "*How do the factors influence the adoption of quantified self-technology for managing diabetes in practice*? ". This chapter presents the results of the thematic analysis, organised according to the key factors influencing the adoption of quantified self-technology, and provides insights into how these factors manifest in practice

4.2 Demographic Profile of the Participants

The demographic profiles of the participants are presented in Table 4.1. The age range was between 18 and 65 years. The sample had much more middle-aged adults (36-45 years) and (46-65years), who accounted for 22 of the participants. The sample had a gender imbalance, with 22 females and 13 males. Most participants had a tertiary qualification 25, whilst only 2 participants attained primary education. Participants who had diabetes for the longest time, i.e., more than 10 years, were 5, and those with the least number of years, i.e., less than one year, were 4 .

Table 4.1: Demographic Distribution of Participants

	AGE			
Age Range	18-35	36-45		46-65
Number of Diabetics	10	12		13
	GENDER			
Gender Type	Male	Female		
Number of Diabetics	13	22		
	HIGHEST EDUCATIONAL LEVEL			
Highest level of Education	tertiary	secondary	primary	

Number of Diabetics	25	8	2	
	YEARS WITH DIABETES			
Years with Diabetes	Less than 1 year	2-5years	6-10 years	More than 10 years
Number of Diabetics	4	12	14	5

4.3 Presentation of the findings of the study

Data analysis revealed six themes that influence the adoption of QST. Although the themes are presented as distinct conceptual domains, some interconnections between them are expected, as participants often described their experiences in overlapping ways. Where relevant, cross-references are provided to highlight these relationships without compromising the analytical separation of constructs. These themes are user characteristics, technology preparedness, social norms, benefits of mySugr quantified self-technology, usability of quantified self-technology and cybersecurity risks. Table 4.2 presents the six themes and categories that emerged during data analysis.

Table 4.2: Themes and Categories

Theme	**Code Group/Category**
1. User Characteristics	Digital Literacy
	Technology Awareness
	Technology self-efficacy
2. Technology Preparedness	Affordability of the Technology
	Training
	Access to Resources
	Technology anxiety
3. Social Norms	Social Support
	Social Influence
4. Benefits of mySugr quantified self-technology	Monitoring
	Adherence
	Cost saving
	Data Collection and Sharing
	Motivation
5. Usability of quantified self-technology	Perceived Enjoyment

	Perceived ease of use
	Perceived usefulness
6. Cybersecurity Risks	Financial risks
	Data breach
	Privacy breach

4.4 Theme 1: User Characteristics

The study found that user characteristics are factors that determine the adoption of quantified self-technology for managing diabetes. User characteristics denote the features, attributes, or factors associated with individuals or groups that affect their decision to adopt and utilise new technology (Dissanayake et al., 2022). Three elements were found to determine user characteristics: digital literacy, awareness, and self-efficacy. Figure 4.1 visualises the user characteristics theme.

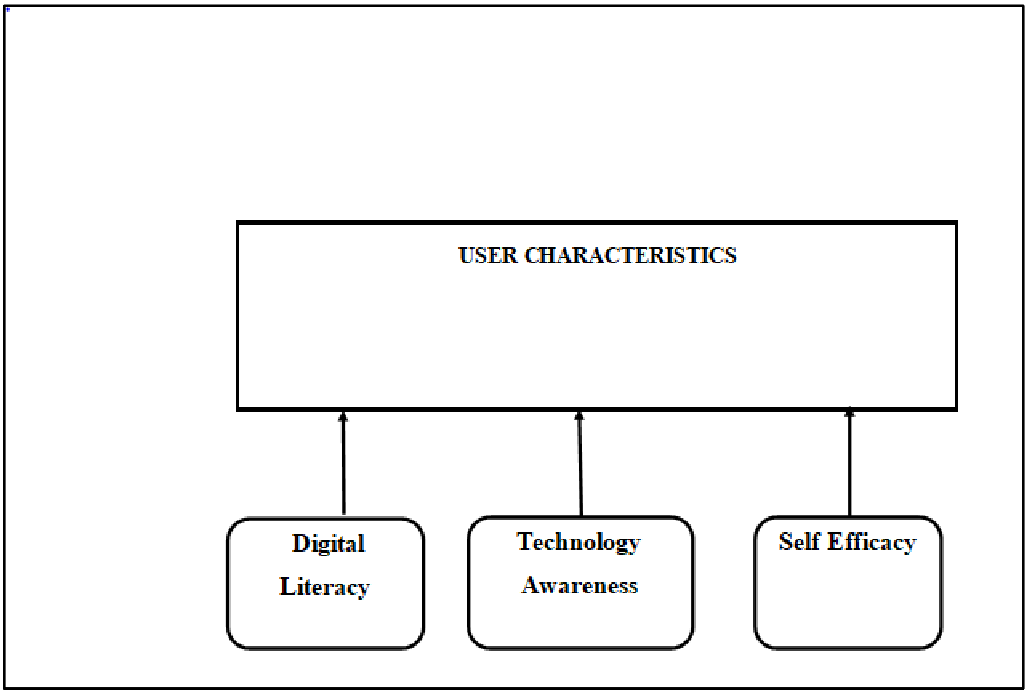

Figure 4.1: User Characteristics

4.4.1 Digital Literacy

The study found that digital literacy is a factor that determines the adoption of QST for managing diabetes. Digital literacy is possessing certain skills and knowledge that enable one to use digital technologies (Arias López et al., 2023; Gualtieri et al., 2018; Madanian et al., 2023). Digital literacy was influenced by the age of a diabetic patient and educational attainment.

Participants Age

Younger individuals revealed they were digitally literate because of exposure to technologies such as smartphones, social media, and online games. Participants aged 18-35 reported that prior exposure to technology was a reason they adapted quickly and had more confidence using the mySugr app. In this respect participants P3 and P20 said:

> *I like using technology to manage my diabetes because it's cool and convenient, and I'm aware of its benefits, which we learn about at university and on online platforms. I am really tech-savvy and very eager to learn new things and confident to use anything new.* (P 3.)
>
> *I am a young adult. I am often among the initial adopters of new technology, such as health trackers, new AI software, online games and the latest iPhone. ……….. and I take pleasure in seeing its capabilities and adjusting to its functionality.* (P 20.)

Middle-aged participants, aged 36-45 years and 46-65 years, perceived technology as difficult to use and believed it was suited for the young. The perceived difficulties were attributed by participants to rapid technological advancement, which they found difficult to catch up with and resulted in inadequacy. The participants had varying degrees of exposure to technology in professional and personal settings, influencing different perspectives on the value of the mySugr QST application. In this respect, Participants P7 and P29 said:

> *Technologies are for young people, you know. ……. People of my generation go with the doctor's word and take herbs. Maybe if I were still in my 30s, I would have been keen to use these things. Learning to use these things is like going back to school……*(P 7.)
>
> *I am in my 60s and I cannot be seen with my phone everywhere as if I am a love-struck teenager. It is really difficult to keep up with technology at my age. At this age, you just want to rest and not be disturbed too much by these phones …….* (P 29.)

These findings show that digital literacy varied across age groups and affected the level of confidence that the participants had in using the application. On one hand, younger participants defined themselves in relation to being familiar with and adaptable to technology. On the other hand, older participants associated technology with difficulty and a lack of correspondence with their age-based identities. Therefore, differences in digital exposure based on age groups affected how they used the QST.

Education level

Educational level influenced the digital literacy of participants. Participants with a tertiary level (71%) were confident using the mySugr QST application. The participants revealed they could easily navigate the application interface and interpreted the generated results. Moreover, the participants who had prior knowledge of self-tracking technologies through research knew the benefits. From the results of this study, those with higher education levels revealed they were ready to use the technology for diabetes management. In this regard, participants P6 and P21 said:

> *Since I am educated. I do research and know about these apps and how I can benefit from them. I have them on my phone and I can confidently use them and interpret the results*. (P 6.)
>
> *I have a master's degree. I know all about technology and have fitness trackers, Samsung Health, and Dr blood on my phone…. I just googled the app and found out what it is about, its benefits, and ratings. You know how it is with us learned people. We Google everything.* (P 21.)

In contrast, individuals with secondary (23%) and primary (6%) education levels had challenges using the mySugr QST application. Participants reported that this was because the application was new to them and that they found navigating the interface difficult. The participants highlighted that they struggled with understanding the data produced by the application because it used some medical terms. This led those with a low level of education to doubt their ability to use the mySugr QST application. In this regard participants P35 and P29 said:

> *I'm just a security guard with a secondary school education. These technologies are for the educated, as they have difficult medical words and instructions. I do not understand the meaning of the results and wish I were educated …….* (P 35.)
>
> *You know I ended at the primary level ………. I am so glad to be part of this study, as now I have learnt something and can teach others. No education is required to use the app, except that you just won't be very confident the first time using the app".* (P 29.)

Overall, data analysis uncovered that educational level is a trait of user characteristics that influences the adoption of mySugr QST application. Participants with higher levels of education easily learnt how to use the mySugr QST application compared to those with lower levels.

4.4.2 Technology Awareness

Awareness does not just mean knowing a technology exists. However, it also denotes the comprehension and knowledge of contemporary and developing technologies, their applications, advantages, risks, and societal, occupational, and private life implications (Brummer, 2025; Siddhartha Paul Tiwari, 2022).

The study found that 24 (69%) participants were unaware of QSTs and had never used similar apps. Three factors were uncovered as causes of a lack of awareness. They were a lack of health education, the perception that mobile-based apps are for youngsters, and medical practitioners not introducing such apps to patients (Ndlovu et al., 2025).

Health education

Most participants reported health education illiteracy as the reason for their lack of awareness of QSTs, such as the mySugr application. Even though the diabetics had the chronic disease for years, they reported that they were not taught about information technologies that can be used for diabetes management. The diabetics noted that they could not remember encountering such information from healthcare facilities' noticeboards, radio/television broadcasts, social media, or news channels. In this regard, Participants P9 and P32 said:

> *I have not used any technologies to manage my diabetes. The mySugr application that you gave us for this study was the first one that I received. I have never seen any advert or awareness programs on state television channels, newspapers, or even the hospital itself to educate us on these technologies so that we know of their existence*. (P 32.)

> *Before this intervention, I knew nothing about the technology apps that can monitor health. I didn't have any idea of the existence of such applications before. So, there was no technology I was using*. (P 9.)

These findings indicate that access to health education impacted the participants' awareness of QST for managing diabetes. Despite the participants' extensive engagement with healthcare services, they revealed a lack of access to information concerning digital self-management technologies through known information channels. This suggests that the participants' awareness of the technologies did not develop independently.

Practitioners not sharing medical information

There were diabetics who attributed the lack of awareness to healthcare practitioners, whom they suspected of concealing knowledge of QSTs from the diabetics. The diabetics felt that their practitioners were supposed to introduce them to QSTs when they were diagnosed with diabetes. The practitioners were blamed for hiding information so patients would become dependent on them for routine checkups. In this respect, one participant said:

> *So when I first started using the medical apps, the doctor was not happy, but I realised that these doctors are after money. This is because every appointment I book, I pay a consultation fee.* (P 12.)

These accounts reflect a perception among some participants that healthcare practitioners acted as gatekeepers to information about QSTs. Participants linked their lack of awareness to an absence of practitioner-initiated communication regarding digital self-management options at the point of diagnosis. As a result, awareness of such technologies was framed as being constrained by practitioner-patient information asymmetry rather than individual disinterest. This finding also suggests a degree of mistrust or perceived misalignment of interests between patients and healthcare practitioners, where limited information sharing may reduce confidence in the healthcare system and act as a barrier to awareness of QSTs.

Misconception that mobile applications are for youngsters

A prevalent assumption was that QSTs such as the mySugr application were designed for young people. This view was prevalent amongst people over the age of 50, who showed no interest in learning how to use mobile-based applications. The diabetics over 50 years disclosed that they were comfortable using traditional techniques to monitor their diabetes. In this respect, participant P17 said:

> *Technology is not really my thing, worse at my age. It requires learning lots of things, whilst not being designed to be easy for us. It is for the young. Even my age mates know that we need to stick and trust the doctors. ……* . (P 17.)

There were 11 (31%) participants who had some knowledge of QST applications, such as the mySugr application. The participants had prior experience using similar technologies, such as fitness trackers like Home Workout App, Glow, Strava, and Dr. Blood. Participants highlighted that prior experience with health-related applications improved their awareness of QSTs. In this respect, the participants P20 and P21 said:

> *I use the MyFitnessPal app for general nutrition and Google Fit for tracking my physical activity. I have used MyFitnessPal for about six months, and Google Fit for about a year, so I know about these technologies, what they are for, and how to use them for.....* (P 20.)

> *I was already familiar with several apps for monitoring health, especially when managing my diabetes. I have been using a glucose monitoring device that connects to my smartphone for years. This allows me to easily track my blood sugar levels throughout the day and spot any concerning trends......* . (P 21.)

Awareness of a technology involves understanding its purpose, potential benefits, and methods for integrating it into daily life, particularly in relation to health and wellness objectives. A lack of awareness resulting from inadequate exposure or restricted information dissemination by credible sources, such as healthcare professionals, may be an obstacle to awareness. Moreso, the reluctance to learn new technologies makes diabetics lack awareness of the benefits of the mySugr QST.

4.4.3 Technology Self-efficacy

Self-efficacy denotes an individual's conviction in their capacity to effectively utilise and manage technology to execute a certain activity or resolve challenges (Mushi, 2020; Venkatesh et al., 2003). The study found that participants' confidence when using the mSugr QST application depended on prior experience and conducive work environments.

Prior experience

Participants who had successfully used mobile-based applications reported being comfortable with the mySugr QST application. On the other hand, participants who had encountered challenges with other technologies in the past revealed they were not confident using the mySugr QST application. Participants identified past challenges with new technologies as failures to download and install applications. Participants noted that this instilled fear of embracing new technologies, thus reducing their confidence in using the mySugr quantified self-technology. In this regard, Participants P6 and P19 said:

> *I can download any app in general since I have been using many different health apps. ……. You know, I can use this app via Bluetooth. I can connect my Accu-Chek meter automatically, and it sends my results to mySugr, eliminating manual entry hassle and the possibility of making mistakes*. (P 6.)

> *These technologies are basically the same. So, if you fail to do certain things on one, what makes you think you will be able to do them in the other? You need to look for alternatives or do what is within your abilities and forget about them, or else you will be a laughingstock*. (P 19.)

The above narratives demonstrate how participants' previous experience with digital technologies affected their confidence to use QST. The participants who had already used mobile applications successfully found it easier to use the technology when engaging in self-monitoring activities. The participants showed different levels of technology self-efficacy because their past experiences determined their ability to use the application.

Work environment

Prior experience using technologies was found to be associated with the jobs or work environments of diabetics. Participants who worked in environments that exposed them to digital technologies revealed that they were skilled and confident in using the mySugr QST application. Work environments were found to promote technical competencies in using various devices and applications by participants. In this regard, P2 and P3 said:

> *I use computers in my workplace for many tasks. When I face a challenge, I can easily ask for help from my colleagues. If it's too complex, I simply call the IT technician, who helps me. So, there is no point in time when I can get stuck for a long time. Next time, I will know what to do when I face the same problem*. (P 2.)
>
> *As a university student, I can use any technology because at university everything is wanted in softcopy. You research online, write assignments using your computer and post on Google Classroom....* (P 3.)

Self-efficacy in using mySugr QST was determined by prior experience. Favourable prior experiences with technology and supportive environments, such as workplaces, improved self-efficacy. On the other hand, diabetics who had a bad, terrible prior experience with technologies were not confident about using the mySugr QST application.

4.5 Theme 2: Technology Preparedness

Technology preparedness denotes the readiness and capability of individuals, companies, or communities to efficiently adopt, utilise, and address technological advances and problems (Gulatee et al., 2020; Kaivo-oja & Knudsen, 2016). The findings of data analysis revealed that the preparedness of diabetics to use the mySugr QST application was influenced by four factors: technology affordability, access to resources, training, and technology anxiety. Figure 4.2 visualises the factors.

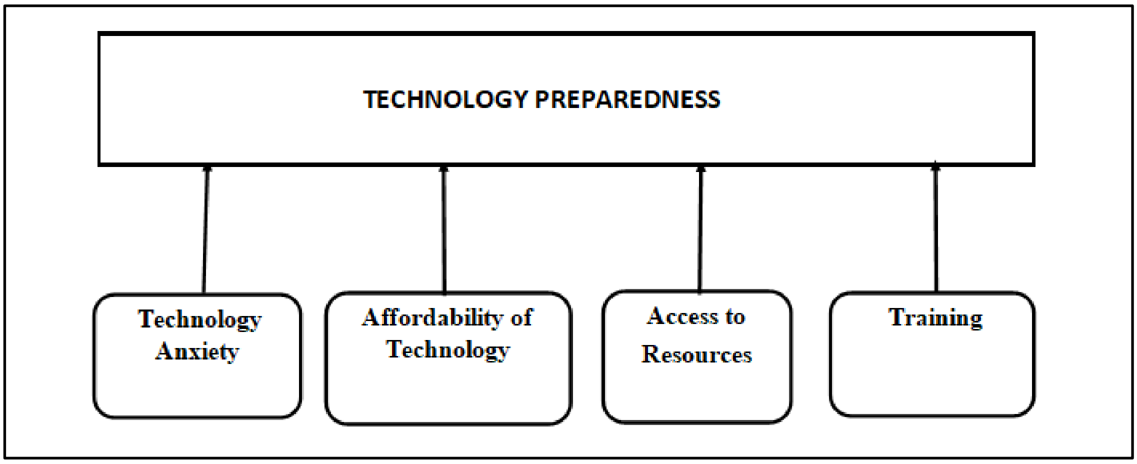

Figure 4.2: Technology Preparedness

4.5.1 Affordability of technology

Technology affordability denotes the degree to which people, communities, or organisations can economically obtain and sustain the utilisation of technology (Sieck et al., 2025). The study found that the affordability of the technology was affected by the high cost of devices, subscription fees for applications, and hidden costs.

High cost of devices

Participants revealed that the high initial acquisition cost of QST devices may discourage them from utilising these technologies. Participants in this study indicated that the cost of a smart glucometer and the installation and purchase of a WiFi router is a financial burden on them. They indicated that these devices are costly, which is exacerbated by Zimbabwe's socio-economic conditions.

> *I needed to purchase a new smartphone, which is very costly. Things are expensive here in Zimbabwe* . (P 10.)

> *To use this technology, you need a phone. Not just an ordinary phone, but a smartphone that is expensive. To have internet, you need to buy a router; this installation process is expensive. A glucometer, too, is expensive for someone like me who has financial limitations*. (P 33.)

The data suggest that the affordability of QSTs is a barrier to adoption among participants. The need to purchase multiple devices, such as smartphones, connectivity infrastructure, and monitoring devices, was seen as being unaffordable. As such, considerations of cost emerged as factors in understanding participants' engagement with these devices.

Subscription fees for applications

Data analysis uncovered that some participants perceived the adoption of mySugr, a QST application, as expensive and unsustainable. There were 20 (57%) participants who reported having limited finances to pay for subscription fees for the mySugr application. The participants emphasised that financial challenges were due to social and economic hyperinflationary challenges. In this respect, participants P4 and P27 said the following:

> *Even though this is a subscription app, I made sure that I have money to pay for that, which I felt was important for managing my condition. I chose to pay an annual subscription* . (P 3.)
>
> *It is unfortunate that the app has reminders. However, when I tried to use those reminders, I actually noticed that there are subscription fees, one has to pay to use them…* (P 4.)

The study results indicate that some participants were financially unprepared to fund the adoption of mySugr QST. The subscription costs created a permanent financial obligation that impacted how diabetics decided to continuously use the application. While some participants prioritised and budgeted for subscription costs, the majority reported financial constraints that limited their ability to engage with paid features. Therefore, the affordability of the application was found to be a differentiating factor that shaped the use of the QST.

Hidden costs

There were 15 (43%) participants who disclosed that they underestimated the initial costs of using mySugr QST application. After being aware of the cost overhead, such as broadband, glucose monitors, and glucose sticks, the participants committed to continuing to use the application because they had realised the benefits of the technology. Hence, the participants revealed that the perceived benefits of using the mySugr QST motivated them to adopt it. In this regard, participants P7 and P27 said:

> *I had to purchase many glucose sticks so that I could measure my blood sugar levels up to six times a day and also ensure that I had data bundles. For anything related to my health, I am willing to spend any amount. Cost is not a concern for me*. (P 7.)

> *I cannot afford glucose sticks, but I would love to measure my blood sugar after every meal and track my progress. I need WiFi at home and data bundles, which I cannot afford.* (P 27.)

These results show that these hidden and recurring costs became more salient to participants over time following their initial engagement with technology. While some participants were willing to pay these additional costs in relation to perceived benefits, others continued to be constrained by affordability issues. Thus, QST adoption and usage were influenced by participants' ability to reconcile perceived benefits with cost demands.

4.5.2 Access to resources

Quantified self-technology resources are digital tools, systems, and infrastructure that enable comprehensive personal data collection, tracking, and analysis across various life domains, facilitating the management, processing, storage, and communication of information for both individual and organisational use (Barry, 2020). The study found that the resources required for managing diabetes using the mySugr QST application were a compatible smartphone, internet connection, and power supply.

Compatible smartphone

The primary device required for using the mySugr QST application was a smartphone handset with internet connectivity. Several participants revealed that they considered upgrading their cell phones to meet the minimum requirements for using the mySugr QST application. One participant said that the benefits of self-tracking are not fully realised without a multipurpose device. Thus, lacking a suitable smartphone hindered their preparedness to use the mySugr QST application. In this regard, participants P10 and P25 stated:

> *My phone was not compatible with the app. So, I had to upgrade my phone and use the latest versions. Luckily, I was in the process of buying a phone. If I had not upgraded my phone, I would have failed to use this app*. (P 10.)

> *Firstly, I had to have a gadget that connects to the internet, which is a smartphone. Secondly, I needed to have either Wi-Fi or private Wi-Fi, which translates to data.* (P 25.)

These results indicate that access to a compatible smartphone was a prerequisite for engaging with the QST. Participants' readiness to adopt QST was directly influenced by the availability and suitability of their existing devices. Consequently, limitations in device compatibility functioned as a practical access constraint rather than a lack of interest in self-quantification.

Internet connection

Reliable internet access through Wi-Fi or mobile broadband was recognised as essential for the successful use of mySugr QST application by participants. Participants highlighted that inconsistent internet access hindered the operations of the application, for example, syncing data to the cloud, communicating, and accessing recommendations. Hence, reliable internet connectivity was identified as an essential resource for using the mySugr QST application. In this respect participants P21 and P30 said,

> *I use the internet to sync my data to the cloud. It requires the internet so that I can upload my data. My insulin pump also requires me to update its software regularly so that it works in sync with the app*. (P 21.)
>
> *There is a feature where you ask questions and get answers. I have forgotten the name, but this feature requires you to be connected to the net. Also, if you want to compare your data with online groups, you need to be connected to the internet*. (P 30.)

The data demonstrate that a dependable internet connection enables diabetics to utilise QST effectively. Participants linked their internet connection to essential system functions. The limited internet access, along with intermittent connection problems, prevents users from effectively using QST.

Power supply

A dependable power source was considered essential for powering tools such as Wi-Fi routers, mobile devices, and glucometers by participants. One challenge all participants reported was the unreliable power supply, which often results in blackouts in the city of Bulawayo, Zimbabwe. Participants reported that the blackout disturbed the self-tracking routines, resulting in interrupted data collection and loss of real-time monitoring. To guarantee continuous self-tracking of diabetes, the participants suggested that power backup options such as power banks or generators can be used. Here is what participant P1 and P10 said:

I would need a constant supply of electricity and backup power, like solar, as there is always load-shedding of electricity. We spend most of our time without electricity, so I must ensure my phone is fully charged. (P 1.)

I will need to ensure that my phone is fully charged or has an extra battery, as power cuts can sometimes take longer to restore. I would need a power bank as a backup power supply for the internet to work. (P 10.)

The findings indicate that an unreliable power supply poses a practical constraint on sustained engagement with QSTs. Participants linked power interruptions to disruptions in self-tracking routines and reduced continuity of data capture. As a result, access to dependable electricity emerged as an enabling resource for consistent technology use.

4.5.3 Technology Anxiety

Technology anxiety denotes humans' uncertainty or fear when engaging with technology, especially when using novel devices, apps, or systems (Kim et al., 2023). Data analysis uncovered two sources of anxiety, and they are the fear of seeking assistance and being technology dependent.

Fear of seeking assistance

In this study, the anxiety experienced by elderly participants was reported as stemming from a fear of persistently requesting assistance in utilising mobile applications. The elderly expressed that they were not ready to continuously rely on others for assistance, which provoked feelings of frustration. In this respect, participant P11 said:

I constantly needed assistance, especially with entering data, as I cannot see properly. I also did not understand the graphs and needed someone to explain them all the time. Knowing that I must constantly seek help made me feel so much of a burden. (P 11.)

The findings reveal that technology-related anxiety experienced by certain participants was linked to their fear of dependence on others for support. The need to constantly seek help was considered emotionally draining and affected the participants' self-assurance with technology use. As such, fear of seeking help acted as a deterrent to further usage of the application.

Technology dependence

The diabetics felt their lives depended on the mySugr QST application. Some diabetics perceived the continuous monitoring and receiving updates as unsettling because they felt that the technology had taken over their lives. The diabetics highlighted that they were sometimes put under pressure by the results of self-tracking, especially when they failed to meet the daily prescribed thresholds. Consequently, this anxiety was reported to likely adversely affect their willingness to embrace QST. In this regard, participants P19 and P30 said:

> *I disliked that I needed to constantly check for notifications and updates on my phone. ..... Monitoring my diet and having an app tell me this makes it seem as if I am under a microscope, and I must feel guilty about eating ice cream. I find it unsettling to be scrutinised for everything….* (P 19.)

> *I no longer sleep properly because I am now just too nervous with each coming day. My life revolves around measuring, reminders, and eating healthy; it is now a full-time job for me*. (P 30.)

These accounts indicate that continuous monitoring and persistent feedback contributed to feelings of technology dependence among some participants. The intensity of self-tracking was experienced as intrusive and emotionally demanding, particularly when performance targets were not met. As a result, heightened anxiety emerged in relation to the perceived dominance of the technology in participants' daily lives.

4.5.4 Training

Training is a systematic process that provides structured instruction, deliberate practice, and experiential learning to enhance skills, knowledge, and competencies for an individual's current job (Anuradha, 2020; Kaushal, 2023). The study found that a lack of sufficient training made some diabetics unprepared to use the mySugr QST application. The diabetics disclosed that the training they had received was insufficient to master how to download, install, configure, and interpret the results on the application. Participants disclosed that a lack of sufficient training affected their confidence in using the mySugr QST application. However, some participants appreciated the training that they received and were comfortable using the application. In this regard, participants P11 and P23 said,

> *I was uncomfortable because I did not know how to use the mySugr app ……. I constantly needed someone to help me, even after training, where I was taught almost everything, from logging in to entering results from the glucometer after measuring*. (P 11.)

> *I was taught how to interpret the trends and colour codes that come in the form of graphs and make meaningful information out of them. I also asked my doctors if there*

were things I did not understand so that they could simplify them, as I was not familiar with them. (P 23.)

The findings indicate that the adequacy of training influenced participants' preparedness and confidence in using the application. While some participants reported persistent uncertainty despite receiving training, others described improved competence following guided support and clarification. Consequently, variations in training experiences shaped levels of readiness to engage with QST.

This section establishes that diabetics are prepared to adopt the mySugr QST application if the cost of purchasing and operating it is affordable, if using it does not cause anxiety, if they receive sufficient training to use it, and if they have access to the required resources.

4.6 Theme 3: Social Norms

Social norms are the informal, self-enforcing rules and established patterns of behaviour within a social group or community that govern individual conduct and significantly influence how individuals accept and use new technologies or exhibit specific behaviours (Cardinal & Cardinal, 2023; Okati-Aliabad et al., 2024; Schretzlmaier et al., 2022). Data Analysis revealed two main factors that influence social norms: social influence and social support. Figure 4.3 visualises the findings.

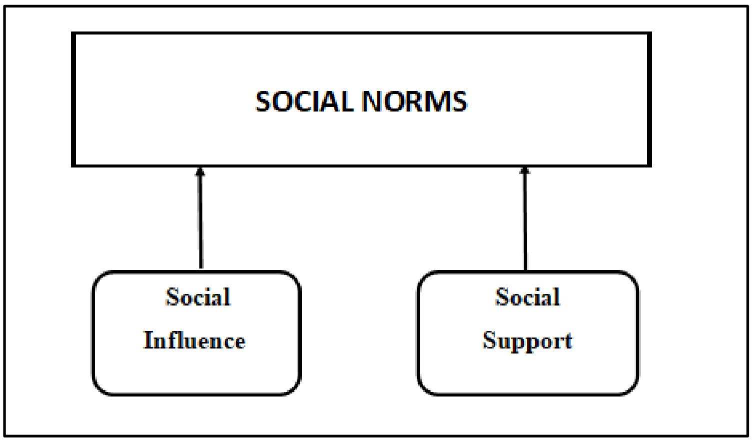

Figure 4.3: Social Norms

4.6.1 Social influence

The diabetics identified themselves as belonging to three social groups: religious church group, farmers group, and family friends. The groups had distinct socio-cultural values and expectations that institutionalise the group. The social groups were found to have positive and negative influences on the adoption of mySugr, a QST application.

Positively influence

Participants reported that the groups provided emotional support, informational support, and encouragement related to diabetes treatment and management. These groups primarily functioned as platforms for sharing personal experiences and insights, with communication largely occurring through social media channels. In this respect, participants P14 and P29 said:

> *In our church group, one lady explained to us the benefits of complementing technology in our health management. We are excited to share our progress with each other and have made it a weekly norm to have such discussions as church members* .(P 14.)
>
> *I am part of a diabetic WhatsApp group where group admins post what we should eat, do, and administer to control our diabetes. I was surprised when I mentioned this app to our group, I realised that almost everyone in the group uses a glucometer. So, it is now a standard and everyone is considering getting one and using it in combination with the app*. (P 29.)

The above narratives illustrate that social groups provided a supportive environment where the use of QSTs was normalised. Group experiences and peer pressures seemed to have a positive influence on attitudes towards self-tracking and technology use. Therefore, collective engagement within social networks helped to increase users' receptiveness to QST.

Negative influence

Participants reported that, negatively, stigma manifested within social groups regarding the use of technology for health management, particularly among members of certain church denominations who opposed technological interventions in health. Because of social and cultural norms followed in groups, one social group had a pronounced preference for traditional medicines over modern medical treatment. Members of this group also highlighted that the group stigmatised individuals who had divergent perspectives from standard group norms. This illustrates how profoundly beliefs within social networks can have stigma. In this regard, participants P7 and P21 said:

> *I am a former member of a church group that did not allow people to use technological applications or go to the hospital. I decided to quit and seek proper medication, complementing it with technology*. (P 7.)

Speaking about an application as a form of health guidance in our church is taboo. ……. I have been seen as an unholy person and a person of little faith. They have been adamant and think I should use the healing methods used by the church. (P 21.)

The above narratives suggest that the social influence prevailing in particular groups acted as limiting factors in the adoption of technology. Participants reported their experiences of stigma and social sanction in relation to their health practices, which diverged from the beliefs of the dominant group. Therefore, social pressure in these groups shaped participants' attitudes towards QSTs.

4.6.2 Social support

Social support denotes the emotional, practical, or informational assistance individuals obtain from others, including family, friends, colleagues, or community members (Chittem et al., 2022; Chen et al., 2021; Okati-Aliabad et al., 2024). The study found that the social support required for adopting mySugr QST application was in the form of technological and financial support.

Technical support

Aligned with this definition, data analysis revealed that the elderly had a stronger appreciation of the social support that they received from family and social groups. The elderly acknowledged that they received technical support from their families, especially the younger members, who supported them with device operations. The elderly were helped with technical things such as charging the phone, downloading software, installing, and configuring. In this regard, participants, P3 and P32, stated:

My son makes sure that my phone is fully charged all the time and stays on a battery.... I am glad that he positively supports me as his opinion matters to me since he is very educated . (P 3.)

My daughter did everything, and diabetes has also affected my right eyesight. Although I can download it on my own, I take too much time trying to read what is written, so to quicken things, most of the things are done by my daughter. (P 32.)

These narratives emphasise the role played by technical assistance provided by the participants' families in facilitating the use of QST among elderly participants. Assistance with the operation of devices and application management helps alleviate issues around participants' limited technical skills or physical limitations. Thus, social support acts as an enabling factor that facilitates participants' engagement with QSTs.

Financial support

Family members provided financial support to the diabetic patients. Several participants received monetary contributions from relatives to finance mobile broadband and mySugr QST application subscription costs. Such financial backing is fundamental as it facilitates access to quantified self-resources. In this regard, participants P9 and P20 stated:

> *My siblings help me with buying data bundles, which I need. My aunts and cousins also help by paying or topping up for my subscriptions* . (P 9.)
>
> *My husband has been supportive in using the app for monitoring diabetes because he makes sure that I always have data bundles (broadband) and pays for the monthly subscriptions for reminders to take medication* . (P 20.)

Despite encouragement and support from family members, participants reported that some of their physicians were not very receptive to adopting self-tracking tools. This view was attributed to factors such as older physicians' commitment to rigid conventional clinical methods, which consequently discouraged adoption. In this regard participants P12 and P16 said:

> *So when I first started using the app, the doctor was quite sceptical about it because he is quite a traditional person, considering his age. He prefers that I visit the hospital, because he thinks information posted on the internet is inaccurate*. (P 12.)
>
> *I had tension with my doctor because I was not frequenting the hospital, ……... He did not even entertain the issue of the app, and his perceptions are that I do not have any medical knowledge or know anything*. (P 16.)

The findings revealed that the adoption of mySugr, a QST application, was socially supported by families, friends, and support groups. However, physicians were perceived as not supporting the initiative by the diabetics. The physicians were found not to trust that the diabetics could incorporate medical interventions based on internet sources.

4.7 Theme 4: Benefits of mySugr quantified self-technology application

A technological benefit denotes a favourable outcome or advantage derived from the utilisation or application of technology (Barros et al., 2021). Data analysis uncovered five (5) advantages of adopting and using the mySugr QST application: monitoring, adherence, data collection and sharing, motivation and cost saving. Figure 4.4 visualises the advantages.

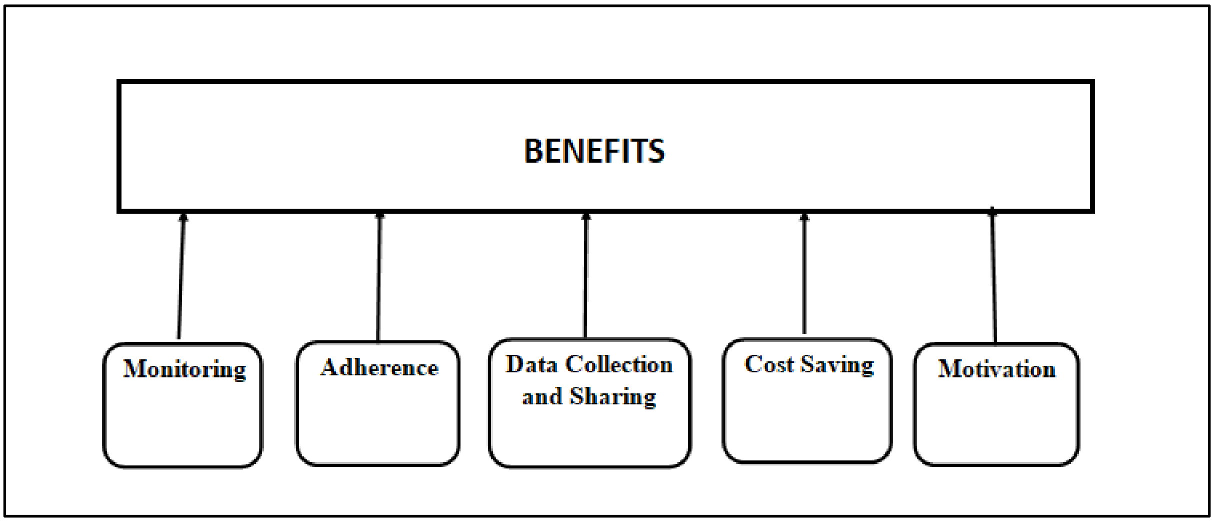

Figure 4.4: Benefits of mySugr quantified self-technology application

4.7.1 Monitoring

Participants highlighted that mySugr QST application provided the diabetics with a platform to observe, check and track their physiological and behavioural patterns. They could track and monitor physiological metrics such as heart rate, sleep patterns, activity levels, and blood glucose level fluctuations in real time. Quantified self-monitoring was revealed as providing data that empowered the diabetics to make informed decisions when managing their diabetes, for example, taking medication, planning their diet, and engaging in physical exercise. In this regard, participants P5 and P11 said:

> *This application has greatly helped me monitor my blood glucose levels. I check in the morning and after I have eaten. If my blood glucose level is normal, I maintain my current routine. However, suppose the level is either low or high. In that case, I must take action, which may include adjusting my diet, losing weight, or taking medication as soon as possible*. (P 5.)
>
> *I am now using an app called mySugr to monitor my diabetes. I check my blood glucose levels three times a day before meals. The app enables me to monitor my blood sugar and activity levels daily*. (P 11.)

These excerpts demonstrate that self-monitoring through the application enabled participants to observe and respond to changes in their physiological and behavioural patterns. Real-time access to personal health data supported routine tracking and informed day-to-day management decisions. As a result, monitoring emerged as a benefit shaping participants' engagement with the QST.

4.7.2 Adherence

mySugr QST application was reported as providing diabetics with an interface for managing the administration of prescribed medication, eating on time and engaging in physical activities. Participants highlighted that the application has a functionality for providing automated reminders that prompt for medication intake. The diabetics appreciated the reminders and recognised that it improved their adherence to medications as well as daily activities. In this respect, participants P28 and P35 said:

> *I like the reminders the most, because I used to forget to take medication, because most of the time I would sleep without taking any medication, but the application gives reminders. I no longer miss medication since I started using the app*. (P 28.)

> *The app has a reminder function that alerts you when it is time to take medication. Thus, even if I'm at a wedding, I won't miss my medication. It also tells me to eat on time and exercise all the time*. (P 35.)

The reminder functions showed effective support for diabetics who needed to follow their prescribed medication and daily self-care routines. The automated reminders successfully decreased forgetfulness while helping people include their treatment tasks into their regular activities. Consequently, adherence emerged as a perceived benefit that reinforced continued use of the QST.

4.7.3 Cost saving

Participants noted that the use of mySugr, a QST application, resulted in substantial cost savings in healthcare. They revealed that by facilitating proactive health management, the application prevented issues that frequently led to frequent hospital visits, thus reducing travel costs, medical consultation fees, and costs associated with hospitalisation and medical tests. By detecting possible diabetic-related complications early, diabetic patients revealed that they could now reduce the necessity for more costly procedures caused by uncontrolled diabetes. This was conveyed through the following:

> *The application has helped save money. I can now check my blood glucose level and do not need to go to the hospital for blood tests.* (P 5.)

> *I used to go to the hospital every two weeks, especially when my sugar was too high. I used to have what they call uncontrolled diabetes. I have managed to cut down transport costs, consultation, and test fees, because I can now monitor my diabetes…* (P 27.)

The data above imply that the participants associated the use of the application with a reduction in health-related costs. The self-monitoring enabled the earlier detection and management of blood glucose changes, which the participants associated with a reduction in hospital visits and costs. Hence, cost savings can be considered a benefit resulting from the sustained use of the quantified self-technology.

4.7.4 Data Collection and Sharing

Participants revealed that the mySugr QST application collected a lot of data from diabetic patients. The data collection and sharing benefited diabetics and practitioners through trend analysis and improved medical practitioner-patient communication.

Trend Analysis

The mySugr app was revealed as a tool that collects patients' physiological data. The data was visualised in the form of graphs. Participants revealed that access to physiological data gave them an opportunity to comprehend how diabetes relates to daily life activities, food and medication through trends and patterns formulated, which could be analysed. This, in turn, helped them make informed decisions about themselves and their health. In that respect, participants P5 and P22 said:

> *Now, the app allows me to input data collected from my glucometer. This data is then used to create a graph from which I can determine the ranges of my glucose levels over time, such as weekly, monthly, or quarterly. The knowledge that I get from this interpreted data has taught me so much about the effects of diabetes and I can share it with doctors* . (P 5.)

> *The app tells me what needs to be done about my blood glucose levels, if too high or too low and makes recommendations on my everyday eating. ……For someone who has diabetes, I am encouraged not to starve, so my eating habits have changed, too*. (P 22.)

The results indicate that trend analysis enabled participants to better understand their physiological data over time and its relation to their day-to-day behaviour and treatment practices. Thus, data interpretation and sharing were identified as important benefits of engaging with QSTs.

Medical Practitioner-Patient Communication

Some diabetics revealed that they shared the data from the mySugr app with their practitioners, enabling online consultation. Through online consultations, the practitioners interpreted the data and made medical recommendations. In addition, participants revealed that this data collection facilitated improved communication and decision making, and there was a consistent record of their activities, diet, and blood sugar recordings. This was communicated through the following:

> *I now have an up-to-date record of what I was eating and doing before consultations. I show my doctors and nurses graphs of my blood glucose levels through consultations on WhatsApp. The trends come monthly and quarterly, and it becomes easy to tell whether I am maintaining the glucose levels very well* . (P 6.)

> *My doctor uses the data from the reports I would have shown him. He uses them to make better decisions to manage my diabetes*. (P 10.)

From the above data, the dissemination of application-generated data led to more informed interactions between participants and healthcare practitioners. The provision of structured records and visual summaries facilitated remote consultations and clinical decision-making. Hence, data sharing through the application was perceived to improve communication between practitioners and patients.

4.7.5 Motivation

Motivation is the internal drive or incentive that compels people to adopt and continuously use a technology (Vadodkar, 2022). Participants revealed that they were motivated by mySugr QST in three ways: goal setting, gamification, and shared community.

Goal setting

Participants disclosed that the mySugr QST application enabled them to set and track goals. The participants revealed that the application rewarded achievement, which was perceived as a positive reinforcement that motivated them to sustain healthy habits. In addition, the app kept them motivated by persuading them to achieve their goals and providing constructive feedback. In this respect, participants P26 and P33 said:

> *The application provides me with badges and rewards upon achieving certain goals it has set for me. I feel motivated by this. I also appreciate how mySgr acknowledges my achievements*. (P 26.)

> *Since I started using mySugr, I set my target weight and sugar levels. I can achieve this one step at a time, and the app pushes me not to give up, providing me with feedback and letting me know that I am on track to attain my goal.* (P 33.)

These data show that goal setting features facilitated participants' motivation through structured feedback and positive reinforcement. The ability to set goals and be recognised for achieving them facilitated participants' engagement with self-management activities. Hence, goal attainment mechanisms were identified with motivational aspects of QSTs.

Gamification

Data analysis revealed that mySugr, a QST application, had gamification features that motivated participants. Participants in this study revealed that they were motivated by these gaming features to manage diabetes. The games incorporated in the application rewarded diabetics when they achieved certain milestones through badges and points, which could be converted to cash and enabled them to purchase additional features or even get the paid-for reminder feature unlocked. In this respect, participants P12 and P31 said:

> *There are games in the app. Once you achieve a certain goal, you are rewarded by being given a badge. This is so motivating to be recognised even for little achievements*. (P 12.)

> *I am motivated because you can earn points which you can redeem for cash. You can use this cash to purchase advanced features. I once got the reminder feature unlocked through points*. (P 31.)

These data imply that the gamification features acted as motivational factors that facilitated the maintenance of interest in the application. The rewards, such as badges, points, and feature unlocks, helped to reinforce the efforts made by the participants in managing diabetes. Thus, the game-based rewards were considered an effective means for promoting the use of QST.

Shared Community

Participants revealed that the mySugr application had a community feature that provided an interface for communicating with other diabetic members. Thus, diabetics highlighted that they could draw inspiration from other diabetics based on their health achievements and motivate each other to achieve their health objectives by using the app. Thus, participants disclosed that this virtual community created a sense of belonging for diabetics. In that respect, participants P3 and P17 said:

The app motivates you by giving you access to make contact with other users living with the same condition. We encourage each other to eat healthily, exercise and achieve normal blood sugar levels. We share our achievements and inspire each other. (P3.)

Through the community feature, I was also able to connect with others with diabetes, and we motivate each other. It is gratifying to achieve this. (P17.)

The findings revealed five significant benefits of mySugr. This QST application enhances personal health management and potentially improves diabetes management. The benefits include monitoring, cost saving, adherence, data collection and sharing, and motivation. These factors are discussed in the Discussion Chapter.

4.8 Theme 5: Usability of mySugr quantified self-technology application

Usability pertains to the ease, efficiency, and satisfaction with which users engage with a product, system, or service (Madan & Dubey, 2012). The study found four usability factors that determine the adoption of mySugr, a QST application. The factors were perceived enjoyment, ease of use, and usefulness of the application. Figure 4.5 visualises the factors.

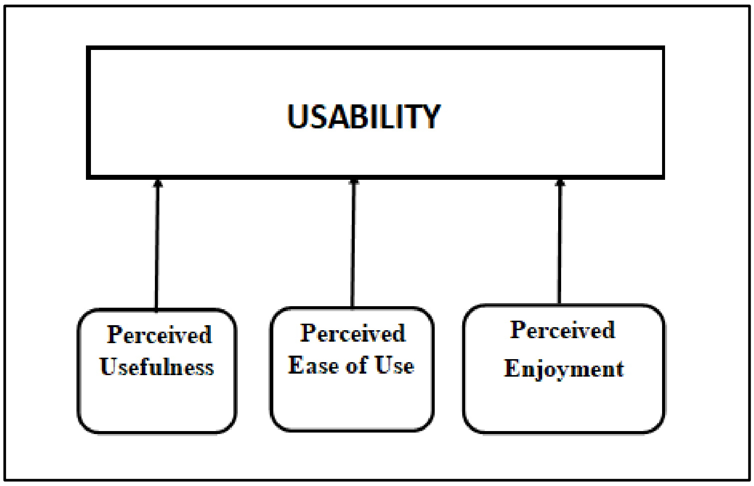

Figure 4.5: Usability of mySugr quantified self-technology application

4.8.1 Perceived usefulness

Diabetics indicated that they would continue using the mySugr QST application if they perceived it as useful and reliable. In the context of usability, usefulness was associated with the application's smooth functioning, accessibility, responsiveness, and accuracy during interaction. Participants expected the application to be error-free and consistently operational, particularly for functions such as reminders and glucometer integration. While perceived benefits focused on the outcomes gained from using the application, usability-related usefulness centred on the quality and dependability of the user experience. In this regard, participants P1 and P14 stated:

> *When you set an alarm for medication administration, it must always remind you at the set time. ……... Whenever the alarm must ring, it must always ring; I must not use something that is not reliable*. (P 1.)
>
> *I consistently verify the precision of the app data and my glucometer against my doctors' measures. If I lacked faith in it, I would refrain from utilising it. I rely on my mySugr app to make informed decisions about my insulin dosages*. (P 14.)

The diabetics appreciated the ability of the mySugr QST application to generate information. The application generated personalised blood glucose trends, dietary practices, and activities. Participants observed that insights derived from their own health data enhanced their understanding of their conditions. Hence, the application was perceived as useful for diabetes self-care. In this respect, participants P1 and P7 said:

> *I liked the part where it told me about me and me alone, not others. It will recommend things that are specifically for me, not for every person with diabetes. This was wonderful. I have had time to learn more about my diabetes because of this app.* (P 1.)
>
> *The app has been useful to me because I can input my readings. I can see the readings from the glucometer in the app, see my glucose level, see my trends and learn from them and get recommendations personalised to me, which have helped me a lot*. (P 7.)

From these accounts, the perceived usefulness of QST by diabetics is related to the reliability, accuracy, and ability to provide personalised information. The participants stressed the need for consistent and reliable feedback as a prerequisite for further use. Thus, the potential to facilitate informed, personalised self-care in diabetes was identified as a key aspect of usability.

4.8.2 Perceived Enjoyment

The diabetics indicated they would continue using the mySugr QST application if they found it enjoyable. During the short period of time that the diabetics experienced the application, they revealed that they perceived enjoyment as coming from gamification, incentives and social connection functions. Some diabetics disclosed that they enjoyed interacting with others on community forums. There was also an appreciation of the incentives that were rewarded for achieving goals. Participants noted that the incentives could be redeemed as discounts when purchasing health goods. Furthermore, they highlighted that features that allowed pictures to be uploaded made the application enjoyable. In this regard participants P12 and P16 said:

> *It has a welcoming sound it makes, that I enjoy listening to, 'the monster sound'…. There is a community network too, where we compete and make managing diabetes fun.* (P 21.)

> *As for the photo upload. It is the most fun; I usually upload photos of my wife and kids. These people have been of great help on my journey, especially my wife, who often had sleepless nights taking care of me....* (P 16.)

The data suggest that factors such as enjoyment, which stem from interactive, social, and incentive-based elements, influenced participants' willingness to continue using the app. Elements such as gamification, social engagement, and personalisation contributed to positive user experiences. As such, perceived enjoyment emerged as an important factor in usability, which influences sustained engagement with QST.

4.8.3 Perceived ease of use

The ease of use of medical technology was highlighted as an essential component of its overall functionality. Participants emphasised that a user-friendly application facilitates effortless engagement. Diabetics disclosed that they found it easy to access the application, capture data and navigate the interface. Because the application was easy to use, the diabetics said they found it easy to learn. Hence, the application allowed them to swiftly comprehend and execute activities without being overwhelmed. However, some participants noted that they struggled with the app's terminology, which made the application difficult to use. In this respect, participants P1, P3 and P23 said:

> *It is very easy to move around the app and very easy to follow the steps. You either press 'going forward' or 'backward', and that is it. Nothing complicated. This made me use it. I doubt I would use it if I had to figure out many things.* (P 1.)

> *I have two missing fingers, but I was able to use the app like any other normal person. This app is straightforward to use, even for anybody with disabilities.* (P 3.)

> *For a person not in the medical field, there is much jargon that would need help explaining, and I had to attend training so that I was taught how to interpret the trends that come in the form of graphs. I have also come across unusual words like "Bolas", "hypos" and "deviations".* (P 23.)

The findings indicate that perceived ease of use was associated with simple navigation, accessible design, and intuitive functionality. Participants who found the interface straightforward reported greater confidence in learning and using the application independently. However, specialised terminology and medical jargon emerged as challenges that complicated usability for some users.

Overall, the analysis uncovered three usability factors that affect the adoption of mySugr, which are perceived usefulness, perceived enjoyment, and perceived ease of use. In the discussion section, each of these factors are discussed.

4.9 Theme 6: Cyber security risks

Cybersecurity risks denote potential threats or vulnerabilities that may jeopardise the confidentiality, integrity, or availability of digital systems, networks, and data (Ajana, 2020; Hutton et al., 2018; Schretzlmaier et al., 2022). This study's data analysis uncovered cybersecurity risks, such as financial risks, data breaches, and privacy breaches, which can affect the adoption of mySugr QST application. Figure 4.6 visualises these factors.

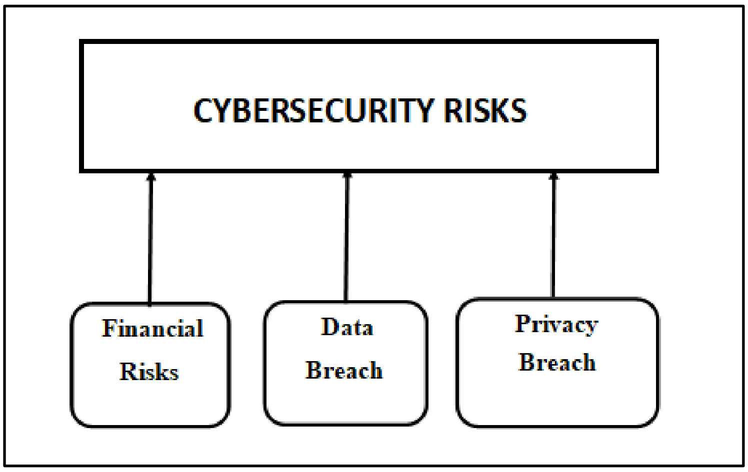

Figure 4.6: Cybersecurity Risks related to Quantified Self-technology

4.9.1 Financial risks

Participants were scared that if their personal data were stolen, they would be vulnerable to cybercrimes that may result in financial loss. There were 20 (57%) diabetics who raised concerns that their stolen identities may be exploited for fraudulent financial activities. The fraudulent activities mentioned by the diabetics included medical insurance fraud, bank loans, and life cover. Some participants revealed that the fear of financial loss due to fraud clearly affected their readiness to adopt and to continue using the mySugr QST application. In this respect, participants P3 and P25 said:

> *People commit fraud or fake things with your data. You know, some people think that since I have had diabetes since I was a child, I might die. Who knows, maybe when they get this data, they may take out a life policy on me and cash in on it, pretending to care for me.* (P 3.)

> *I am afraid that my data can be stolen and misused…I use my personal bank cards and enter my health data. If this data is stolen, my money can be stolen, and my data can be sold to data brokers*. (P 25.)

The data indicate that concerns about financial fraud and identity misuse shaped participants' perceptions of risk when engaging with the application. Fears of unauthorised access to personal and health data were closely linked to potential financial loss. As a result, perceived financial cybersecurity risks emerged as a factor influencing participants' willingness to adopt and continue using the QST.

4.9.2 Data breach

The diabetics were worried about data breaches. There were 7(20%) participants who were concerned that the data gathered by the mySugr QST application may be stolen by cyber criminals. They revealed that data such as physiological data, glucose metrics, and physical activity can be sold to insurance firms and advertising firms for profit. The diabetics feared that if insurance companies accessed their medical histories, they could be classified as high risk, which could increase their premiums. A more insidious issue was reported as the possibility of hospitals using patient data to solicit donations. In this regard, participants P15 and P21 said:

> *I am scared that if my data, such as my sugar levels, my exercise pattern, and other data collected by the app, is stolen and whoever stole my personal data and conducts crimes with it, I might lose my job and be blacklisted. I do not feel comfortable with my data being used and shared, or taken over by anyone, especially insurance companies*. (P 15.)

> *You can find the hospital now using your data to solicit donations or others now advertising fraudulent things using your details or even your picture, saying this diabetic got healed from our medicine, yet I do not know anything about it*. (P 21.)

The above excerpts imply that concerns about data breaches increased participants' apprehension about the use of QSTs. Their apprehensions were mainly centred on unauthorised use of health information, secondary use of health information, and negative consequences relating to employment, insurance, and reputation. Therefore, perceived cybersecurity risks of data breaches affected participants' comfort with and trust in using QST.

4.9.3 Privacy breach

The diabetics raised concerns that unauthorised access to medical data may result in reputational damage to their social and corporate lives. The participants revealed that they feared that medical data breaches may reveal their medical status to a broader audience, possibly resulting in stigma. This is because some diabetics highlighted that the mySugr QST application captures sensitive data such as underlying health conditions. The illegitimate dissemination of medical data heightened apprehensions over privacy and public perception. In this respect, participants P9 and P8 said:

> *My health is my privacy, and if this data is leaked to my colleagues, I might not be assigned high-risk tasks that are paying jobs, as they might think I am not capable of coping with the job demands. I do not want people to know that I am diabetic.* (P 9.)

> *You know, as a diabetic, you try out many things hoping to get a cure. .... Now, imagine if my other underlying conditions are exposed. I need to be guaranteed that my health secrets are kept private.* (P 8.)

These excerpts indicate that concerns about privacy breaches were closely linked to fears of stigma and reputational harm. Participants associated unauthorised disclosure of medical information with potential professional and social consequences. As a result, concerns about confidentiality affected participants' comfort in engaging with QST.

Overall, data analysis uncovered three cybersecurity risks that may affect mySugr QST application adoption. The risks are financial risks, data breaches, and privacy breaches. These risks are discussed in Chapter 5.

4.10 Summary of Findings

The findings of this study are summarised in Table 4.3, which presents the main themes, subthemes, and corresponding elements derived from the analysis. These findings directly address the research questions by identifying the key factors influencing the adoption of quantified self-technology for managing diabetes (Research Question 1) and explaining how these factors operate in practice (Research Question 2). Each theme reflects a critical dimension of adoption, including user characteristics, technology preparedness, social norms, perceived benefits, usability, and cybersecurity concerns. The relationships among these factors, as experienced by participants, are further visualised in Figure 5.1 to illustrate how they collectively influence the adoption of the mySugr quantified self-technology application in a developing-country context.

Table 4.3: Summary of Findings

Main theme	Sub theme	Elements
User Characteristics	Digital literacy	• Participants Age • Educational Level
	Technology Awareness	• Health Education • Practitioners not sharing medical information • Misconception that mobile apps are for youngsters
	Self-efficacy	• Prior experience • Work environment
Technology Preparedness	Affordability of Technology	• high cost of devices • subscription fees for applications • hidden costs
	Access to Resources	• Compatible smartphone • Internet Connection • Power supply
	Technology Anxiety	• Fear of Seeking Assistance • Technology dependence
	Training	
Social Norms	Social Influence	• Positively Influence • Negative Influence
	Social Support	• Technical Support • Financial Support
Benefits of mySugr quantified self-technology application	Monitoring	
	Adherence	
	Cost saving	
	Data Collection and Sharing	• Trend Analysis • Medical Practitioner-Patient Communication
	Motivation	• Goal setting • Gamification • Shared Community
Usability of mySugr quantified self-technology application	Perceived Usefulness	
	Perceived Ease of Use	
	Perceived Enjoyment	• Gamification Components • Incentives • Social Engagement
Cyber security Risks	Financial Risks	
	Data Breach	
	Privacy Breach	

Building on these findings, the next chapter provides a critical discussion by interpreting the results in relation to existing literature and the proposed conceptual framework.

Chapter 5 : DISCUSSION

5.1 Introduction

Building on the findings presented in Chapter 4, this chapter provides a critical discussion and interpretation of the results in relation to the research questions, existing literature, and the conceptual framework developed in Chapter 2. The chapter examines how the identified factors influence the adoption of QST in practice and situates these findings within broader theoretical and contextual perspectives. Thus, this chapter answers the research questions posed in the study. The main research question posed in this study was: *"How can a framework be developed to inform the adoption of quantified self technology for managing diabetes in developing countries?"* To answer the main research question, two sub-research questions were formulated:

Sub-Research Questions

1. *What are the factors that influence the adoption of quantified self-technology for managing diabetes?*

2. *How do the factors influence the adoption of quantified self-technology for managing diabetes in practice?*

To answer sub research question 2, six investigative research questions , originally formulated in Chapter 1, were used to guide the discussion and these are:

- *2.1 How do user characteristics influence the adoption of quantified self-technology for managing diabetes?*
- *2.2 How does technology preparedness influence the adoption of quantified self-technology in managing diabetes?*
- *2.3 How do social norms influence the adoption of quantified self-technology for managing diabetes?*
- *2.4 How do perceived benefits influence the adoption of quantified self-technology for managing diabetes?*
- *2.5 How does usability influence the adoption of quantified self-technology in managing diabetes?*

2.6 *How do cybersecurity risks influence the adoption of quantified self-technology for managing diabetes*?

The findings of this study are discussed as follows: Section 5.2 discusses the factors that influence the adoption of QST in monitoring and managing diabetes. Section 5.3. discusses how identified factors interact to influence the adoption of QST by diabetic patients in monitoring and managing diabetes.

5.2 Sub research question 1: What are the factors that influence the adoption of Quantified self-technology in monitoring and managing diabetes?

The objective of the sub-research question one was to identify the factors that influence the adoption of quantified self-technology in monitoring and managing diabetes. To answer this research question, the researcher conducted a Systematic Literature Review (SLR), which was presented as Chapter 2. The main factors that influence the adoption of quantified self-technology are user characteristics, technology preparedness, social norms, perceived benefits of quantified self-technology, cybersecurity risks, and usability. Consequently, the identified factors were presented as a proposed conceptual framework for the adoption of quantified self-technology in managing diabetes. The conceptual framework was presented in Chapter 2, Section 2.8, in Figure 2.7. Moreover, the findings of sub-research question 1, *"What are the factors that influence the adoption of quantified self-technology in monitoring and managing diabetes?",* were published as two peer-reviewed journal papers (Mutunhu et al., 2024a; Mutunhu et al., 2024b) and a book chapter (Ndlovu et al., 2024).

5.3 Sub research question 2: How do the factors influence the adoption of quantified self-technology for managing diabetes in practice?

The objective of this research question is to examine how the identified factors influence the adoption of quantified self-technology by diabetic patients in managing diabetes. The objective was answered through six sub-research questions discussed in the subsequent sections (sections 5.4 to 5.9).

5.4 How do user characteristics influence diabetic patients' adoption of Quantified-Self-technology?

The objective of this research question is to determine how user characteristics influence the adoption of quantified self-technology. In this study, user characteristics denoted the attributes and features of diabetic persons engaging with quantified self-technology. The analysis revealed three factors determining user characteristics: digital literacy, technology awareness, and technology self-efficacy. These factors are discussed in the subsequent sections.

5.4.1 Digital literacy

Digital literacy is possessing certain skills and knowledge that enable diabetic patients to use digital technologies (Arias López et al., 2023; Madanian et al., 2023). In the context of this study, a digitally literate patient can use mobile health applications to manage diabetes. Data analysis revealed that digital literacy is affected by the participants' age and educational levels.

Participants Age

Participants who were digitally literate attributed that to their young age. They highlighted that they grew up in the digital age, which calls for using technology in most everyday tasks. This finding is comparable to the findings of Dovie et al. (2020), who conclude that younger individuals exhibit greater digital literacy and proficiency compared to older generations, a disparity strongly shaped by the technology epoch of their birth. Moreso, Tran et al. (2020) characterised Vietnamese secondary pupils as "digital natives," born between 2002 and 2010, highlighting their distinct approach to obtaining digital information.

Conversely, those who were digitally illiterate were the late majority (Rogers et al., 2019). The late majority were eager to learn how to use QST with the hope of gaining proficiency. Thus, they required more training to keep abreast of technological advancements. The findings of this study are consistent with Aviraj et al. (2024), who conclude that people who adopt technology later in life display varying degrees of technological competence, which directly influences their willingness to adopt QST.

The findings of this study suggest that, irrespective of digital literacy in using QST, some individuals, especially the older participants, swiftly adopted the technology because they recognised its value. The value of the technology in managing diabetes was a significant factor that influenced the participants to learn to use the technology. Conclusions drawn from this study are aligned with those of Zapletal et al. (2023), who highlight that before the pandemic, older adults who did not use digital technology acquired digital literacy skills without formal training to maintain virtual connections during COVID-19. However, research has brought forward some perspectives that do not align with the findings of this study (Choudhary & Bansal, 2022; Ma et al., 2020). Choudhary and Bansal (2022) conclude that increased literacy does not automatically lead to increased technology uptake. On the other hand, Ma et al. (2020) found that two people with the same level of digital literacy can end up having different behaviours with technology owing to different personal motivations or interests. Furthermore, Adeleke et al. (2024) posit that digital literacy does not significantly impact the adoption of QST across diverse age cohorts, as both usage and adoption rates remain relatively comparable.

From the findings of this study, it is evident that a patient's age affects their digital literacy; however, propensity to adopt QST was determined by how a patient perceived the importance of the application in monitoring and managing diabetes. Since our sample had participants of different age groups with varying digital literacy experiences, it is essential to develop effective methods for improving digital literacy using QST across different age groups.

Educational Level

The educational level of a participant was found to impact the use and understanding of QST directly. Some participants with higher education levels were found to have the acumen to use, process and understand information on the app. This finding aligns with research that uncovered that higher educational attainment enhances abstract thinking, problem-solving, and information processing (Dadon-Golan & BenDavid-Hadar, 2025). Such cognitive characteristics brought by academia essentially prepare a user to navigate new technological interfaces logically, comprehend data visualisations, and analyse the output (Intzar Hussain Butt et al., 2025).

On the other hand, participants with lower educational attainment were found not to be not ready to understand and navigate the functionality of the QST applications. This finding aligns with research that found lower educational attainment necessitates tailored strategies when utilising health technologies (Lee & Nathan-Roberts, 2021; Mbanda et al., 2021). Mbanda et al. (2021) emphasised that technology adoption in low literacy groups can be enhanced by providing simple-to-use interfaces reinforced with visual aids to increase memory retention.

The findings of this study suggest that even though participant educational level had a direct impact on the readiness to adopt QST, educational level did not directly translate to first-time proficiency in using the app. This finding conforms with research that found that being educationally literate does not translate to high technology adoption because people are naturally sceptical of using new technologies (Nikou et al., 2022; Akello, 2024). This finding implies that when providing QST for managing and monitoring diabetes, users should be provided with some training and instructions for using the technology to effectively utilise it and engage actively in their own data-driven health management.

5.4.2 Self-efficacy

In this study, self-efficacy was defined as the ability of diabetic patients to use QST without anybody's assistance. Prior experience and work environments were found to be three determinants of self-efficacy.

Prior experience

This study found that a participant's technological experience determined their technology self-efficacy. Prior technological experience characterised by negative user experience was found to result in diminished self-efficacy amongst some of the participants. It was uncovered that participants with low self-efficacy needed support to use the QST applications. This finding conforms with the findings of a study that established that apprehension of failure deters additional efforts to embrace a technology (Wittkowski et al., 2020). Conversely, participants with prior positive user experience with technology, even in a different context, exhibited a heightened propensity to use QST. The elevated self-efficacy enabled some participants to perceive QST as a manageable instrument rather than a menace. This finding aligns with Chamorro-Koc et al. (2021), who conclude that a positive mindset promotes perseverance and facilitates deeper engagement with the technology's comprehensive features. With particular focus on older people, Kavandi and Jaana (2020) suggests that a positive technology experience is instrumental in breaking the obstacles of self-efficacy in technology adoption.

Work environment

Data analysis revealed that a work environment that provides resources, skill enhancement, and peer support promotes technological self-efficacy. This study found that people with diabetes who were employed in supportive work environments were more inclined to engage with QST since such environments provided health wellness support. In contrast, those in less supportive working environments were found to be overwhelmed by QST and to have low self-efficacy. Literature search looking for similar or contradicting this finding could not find studies on the adoption of quantified self-technology or health informatics that associated work environment support and self-efficacy.

5.4.3 Technology Awareness

Awareness pertains to comprehension and knowledge of contemporary and developing technologies, their applications, advantages, risks, and societal, occupational, and private life implications (Brummer, 2025; Siddhartha, 2022). This study's data analysis uncovered three factors that inform awareness of QST. They are inadequate health education, the misconception that mobile applications primarily cater to a younger audience, and the failure of medical professionals to recommend these applications to their patients.

Health education

Data analysis uncovered that participants' awareness of QST was informed by public health education at their disposal. Two sources of public health education were uncovered, and they were immediate social circles and public health campaigns provided by government health institutions. Amongst the participants in this study, a few were aware of QSTs whose source of knowledge was immediate social circles or personal research. On the other hand, the majority of the participants pleaded ignorance of QSTs. The main reason for the lack of awareness was attributed to a lack of health education on quantified self-technology. The participants had never heard about the technology because they had never seen any advertisements on television, billboards, or in hospitals. The findings of this study corroborate the findings of Vollbrecht et al. (2020) and Kreitmair (2024), who emphasised that inadequate health education may result in lost opportunities for patients to utilise advantageous technologies. Moreover, Kahn and Terry (2024) found that insufficient exposure to medical technology can render patients less inclined to pursue or employ resources that could improve their health management (Chadwick et al., 2024). To improve awareness through health education, researchers note that educational films disseminated through social media platforms such as WhatsApp have successfully enhanced awareness among individuals with diabetes (Alhazmy & Khalil, 2024; Yoon et al., 2024). Equally, the sentiments of awareness campaigns are corroborated by Ramadaniati et al. (2024), who indicated that enhancing awareness through education and outreach programs may elevate adoption rates. Hence, the findings of this study suggest that augmenting health education initiatives is essential for elevating knowledge and understanding of QSTs, which can improve their adoption.

The misconception that mobile applications primarily cater to a younger audience

Being aware that quantified self-technology can be used for managing and monitoring diabetes was found to be negatively affected by the misconception that mobile phones are tools for youngsters. This viewpoint suppressed eagerness to experiment and discover new opportunities that can be benefited from using mobile technologies for health management by the elderly. Hence, the elderly psychologically blocked themselves from knowing that QST is instrumental in diabetes management. The findings of this study are aligned with research that has concluded that older diabetics may be left behind in utilising health technologies because they consider mobile technologies irrelevant to their demographic (Allen & Litchman, 2020; Picton et al., 2016). This is further corroborated by digital exclusion research, which found that age-related prejudices may cause older adults to see new technologies as intended for youngsters (Huang et al., 2023; Kenny & Connolly, 2017). Nonetheless, there is research that contradicts the findings of this study. Nicosia et al. (2022) study from the United States of America revealed that although youngsters may embrace mobile technology more readily, there is an increasing number of the elderly who are embracing mobile technology, mostly the educated. The contradiction between our findings and Nicosia et al. (2022) could be because our sample is from a developing country, whose technology adoption patterns could be different from those of developed countries. However, to improve QST awareness in the context of our sample and other developing countries, there is a need to correct the misconception that mobile technologies are for youngsters. Dispelling this myth is crucial for enhancing knowledge and adoption of quantified self-technology among all demographics.

Medical professionals not recommending quantified self-technology

Some participants in this study perceived medical professionals as not ready to recommend QST to the diabetics. Hence, the diabetic participants were never introduced to QST and were unaware of the technology. The findings of this study confirm the findings of Berrami et al. (2024) in Morocco, who found that approximately 15% of private sector physicians endorsed mobile applications to patients for health management. Furthermore, there is research that has concluded that if medical practitioners do not recommend medical technologies to patients, they will not know the technologies (Powell, 2017; Rudawska et al., 2024). In contrast to our findings, Meyer and Vergnaud (2020) found that participants received verbal recommendations from their medical practitioners to utilise medical applications.

In this study, an assumption was provided as the reason medical practitioners were not recommending QST. The participants' perceptions were that if practitioners recommend QSTs, they will lose consultation fees. However, the participants' perceptions in this study are not aligned with past research findings. There is research that found that practitioners may refrain from recommending medical applications to patients because they are not aware of the benefits brought by the technologies (Alaslawi et al., 2022; Vukmirović et al., 2023). Moreover, practitioners were found to be hesitant to endorse medical technologies because of issues with data privacy or any other cyber threats associated with online devices and outside the scope of their speciality (Oudbier et al., 2024; Sarradon-Eck et al., 2021; Tomasella & Morgan, 2020).

The findings of this study suggest that medical practitioners should recommend QST to their patients. This will improve the awareness of QSTs among diabetic patients. The inference aligns with Ramadaniati et al. (2024), who contended that health practitioners should proactively ensure that patients are informed about health technologies, including their pros and cons, to elevate adoption rates.

5.5 *How does the technology preparedness of the diabetic patient influence the adoption of Quantified Self-technology?*

The objective of this research question was to determine how technology preparedness influences the adoption of quantified self-technology. In this study, technology preparedness pertains to the readiness and capability of diabetics to efficiently adopt, utilise, and address technological advances and problems in QST. The analysis revealed three factors that influence technology preparedness: access to resources, technology anxiety, and affordability of the technology. These factors are discussed in the subsequent sections.

5.5.1 Access to Resources

In this study, access to resources was the availability of necessary and fundamental resources required for a diabetic patient to utilise QST. Three crucial resources were identified: a compatible smartphone, reliable internet connectivity and intermittent power supply.

Compatible Smartphone

A crucial resource for utilising QST was found to be a compatible smartphone. A compatible smartphone is a phone handset that accepts a QST application to be downloaded, installed and configured. A barrier to a compatible smartphone was found to be mostly because some participants could not afford to buy such a device. The findings of this study corroborate findings from prior research (Campanella et al., 2024; Farenden et al., 2024; Mehbodniya et al., 2021 ; Robinson et al., 2024), which concluded that accessibility to a suitable device is crucial for effective engagement with health technologies such as QST. However, there is research that found that mere availability of a smartphone may not lead to adopting self-tracking devices because of digital illiteracy, physical limitations, and a lack of social support structures (Kifle et al., 2010; Rasekaba et al., 2022). Moreover, some research found that individuals in resource-constrained environments who cannot afford devices were found to embrace medical technologies through shared devices and intermittent mobile device access (Bimerew, 2024; Kifle et al., 2010; Rasekaba et al., 2022).

Internet Connection

Reliable internet connectivity was found to be the backbone of utilising QST as a tool for monitoring and managing diabetes. This study uncovered two factors that affect the internet connectivity of diabetic patients. First, unreliable power supply in Zimbabwe, where the data was collected, often results in intermittent internet connectivity. Secondly, internet connectivity is a pay-as-you-go transaction; without paying for the subscription, the internet is cut off. The findings of this study correspond with the findings of Ebekozien et al. (2024), who found that an insufficient internet connection impedes technology adoption by diabetic patients in under-resourced regions. The absence of a connection impedes real-time data gathering and monitoring, adversely impacting diabetes care (Sharma & Patten,2022). The findings of this study reflect the lived experiences of under-resourced countries, which contrast with the findings of research from developed countries. Contrasting the findings of this study are the findings of Dalgic-Tetikol et al. (2022) and Wu et al. (2025). These scholars found high adoption rates of mobile health technologies in countries such as Turkey and China, respectively, owing to reliable and affordable internet access. Hence, the findings of this study suggest that unreliable internet connectivity and high broadband costs may be obstacles to the adoption of QSTs for managing and monitoring diabetes.

Power Supply

Intermittent power supply was considered the biggest obstacle to adopting and using QSTs for managing and monitoring diabetes in Zimbabwe. It came out from the discussion with the participants that power supply from the national grid has been intermittent for over the past decade. Intermittent power supply was found to adversely affect the monitoring and management of diabetes because electricity is needed to power mobile devices and internet transmitters. Because of power supply challenges in the country, participants revealed that alternative power sources were used to charge mobile devices and keep the quantified self-apps running. The findings of this study are consistent with research in other third-world, middle-income countries, which found that intermittent electrical power supply impacts the preparedness to adopt health technology (Lazo et al., 2023; Machimana et al., 2024). Similar to our findings, in South Africa, the literature highlights that loadshedding affects the adoption of mobile health technology (Bantjes & Swartz, 2023; Kambunga & Waltorp, 2024). In that respect, Kgarose et al. (2024) suggested that diabetic patients could benefit from alternative power sources, such as power banks and solar energy, to power mobile devices. Moreover, Khoza (2024) emphasised that renewable energy sources can provide an uninterrupted power source in a constrained environment (Khoza, 2024). Therefore, this study found that intermittent power supply is an obstacle to the preparedness of diabetics to adopt QSTs for monitoring and managing diabetes.

5.5.2 Technology Anxiety

Technology anxiety denotes the uncertainty or fear humans encounter when engaging with technology, especially over the utilisation of novel devices, apps, or systems (Kim et al., 2023). In this study, two anxiety factors were found to affect the adoption of QST, and they are: fear of seeking assistance and technology dependence.

Fear of seeking assistance

This study found that diabetics with low self-efficacy continuously seek assistance to use QST. Consistently seeking assistance from others was observed to result in a phobia of being rejected by those with technical knowledge. The phobia was common amongst the elderly. This finding closely aligns with Portz et al. (2019) study in America, who observed that grandchildren were solicited for assistance to use new health technology by the elderly, as they found it complex to navigate interfaces. This is corroborated by the findings of Magsamen-Conrad et al. (2019), who found that when the elderly are frustrated by a technology, they seek expert assistance from peers. The technology dependence syndrome may engender feelings of inadequacy when reliance is considered personal failure (Duque & Otaegui, 2023). This parallels 'learned helplessness', where consistent failure results in unwillingness to try to use a technology (Boddez et al., 2022). Hence, seeking assistance to use QST may result in technological anxiety, which in turn affects the preparedness to use the technology by diabetics.

Technology dependency

The use of QST was perceived as dominating daily life by some of the diabetics and that caused technology anxiety, especially amongst the elderly. Some of the diabetics perceived themselves as subordinate to the device because it was dictating their daily routines. Because the diabetics were required to capture data before and after meals or exercises consistently, they felt out of control of their lives. Anxiety amongst users worsened when the diabetics failed to meet the daily reading thresholds expected from diabetic patients. These findings resonate with Falk (2024), who found that health data tracking is burdensome because it requires constant monitoring, which can be seen as an overwhelming task. In this respect, Shneiderman (2022) concludes that people who view technology as unmanageable are more inclined to escape it. To overcome this challenge, some strategies have been suggested: First, Steelman and Wallace (2017) suggest that technology anxiety can be mitigated through training since it is a temporary barrier. Secondly, other research suggests that a way to mitigate technology anxiety is to offer family assistance to the elderly (Falk, 2024; Jeng et al., 2022; Schreurs et al., 2017). Thirdly, other research suggests that individualised support and explicit guidance on using technology can create an atmosphere that alleviates patient anxiety. Lastly, other studies found strategies for alleviating anxiety encompassing optimising enabling settings, augmenting digital literacy, and offering compassionate social support (Chen et al., 2024; Falk, 2024; Peña-López & Acosta-Gonzaga, 2025).

Overall, these findings indicate that although technology anxiety is a considerable obstacle for certain individuals, it does not uniformly impede adoption and may be surmounted with specific treatments and affirmative experiences.

5.5.3 Affordability of the Technology

Affordability is the ability of the diabetic patient to have enough money to cover the costs associated with QST use. This study uncovered determinants of technology affordability, such as the high cost of devices, subscription fees for applications, and hidden costs.

High cost of devices

Buying a smartphone mobile device compatible with running quantified self-applications was a significant financial burden among low to middle-income participants. Evidence from prior studies uncovered that the cost of smart technologies can be exorbitant for less privileged people in society (Francisco et al., 2024; Valerio et al., 2024). Chen (2025) argues that the cost of technology can introduce inequities that can result in the deprivation of resources to those who cannot afford it. The findings of this study confirm the findings of these prior studies. Because of economic hardships amongst the low to middle-income sampled participants from the city of Bulawayo, Zimbabwe, it was inferred that economic hardships hindered the full utilisation of QSTs. Nonetheless, certain studies contradict this notion, indicating that patients may still embrace high-cost technology if they recognise advantages (Ju et al., 2021). Furthermore, Kavandi and Jaana (2020) found that the elderly may embrace health information technologies they deem beneficial, overcoming financial obstacles. Dehnavi et al. (2021b) found that affordability issues and the absence of economic assistance impede the adoption of QST. Hence, mitigating cost-related obstacles might be essential for enhancing technology adoption among diabetics, fostering equal access to QSTs.

Subscription fees for applications

Quantified self-technology application subscription fees were identified as a deterrent to full adoption. Because of economic hardships experienced by the diabetic, some participants perceived subscription as a financial burden to their lives. Literature corroborates this finding, confirming that most users do not prefer paying for health application subscription fees (Binyamin & Zafar, 2021; Ogbaga, 2024;Mutunhu & Chipangura, 2026). Some scholars revealed that consumers may prioritise fundamental expenses over technological subscriptions, underutilising potentially advantageous products (Larkin et al., 2025). While some participants in our study were unwilling to pay subscription fees, others were willing, emphasising that the advantages surpass the subscription costs. The findings of this study align with research that found that patients from high economic incomes perceived subscriptions as a worthwhile investment in their health (Ang et al., 2023; Liu et al., 2024). Lin et al. (2023) argue that economically disadvantaged individuals may still adopt technology through alternative financing, such as community health programs or subsidies. These findings suggest that although affordability is an issue, it may not uniformly hinder adoption.

Hidden Costs

Hidden costs were found to exert an unnecessary financial strain on the diabetics. The hidden costs were identified to include the costs of glucose strips, device maintenance, and other consumables. Because the costs are cumulative, the diabetic perceived QST as unaffordable. The findings of this study align with those of prior research that found that hidden costs demotivate people from using technologies because, in the long run, they surpass the initial cost (Ferko et al., 2021; Iliopoulos et al., 2020; Revathy & Ginters, 2021). Furthermore, non-disclosure of the hidden cost may later frustrate users, who may abandon the technology (Kaplan, 2020; LaMonica et al., 2021). To address the hidden cost concerns, some studies suggested that the long-term financial effects of QST must be transparent to promote decision-making and sustainable adoption (Biviji et al., 2021; LaMonica et al., 2021; Okolo et al., 2024).

5.5.4 Training

The findings of data analysis highlighted the importance of training in improving technology self-efficacy, which is crucial for diabetics to be prepared to adopt QST. Because the participants had varying digital skills, those with lower self-efficacy believed their hands-on skills could be improved if trained. Importantly, peer training emerged as a viable strategy where the less skilled, especially the old, are paired with the young and skilled. Paired peer training was recognised as a panacea for accomplishing difficult computing tasks such as downloading software, configuring, and analysing data. This study's findings align with previous studies' results (Ivan & Cutler, 2021; Senteio et al., 2021). Senteio et al. (2021) found that paired peer training enables participants to witness peers engage with technology, thus confronting their preconceived notions of technological incompetence. Furthermore, Ivan and Cutler (2021) argue that pairing older and younger people dismantles generational prejudices and empowers older diabetes patients by illustrating that QST adoption is an attainable objective to cultivate the confidence necessary for ongoing participation. However, research conducted by Ivan and Cutler (2021) and Mariano et al. (2022) indicated that pairing older participants with the youngsters who are technologically proficient, if not managed, may not necessarily enhance self-efficacy because older adults may experience intimidation or condescension, thus exacerbating their hesitance.

5.6 *How do social norms influence the adoption of Quantified Self-technology for managing diabetes?*

The objective of this research question was to determine how social norms influence the adoption of QST by diabetic patients. Social norms are the positive or negative influences of family, friends, relatives, and social groups on whether they should adopt QST or not. Thus, two main factors were found to influence social norms in the adoption of quantified self-technology, and these are social influence and social support.

5.6.1 Social influence

Social influence reflects an individual's perception regarding the influence of external people in their adoption of new technology (Okati-Aliabad et al., 2024; Schretzlmaier et al., 2022). In this study, social influence emanated from the groups that diabetics belonged to and their family members. Social influence was found to be either a positive or a negative influence.

Positive influence

Diabetic patients revealed that they receive positive influence from their various social groups. This positive influence emanated from sharing knowledge, recommendations, personal experiences and encouragement about diabetes treatment and management. This positive influence was found to encourage diabetics to continue adopting QST. These findings corroborate research that posits that people are more likely to use technology recommended by their social networks (Bikhchandani et al., 2021; Filippini et al., 2020). Consistent with the findings of the study, Chung et al. (2021) discovered that patients receiving positive influence from family, friends, and healthcare professionals exhibit more readiness to use these technologies. Positive influence can enhance motivation and provide crucial emotional aid through shared experiences (Hazime & Burner, 2024).

Negative influences

The findings revealed a significant dispute over the effects of community and religion, which were found to provide negative influences. Data analysis revealed negative social influence, particularly from religious institutions that invoke spiritual doctrines, which oppose technological advancements in health management. This contrasting perspective aligns with Chittem et al. (2022), who demonstrated that social influence systems may impede readiness by consistently imposing alternative interventions. Corroborating these findings is research that revealed that some cultures may have a natural aversion to technological use because they prefer natural and traditional cures (Jolly & Shivani, 2024). This discovery highlights a potential cultural and religious barrier to adopting QST, supporting literature that suggests the social environment can significantly influence health habits (Rojali et al., 2024; Shalawadi et al., 2024). Thus, negative criticism or unsolicited advice can diminish individuals' confidence and motivation, fostering feelings of inadequacy (Sebri et al., 2021; Straub et al., 2023). These findings highlight the significant impact of culture and religious beliefs on technology acceptance. This study's findings are aligned with the conclusion of research that emphasises the need for culturally sensitive technologies to promote QST systems within specific communities to prepare them for technology utilisation (Naderbagi et al., 2024; Shalawadi et al., 2024).

5.6.2 Social support

Data analysis findings revealed that diabetic patients receive social support from family members, relatives, and medical practitioners while utilising QST. Technical and financial support were elements of social support that were valuable to this study's adoption of QST.

Technical support

Diabetic patients required support from their family members, relatives, and medical practitioners to start and continue using QSTs. The support was in the form of technical support, which was needed to install the app, connect to the internet, and charge mobile handsets. The findings of this study corroborate earlier research findings demonstrating that social support is essential for enhancing technology usage (Herlina et al., 2023; Rojali et al., 2024). Consistent with our findings, Chung et al. (2021) similarly found that patients receiving support from family, friends, and healthcare professionals are more prepared to employ these technologies. Social support can enhance motivation and provide crucial emotional aid through technical assistance to tackle the challenges of diabetes management (Hazime & Burner, 2024).

Financial Support

Financial support is the cornerstone for the QST adoption because it costs money. Costs incurred included the purchase of a handset, subscription fees and internet broadband, which were all identified as bottlenecks to successful adoption. Diabetics who occupied the low to middle income strata could not afford the cost of adoption and required financial help from immediate family members. The findings of this study uncovered that immediate family members such as spouses, siblings, children, and friends provided some financial support to the adoption of QST. The importance of immediate family financial support was emphasised by Dotolo et al. (2025), who found that when patients receive financial support from family members, it eases the burdens of technology adoption and normalises conversations about costs. Furthermore, research argues that when a patient receives financial assistance, the patient experiences social pressure to use the technology, which fosters a strong sense of obligation and reciprocity (Hung et al., 2021; McCauley et al., 2023). Similar findings are echoed by research on family dynamics in managing chronic diseases, emphasising that financial support can be a potent incentive for a patient to follow a treatment plan (Turnbull et al., 2020).

5.7 *How do the perceived benefits influence the adoption of Quantified Self-technology for managing diabetes?*

The objective of this research question is to determine how perceived benefits influence the adoption of quantified self-technology. The perceived benefits are the advantages or favourable results people think they will obtain from utilising a certain technology or adopting a particular conduct. The perceived benefits of health technologies for diabetes patients can impact how likely they are to accept and regularly use these tools. Five main benefits of QST were revealed by this study, as highlighted by participants: monitoring, adherence, data sharing and collection, motivation, and cost saving.

5.7.1 Monitoring

Monitoring is the systematic tracking and capturing of a user's data of their health, behavioural, and daily activities for self-awareness and decision-making (Feng et al., 2021). The findings of this study indicate that QST can facilitate diabetes monitoring and responsiveness to treatment.

Diabetes Monitoring

Quantified self-technology was perceived as instrumental in diabetes monitoring and management. This was realised through the capacity of the technology to measure blood glucose levels in real time, the results of which feed into informed dietary decisions, planned daily physical activities, and ultimately diabetes management. Academic research on chronic disease self-management highlights that successful management depends on a patient's capacity to track their own health data (Alam et al., 2024; Ndlovu, 2026), which is substantially aligned with the findings of this study. Furthermore, the capacity to monitor and manage diabetes has been confirmed by many other studies (Fan & Zhao, 2022; Kim et al., 2024;

Lubasinski et al., 2024; Schretzlmaier et al., 2022). Despite the benefits of diabetes monitoring observed in this study and many other studies, Davish et al. (2019) argue that chronic disease monitoring by patients may have adverse effects because it can result in data fatigue and worry owing to misinterpretation of results.

Monitoring responsiveness to treatment

Quantified self-technology was perceived as having the ability to assist patients with tracking their responsiveness to a recommended treatment. Assessing the impact of treatment was found to be essential for determining the perceived efficiency of a prescribed regimen. There are studies that found similar results to the findings of this study, for example, Barkham et al. (2023) and Bovendeerd et al. (2021) highlight that patients receiving constant positive feedback on treatment outcomes are more inclined to comply with treatment requirements and remain hopeful. In this respect, Janse et al. (2020) observe that treatment feedback gives patients a sense of empowerment because they can observe the impact of their blood glucose responsiveness to medicine, diet, or activities. This parallels the notion of actionable insights in data analytics, wherein information is not merely displayed, but its real-world ramifications are explained, creating a feedback loop in treatment monitoring (Prioleau et al., 2020; Raj et al., 2023). Although the capacity to monitor the impact of treatment is acknowledged as a benefit of QST, there are studies that suggest that mere monitoring does not always lead to enhanced health outcomes or sustained participation (De Cesaris, 2021; Orji et al., 2018). There is a possibility that patients may experience discouragement or frustration if the technology reflects their lack of responsiveness to a treatment plan (Brohman et al., 2020; Wannheden et al., 2021). Furthermore, Feng et al. (2021) found that constantly monitoring the impact of treatments may overwhelm some users, which may result in stress and disengagement. Hence, the inference drawn from this discussion is that there are disadvantages and advantages to monitoring responsiveness to medicine using QST. The use of QST should be administered under the monitoring of a qualified medical practitioner.

Monitoring of physical activities and exercise

Lifestyle management is an integral part of diabetes treatment. The findings of this study confirmed that the sampled diabetics were using QSTs to track their steps, burned calories, and activity duration, with the assumption that it would help in diabetes treatment. There is research that has studied activity self-monitoring in chronic disease management and produced similar findings (Pingo & Narayan, 2019; Ringeval et al., 2020). Ringeval et al. (2020) found that real-time feedback provided by QSTs was a persuasive factor that pushed users to achieve physical activity and exercise objectives. However, some research found contradicting findings (Blackstone & Herrmann, 2020; Cheung & Saad, 2024; Siddika & Ellithorpe, 2025). Siddika and Ellithorpe (2025) found that certain individuals cultivate an obsessive attachment to their fitness data, adversely affecting their general well-being. Aligned with that, Blackstone and Herrmann (2020) found that when patients fail to achieve their self-imposed objectives, they excessively engage in activities that may result in obsession. On the other hand, failure to meet activity and exercise objectives may result in negative emotions of shame and a total rejection of the technology (Cheung & Saad, 2024).

The findings suggest that although there are perceived benefits of quantified self-tracking, there is a need to establish standards for good monitoring practices that help reduce the likelihood of obsession and anxiety. Healthcare providers should advocate for a balanced approach to physical activity monitoring that prioritises enjoyment and well-being rather than performance criteria (Shannahan et al., 2021).

5.7.2 Motivation

Motivation is the internal drive or incentive that compels people to adopt and continuously use a technology (Vadodkar, 2022). Quantified self-technology was revealed to foster motivation through goal setting, gamification, and shared community.

Goal Setting

Goal setting entailed establishing clear and quantifiable objectives for achieving a health-related task or a routine. Quantified self-technology was found to be a tool that helps diabetics set health-related goals. The tools were found to be persuasive, to cultivate a sense of purpose, provide immediate feedback, and enable users to monitor and evaluate progress towards their goals. This study's findings build on prior studies' findings (Desveaux et al., 2018; Strubbia et al., 2020; Tabaei-Aghdaei et al., 2022). Desveaux et al. (2018) assert that self-directed motivation through goal setting is essential for enhancing physical activity adherence in individuals with diabetes. The findings of this study substantiate Strubbia et al. (2020), who found that goal setting creates a positive feedback loop in which the patient's ongoing utilisation of the technology is motivated by the sense of achievement derived from attaining and exceeding health objectives. Martinez et al. (2021) assert that persons who establish specific goals are more inclined to attain superior performance than those lacking defined goals. However, there is research that found that the failure to achieve set objectives may demotivate the user, who can ultimately discontinue using the technology (Mozafarinia et al., 2023; Mustafa et al., 2022). Therefore, to encourage goal setting, this study suggests that QST applications must recognise minor achievements to sustain motivation and continued use.

Gamification

Gamification entails the incorporation of game-like aspects into non-gaming environments to augment user engagement and motivation (Mohanty & Christopher, 2024; Mokonyane et al., 2022). Participants in this study revealed that they were motivated by gaming elements of QST to manage diabetes. The diabetics disclosed that rewards motivated them when they reached their daily routines and physical activities. Rewards were concrete prices in the form of points that could be converted into cash. Similarly, research on diabetes management found that gamification elements such as rewards, levels, and challenges effectively motivated users (Anwar et al., 2025; Thilakshana, 2020). There is research that revealed that gamification in health management converts a potentially tedious chore into an interesting and gratifying experience (Damaševičius et al., 2023; Szinay et al., 2020). However, there are studies that found that the motivating effects sometimes yield adverse outcomes to some users (Bitrián et al., 2023; Oc & Plangger, 2022). Thus, gamification and may result in burnout if not accompanied by commitment to achieve the set goals (Lurz et al., 2024). Alberts et al. (2024) found that when rewards are withdrawn or become less appealing, users may abandon using gamification-based technologies.

Inferences drawn from this study's findings are that QST platforms are needed to achieve equilibrium between motivational components and sustainable engagement tactics that do not depend exclusively on immediate rewards. This entails creating elements that foster autonomy, competence, and relatedness. This indicates that although gamification might augment motivation, it must be planned to guarantee it remains a constructive and supportive experience.

Shared Community

Shared community pertains to social networks and support systems that individuals interact with while utilising QST (Ryan et al., 2021). The study found that diabetics lived in the virtual community much more than in the social physical community. Virtual communities encompass online forums, social media groups, or in-app communities where users can exchange their experiences, challenges, and accomplishments. Virtual communities were valuable for sharing diabetic results, activity achievement, rewards, and creating a sense of belonging. The findings of this study conform with research that found that a shared community provides a medium for engaging, exchanging experiences, and obtaining reciprocal support (Hazime & Burner, 2024; Knittel et al., 2021). Furthermore, social communities were found to be sources of emotional and informational support in health-related behaviours (Couture, 2020; Myneni et al., 2020). Nonetheless, certain studies contradict this notion; they found that online communities are sometimes sources of disinformation, negativity, social pressure, and unhealthy rivalry that can demotivate other patients (Lin & Shorey, 2023; Walsh & Al Achkar, 2021). Furthermore, disparaging remarks or comparisons in online forums were found to result in diminished self-esteem and withdrawal from sharing information on social platforms (van Zandvoort et al., 2025).

Inferences drawn from data analysis were that sharing accomplishments and struggles among QST users foster a genuine and relatable atmosphere. Moreover, offering resources for community interaction and conversation prompts significant ties among users.

5.7.3 Data Collection and Sharing

Data collection and sharing involve systematically gathering patients' data and sharing through QST (Shin et al., 2020). Data analysis in this study uncovered four benefits of data collection and sharing: trend analysis and insights, knowledge about the disease, and improved doctor-patient communication.

Trend Analysis

Trend analysis is the examination and visualisation of diabetic patient data to identify patterns and make informed decisions (Alarcón-Santos et al., 2024). Data analysis established that trend analysis empowers diabetics with a holistic picture of their health. They can visualise and correlate different aspects of health metrics to draw personalised insights, pattern recognition, and predict future diabetic attacks. Trend analysis enabled diabetics to associate particular behaviours, such as diet and exercise, with health results. The findings of this study corroborate Lewinski et al. (2021), who proved that trend analysis facilitates proactive health management. Research on data-driven health highlighted that trend analysis is crucial for recognising patterns that may not be evident from daily measures alone (Prioleau et al., 2020). Since trend analysis requires some data analytics skills, patients who cannot evaluate their data proficiently may see trend analysis as complex, which can result in dissatisfaction, disengagement and an inability to comprehend the results (Palumbo et al., 2021; Staccini & Lau, 2022). Wang and Voss (2022) argue that excessive information inundates users, which can result in information overload and disengagement. To overcome digital trend analysis illiteracy and information overload, this research suggests that QST applications should be user-friendly and provide intuitive visuals that are easy to interpret.

Medical practitioner-patient communication

Diabetic patients valued consolidating their health data into a single location and providing a communication channel with medical practitioners, which is provided by the QST. The diabetics disclosed that personalised communication with practitioners heightened engagement and fulfilment during consultations. This finding aligns with research that underscored the significance of collaborative communication in treatment adherence (Shin et al., 2020). In addition, some research emphasised that continued communication between a patient and practitioner cultivates a sense of commitment to treatment (Schroeder et al., 2017; Staehelin et al., 2024). This shifts the dialogue from a general discourse on symptoms to an interpretation of data and trends (Staehelin et al., 2024). Contradictory evidence from the literature suggests that users often harbour significant privacy breaches regarding their sensitive health data, leading to reluctance to share, even with healthcare providers or family (Hutchings et al., 2020; Kharlamov et al., 2023). Furthermore, other research suggests that not all physicians are prepared or inclined to incorporate QST data into their practice, potentially leading to patient discontent (Campbell et al., 2021). The inference drawn from this discussion is that QST can improve communication between medical practitioners and patients, which in turn improves decision-making.

5.7.4 Adherence

Adherence in this study was the degree to which diabetic patients followed and observed medication routines. Quantified self-technology can enhance adherence through prompt reminders. Because diabetes is a chronic disease that is associated with a wide range of other diseases, like high blood pressure, obesity, and eye diseases, the participants in this study viewed the administration of medical intake as complex because of forgetfulness. Prompt reminders were perceived to decrease the probability of forgetting to take medicine. The findings of this study are aligned with the findings of prior studies (Alhazmy & Khalil, 2024; Khan & Bilal, 2019; Lin et al., 2023; Woodward et al., 2024; Yoon et al., 2024), which agree that QST effectively fosters medication adherence in patients with complex medication schedules. Furthermore, Quisel et al. (2019) demonstrated that people who monitor health activities using digital devices are more inclined to adhere to their medical schedules (Quisel et al., 2019). The findings of this study suggest that reminders foster adherence to medical intake.

5.7.5 Cost Saving

This study found that QST lowered healthcare expenses by facilitating early diagnosis of diabetes-related complications and recommending preventative strategies. Furthermore, this study found that although QST may reduce in-person consultations, it improves online patient-practitioner interactions, which some patients perceived as reducing travel costs. In accordance with our findings, Kesavadev et al. (2024) and De Sario Velasquez et al. (2024) revealed that continuous glucose monitoring can be economically advantageous in averting expensive diabetes-related complications. Our findings corroborated literature that found that diabetes mellitus patients with complications avoided hospitalisation owing to improved self-care monitoring (Almegbel & Aloud, 2021; Kesavadev et al., 2022; Kimura et al., 2022). Although the long-term reduced health costs were observed in this study, different perspectives have been aired by research that found that the cost savings are often not attained by the end-user because the technology itself incurs additional costs (Chilunjika et al., 2024; Munetsi & Maphosa, 2024). Dissenting views emphasised that the initial investment in devices, continuous expenses for internet data, electricity, maintenance, and potential replacement of devices owing to theft or damage, may cumulatively surpass any anticipated savings (Adelina et al., 2015; Munetsi & Maphosa, 2024; Oudbier et al., 2024). Nevertheless, Wang et al. (2020) found that dependence on self-monitoring may occasionally result in overconfidence, causing individuals to postpone seeking necessary medical attention.

The inference drawn from this discussion is that while QST may reduce travel and hospitalisation costs, these savings may be effectively nullified by the ongoing operational and maintenance expenditures associated with the technology. Consequently, the anticipated net cost-saving benefit for diabetic users may not fully materialise.

5.8 *How does usability influence the adoption of quantified self-technology for managing diabetes?*

The research question determined how usability influences the adoption of quantified self-technology. Usability refers to the effectiveness, efficiency, and satisfaction of using QST. Data analysis uncovered the factors that determine the usability of QST, such as perceived ease of use, perceived usefulness, and perceived enjoyment.

5.8.1 Perceived Ease of Use

Data analysis indicated that the intuitiveness and learnability of QST are crucial factors in its perceived ease of use. Intuitiveness pertains to the ease with which consumers browse and utilise technology without requiring considerable guidance (Familoni & Babatunde, 2024; Wiklund, 2024).

There were participants who perceived the interface of the app as easy to use because it was easy to access, understand, capture data, and navigate. First-time users appreciated that the app had easy-to-follow instructions, which improved the learnability. Participants revealed that a simplistic design alleviates cognitive burden by diminishing complexity. This finding aligns with the results of studies that found that interfaces with a negligible learning curve are more likely to be embraced, since users feel less daunted by acquiring new skills (Nie et al., 2023; Pang et al., 2021). In this respect, Langote et al. (2024) underscored the importance of minimal cognitive burden and explicit instructions for novice users to reduce the learning curve and increase adoption (Langote et al., 2024). Bitkina et al. (2020) highlight that simplicity is crucial in medical equipment, as it promotes rapid comprehension and diminishes the probability of user errors. In addition, streamlining the user experience can reduce irritation, lighten the cognitive load for users, and enhance their confidence in using the technology, particularly among the elderly and individuals with disabilities (Ha et al., 2023; LaMonica et al., 2021).

Nonetheless, there were participants who perceived the app as complicated because of the medical terminology used, which increased the learning curve. The technical medical lexicon is recognised as a hindrance in this study and other investigations (Boden, 2014; Kiely, 2020). The finding of this study is contradicted by a study that found that if a technology is simple to use, it can be interpreted as insufficient by technologically adept users, who may perceive the gadget as inadequate (Tran & Vu, 2023). Some studies found that users embrace sophisticated applications if they satisfy users' requirements (Birkhoff & Smeltzer, 2017; Taylor et al., 2022).

These findings indicate that for QST applications to be effectively implemented, their design may harmonise simplicity with an appropriate degree of sophistication that satisfies patient requirements without introducing a steep learning curve. To increase adoption in third-world countries, it is recommended that the technology interface avoid technical jargon to accommodate users of varying educational levels and technical proficiency. Furthermore, users should be provided with clear instructions on using the application, which improves learnability and ultimately perceives ease of use.

5.8.2 Perceived Usefulness

Perceived usefulness is the ability of the QST to assist diabetic patients with certain features and information that address their concerns. For the QST to be useful, it must be able to address diabetes issues, provide quality, personalised information, and be reliable.

Participants perceived the QST app as useful because it facilitated diabetes management in an unprecedented way. The application was found to be useful for monitoring glucose fluctuations, managing diet, taking medication, providing reminders, and tracking activities. Self-tracking capabilities were perceived as vital in understanding and managing diabetes comprehensively. In line with these findings, Offringa et al. (2017) conclude that patients who employed self-monitoring tools for improved glycemic control deemed them beneficial and continued their usage. Other studies found that patients who perceived a health application as beneficial for reducing their blood glucose levels were considerably more inclined to utilise it over an extended period (Corsica et al., 2024; Tu et al., 2020). Nevertheless, Al-Naher et al. (2022) found that patients may fail to recognise a technology's usefulness if its long-term advantages are not immediately evident, resulting in premature disengagement. Hence, the inference drawn from these findings is that the duration of realising the benefits of a technology must be explicitly stated to patients before any adoption takes place, so that they have realistic expectations and not abandon the technology prematurely.

This study found that perceived usefulness was reinforced by the quality of data provided to the diabetic patient by the QST app. The participants perceived the information as of good quality because it provided precise and timely information for making decisions. Users valued the information because the QST app provided essential information on weight management, blood glucose data, and daily activities. The findings of this study corroborate the findings of studies that confirmed that dependable information augments the usefulness and trust in using health applications (Mainoti et al., 2019; Maneze et al., 2019). Jeffrey et al. (2019) revealed that consumers were more inclined to utilise apps that demonstrate transparency regarding their data sources and had clinical endorsement. Even though some of the participants in this study perceived information provided by QST apps as of good quality, some studies caution against that. Chen et al. (2023) found that patients with limited health literacy may struggle to differentiate between high- and low-quality information, often depending on alternative criteria such as social recommendations (Chen et al., 2023). Hence, the findings of this study suggest that diabetic patients' confidence in the provided information is crucial, because bad information can result in misdiagnosis or erroneous guidance that can result in total abandonment of the application. Hence, QST applications should incorporate evidence-based information and guarantee that the data provided to users is accurate, pertinent, and actionable to cultivate trust and usefulness.

This study found that since the QST app provided personalised data, the diabetics perceived the app as useful. The diabetics were grateful that the app provided personalised physiological data and recommendations, rather than generic health advice. There is research that has found results that resonate with the findings of this study (Maher et al., 2020; Moore et al., 2021; Nuijten et al., 2022). Maher et al. (2020) highlight that personalised feedback is a powerful tool for personal health coaching. Furthermore, personalised feedback was found to be more effective in promoting enduring behavioural change than generalised information (Moore et al., 2021; Nuijten et al., 2022).

This study uncovered that personalisation should incorporate context-specific elements related to the lived experiences. For example, dietary recommendations should suggest local cuisines to increase their usefulness. This finding aligns with the literature, which suggests that context-specific customisation of technologies promotes engagement (Chawurura et al., 2019; Scarpa et al., 2021).

However, some research found challenges in the personalisation of information. Some studies argue that personalisation can result in information overload, causing user disengagement (Bawden & Robinson, 2020; Naiseh et al., 2020). On the other hand, Hutmacher and Appel (2022) assert that inadequate personalisation might result in user frustration, as consumers can feel that the technology does not adequately learn from their data or makes incorrect assumptions.

The study's findings suggest that for personalisation to be truly beneficial, it should be based on a thorough analysis of a patient's continuous data. Furthermore, developers should attain a balance in personalisation, ensuring that insights are relevant and intelligible, possibly by allowing users to customise the specificity of the information they receive.

The findings revealed that participants found the app useful owing to its reliability. Participants indicated that the app produced and processed results instantaneously, rendering it reliable for their daily diabetes management. Furthermore, individuals disclosed that they did not experience any crashes while utilising it. Research indicates that constant performance bolsters user trust in the program (Manchon et al., 2022). Hence, the diabetics were confident in using the application. Nonetheless, some research found that patients may exhibit greater tolerance for technical malfunctions when they maintain a robust relationship with their healthcare provider, who can assist in resolving concerns (Drossman et al., 2021; Thapa et al., 2021). Other research suggests implementing stringent quality assurance and testing protocols to minimise bugs, crashes, and data synchronisation errors, ensuring reliable and accurate performance (Kgasi et al., 2024). Hence, a QST with consistent performance is reliable and can win the trust of diabetics.

5.8.3 Perceived Enjoyment

Perceived Enjoyment is the pleasure and fun associated with using technology (Venkatesh et al., 2003). Data analysis revealed that when an app is perceived as enjoyable, diabetic patients will utilise it. Enjoyability in this study was highlighted as the QST app having gamification components, motivational incentives, and social engagement features.

Participants indicated that gamification elements, such as monster sounds, stimulating visuals, and personal photos, augmented enjoyment in using QST. Integrated game components were found to improve engagement with the application. Gaming encouraged diabetics to interact with the technology, which cultivated interest in health management. Prior empirical evidence suggests that gamification can enhance user engagement by rendering the learning process more enjoyable and rewarding (Auza-Santiváñez et al., 2024; Zhao & Wu, 2024). Esmaeilzadeh (2021) also found that gamification may elevate sustained application usage and increase information sharing.

Contrary to our findings, a study in the Czech Republic revealed that perceived enjoyment was an insignificant factor in QST adoption. The users did not see any fun, nor find the technological tools used interesting and fashionable (Grosová et al., 2022). Similarly, Lupton

(2019) found that self-tracking was not fun but rather a burden, thus demotivating them to track their diabetes. Although initial engagement of QST may be driven by perceived enjoyment, long-term adherence is predominantly maintained by perceived health outcomes rather than enjoyment (Bai et al., 2024; El-Nasr et al., 2021).

Participants benefited from financial incentives for using the quantified self-application. Incentives were rewarded for activity completion, good eating, and other diabetic related routines. For example, by undertaking a daily walk or run to achieve the daily recommended steps, diabetics were rewarded with points that can be converted into a cash component. The incentives motivated the diabetics to keep using the application for self-monitoring. This finding corroborates the literature on extrinsic motivation, which asserts that external rewards can serve as significant motivators, particularly in the early phases of adoption when intrinsic drive may be minimal (Al Kathiry et al., 2021; Fu et al., 2023). Kamat et al. (2021) found that a smartphone application offering financial incentives for medication adherence increased adherence rates from 65.7% to 86.8% and significantly lowered blood glucose levels in patients with type 2 diabetes. Nevertheless, Chang et al. (2023) contradict this notion, indicating that the user's desire may dissipate upon removing the incentive, as engagement with the device was driven by rewards rather than health advantages. Furthermore, excessive focus on rewards may induce performance pressure and stress, ultimately discouraging usage rather than promoting it (Bai et al., 2024).

Social engagement enhanced a sense of community and belonging. Quantified self-technology provided an interface for sharing challenges and successes on the diabetes journey. This was accomplished through peer-to-peer support forums that enabled sharing experiences and tips on how to handle diabetes with one another through the platform. This finding relates to studies that found that engaging with individuals facing comparable health difficulties fostered a sense of belonging and offered a foundation for reciprocal support (Ekpezu et al., 2023; Song et al., 2020). However, contradictory findings have shown that online communities may sometimes be a source of disinformation or negativity (Szeto et al., 2024).

5.9 ***How do cybersecurity risks influence the adoption of quantified self-technology?***

This research question determined how cybersecurity risks influence the adoption of quantified self-technology. Three cybersecurity risks were identified: financial risk, data breach, and privacy breach.

5.9.1 Financial risk

The diabetics assumed that if their identities are stolen by cyber criminals, they could be financial victims. Stolen cyber information could be used to access bank accounts, establish credit lines, or acquire medical services in the victim's name, leading to financial loss. Aligned to this finding, Perkins (2023) found that cyber criminals may utilise a patient's insurance details to acquire medical services or equipment, subsequently directing the bill to the victim. Victims may expend thousands of dollars and countless hours attempting to rectify these complications (Brevoort et al., 2020; Maher & Hayes, 2024). Literature indicates that preventive strategies, awareness campaigns, and trauma-informed support programs are essential for protection (Irvin-Erickson, 2024; Why & Pottas, 2021).

5.9.2 Data breach

This study found unauthorised data access and sharing as the principal cybersecurity risk concern among diabetics. Diabetics were worried about a data breach because QST apps captured their personal data, including prescription doses, daily food consumption, fitness levels, medical conditions, biometric data, and credit card details. Because of the sensitivity of the data, the diabetics were concerned that any unauthorised access could have adverse effects. Prior studies have found similar findings (Bertolazzi et al., 2024; Cleveland & Haddara, 2021). Aligned with this study's findings, some studies found patients to be apprehensive about their information being utilised and disseminated to third parties for targeted advertising without authorisation (Downing & Perakslis, 2022; Trinidad et al., 2020). The consequences of data breach violations were found to be a possible total disengagement with a technology (Brinson & Rutherford, 2020; McGraw & Mandl, 2021).

Hacking was identified as a challenge causing data breaches. The diabetics feared theft of their personal health data, such as metrics on glucose readings, blood pressure, and physical activity. Perceptions of data theft discouraged diabetics from using QSTs. Past research results corroborate this study's findings (Ibarra et al., 2019; Rai, 2024). Rai (2024) found that the healthcare sector has been targeted owing to the substantial monetary value of personal health information on the black market (Rai, 2024). In this respect, security concerns have been found to affect patient trust and the adoption of digital health technologies (Alhammad et al., 2024; Coventry & Branley, 2018).

On the other hand, this study found that some diabetics regarded their medical data as not appealing to cybercriminals and were not worried about data breaches. Similarly, findings by Lupton (2021) revealed that Australian participants exhibited fewer concerns regarding data privacy. However, informed consent is the guiding principle for data sharing (Baines et al., 2024; Raj et al., 2023). Hence, to promote QST adoption, user data should be protected by policy and stringent security technologies.

5.9.3 Privacy breach

Participants indicated that the collection and storage of personal health data pose a danger of re-identification. The diabetics assumed that if their health information is matched to their identities, they may suffer possible discrimination owing to their ill health by employers or insurance providers. These findings corroborate research on big data analytics and privacy, which found that an individual's digital footprint can result in potential violations of user privacy (Gaballah et al., 2025; Hajli et al., 2020). To address privacy breach concerns, developers must implement sophisticated de-identification methods, consistently evaluate their efficacy, and ensure that users know the constraints of anonymity regarding their data (Chevrier et al., 2019; Moyo & Ndlovu, 2026).

The information collected by self-tracking technologies can be highly sensitive and reveal aspects that people may not wish others to know. Diabetics were worried that if their online medical data were compromised, it could have negative consequences on their professional outlook. This finding is corroborated by research, which emphasises that an individual's public and professional reputation constitutes a significant asset that can be irrevocably damaged by data breaches (Bansal & Warkentin, 2021; Perkins, 2023; Why & Pottas, 2021).

5.10 Framework for the adoption of quantified self-technology in the monitoring and management of diabetes

This discussion chapter has thus far answered sub research question 1 in Section 5.2, and sub research question 2 from sections 5.3 to 5.9.

The objective of sub research question 1 was to identify the factors that influence the adoption of quantified self-technology in monitoring and managing diabetes. To answer the research question, a systematic literature analysis was carried out in Chapter 2, and the factors were conceptualised into a conceptual framework in Section 2.8, Figure 2.7. The factors that influence the adoption of quantified self-technology for monitoring and managing diabetes were identified as user characteristics, technology preparedness, usability of quantified self-technology, perceived benefits, social norms, and security concerns related to quantified self-technology.

The proposed conceptual framework was empirically evaluated and refined by collecting data through interviews. Sub research question 2 was designed to empirically test the conceptual framework, whose objective was to test how the factors of the conceptual framework influence the adoption of quantified self-technology for monitoring and managing diabetes. Sub research question 2 had 6 objectives for validating the conceptual framework, which were discussed in Sections 5.3 to 5.9. The findings for sub-research question 1 and sub-research question 2 are now integrated to provide an answer to the main research question of this study. The main research question of the study reads, “How can a framework be developed to inform the adoption of quantified self technology for managing diabetes in developing countries?”

The answer to the main research question is conceptualised as a framework adopting quantified self-technology for monitoring and managing diabetes in developing countries, as depicted in Figure 5.1 below. This framework has six main components, namely user characteristics, technology preparedness, social norms, perceived benefits, usability, and cybersecurity. The similarities between the conceptual framework and the proposed framework indicate that the initial framework effectively guided data collection and analysis, while the refinements reflect empirical insights that emerged during the study.

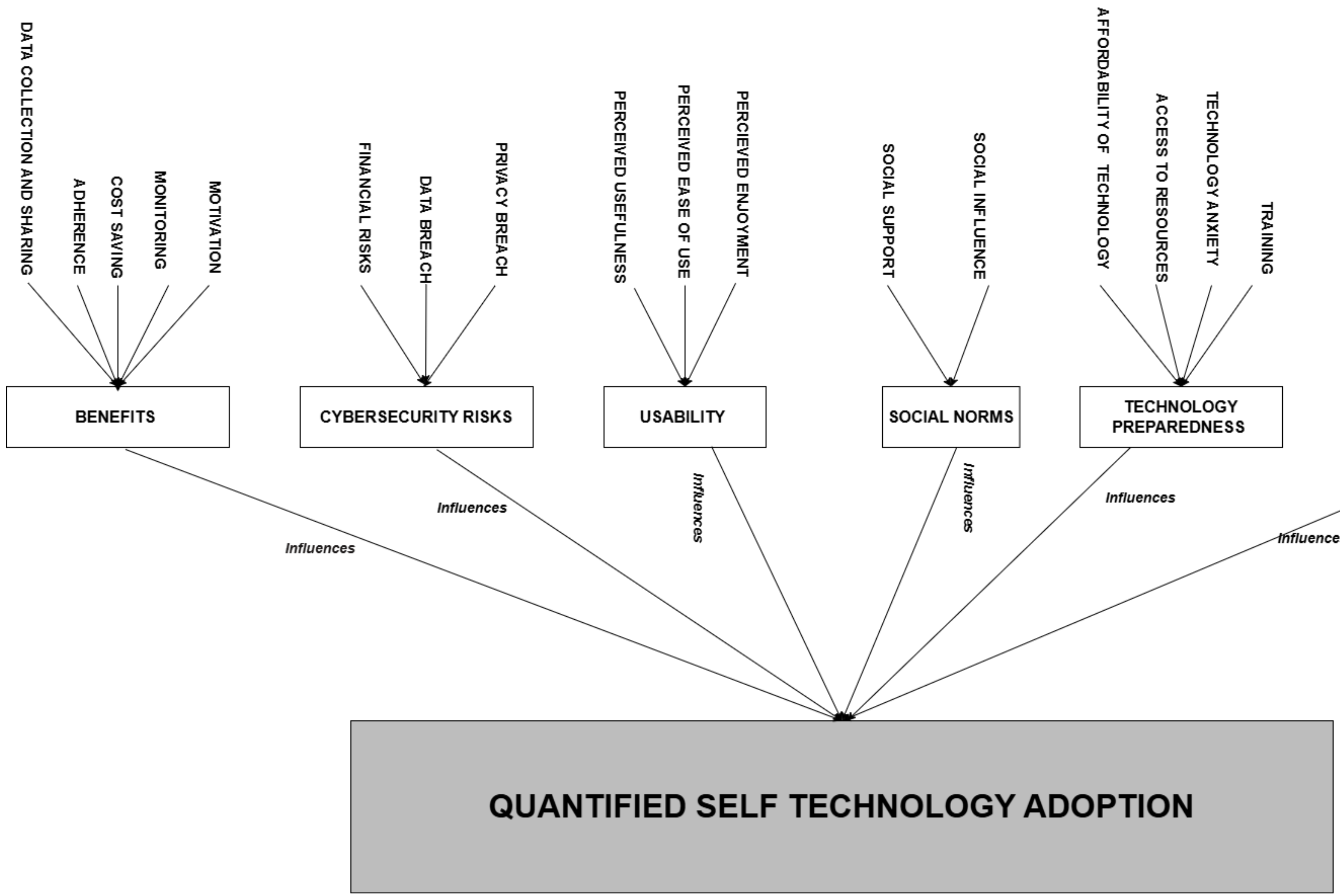

Figure 5.1: Framework for the Adoption of Quantified Self-technology in Monitoring and Managing Diabetes

5.10.1 User Characteristics

User characteristics are users' traits, attributes, and behaviours that influence their willingness to adopt a technology (Dissanayake et al., 2022). Digital literacy, self-efficacy, and awareness are the characteristics of a user that influence the adoption of QST for managing and monitoring diabetes. Evidence for including these characteristics in the proposed framework was uncovered from literature analysis (Section 2.6) and data analysis (Section 4.4), as presented in Table 5.1.

Table 5.1: User Characteristics

User characteristic		**Evidence from literature analysis and research findings**
Digital literacy	• Participants Age • Educational level	• Chapter 2 (Literature analysis)- Section 2.6.1; Section 2.6.3; Section 2.8.1 • Chapter 4 (Data analysis) – Section 4.4; Section 4.4.1 • Chapter 5 (Discussion) – Section 5.4.1
Self-efficacy	• Prior experience • Work environment	• Chapter 2 (Literature analysis)- Sections 2.6.7; Section 2.8.1 • Chapter 4 (Data analysis) – Section 4.4; Section 4.4.3 • Chapter 5 (Discussion) – Section 5.4.2
Technology Awareness	• Health Education • Practitioners not sharing medical information • Misconception that mobile apps are for youngsters	• Chapter 2 (Literature analysis)- Sections 2,6.4; Section 2.8.1 • Chapter 4 (Data analysis) – Section 4.4; Section 4.4.2 • Chapter 5 (Discussion) – Section 5.4.3

Digital Literacy

Digital literacy is influenced by patients' age and educational levels. Patients with high digital literacy levels may adopt technology because they understand its usefulness, making the adoption more likely. Conversely, patients with low digital literacy levels may be sceptical about adopting the technology, as they may perceive it as complex to use and designed only for the educated. Thus, QST needs to be designed to cater to varying age levels and consider the diverse educational backgrounds of its users. It is essential to understand and assess patients' digital literacy levels before any adoption can occur so that their diverse perspectives and concerns can be addressed and the digital gap can be bridged.

Self-efficacy

Self-efficacy is influenced by prior experience and the work environment. Diabetic patients with high self-efficacy are more likely to adopt technology, as they can use it independently without needing assistance from others. Self-efficacy enables people with diabetes to install the application, input their metrics, and connect their glucometers to the app. Thus, prior experience fosters technology self-efficacy as users are more confident in utilising the technology. In addition, conducive work environments present learning atmospheres for diabetics where they can receive peer assistance. Thus, conducive work environments are necessary to empower and equip patients to use technology effectively. Notwithstanding, patients with lower self-efficacy are hesitant to utilise the technology as they may face challenges with tasks such as installation and navigating the app. Without high self-efficacy, diabetic patients may not fully benefit from the technology.

Technology Awareness

Technology awareness is influenced by health education, practitioners not sharing medical information and the misconception that mobile apps are for youngsters. Diabetic patients who are aware of the existence of QST are more likely to adopt it. In contrast, those unaware of it will not utilise it. Lack of awareness is caused by lack of exposure owing to inadequate health education, the misconception that mobile health apps are for a certain audience and failure of medical professionals to recommend these applications to their patients. It is essential to create awareness campaigns through posters, advertisements, or even competitions that empower patients to be knowledgeable about the technology. Health practitioners must be educated on the value of incorporating this technology into their standard practices, enabling patients to benefit from it. Without knowing the existence of technology, patients may miss out on the valuable impact technology can have in managing their diabetes.

5.10.2 Technology Preparedness of the diabetic patient

Technology preparedness pertains to the readiness of diabetics to adopt QST. Diabetic patients who are technologically prepared are more likely to adopt QST. Technology preparedness factors that influence the adoption of QST are affordability of the technology, access to resources, technology anxiety, and training. Evidence for including these technology preparedness factors in the proposed framework was uncovered from literature analysis (Section 2.6) and data analysis (Section 4.5), as presented in Table 5.2.

Table 5.2: Technology Preparedness

Technology Preparedness		**Evidence from literature analysis and research results**
Affordability of Technology	• high cost of devices • subscription fees for applications • hidden costs	• Chapter 2 (Literature analysis)- Section 2.6.8; Section 2.8.2 • Chapter 4 (Data analysis) – Section 4.5; Section 4.5.1 • Chapter 5 (Discussion) – Section 5.5.3
Access to Resources	• Compatible smartphone • Internet Connection • power supply	• Chapter 2 (Literature analysis)- Sections 2.6.6; Section 2.8.1 • Chapter 4 (Data analysis) – Section 4.5; Section 4.5.2 • Chapter 5 (Discussion) – Section 5.5.1
Technology Anxiety	• Fear of Seeking Assistance • Technology dependence	• Chapter 4 (Data analysis) – Section 4.5; Section 4.5.3 • Chapter 5 (Discussion) – Section 5.5.2
Training		• Chapter 4 (Data analysis) – Section 4.5; Section 4.5.4 • Chapter 5 (Discussion) – Section 5.5.4

Access to resources

Diabetic patients who have access to the necessary resources will adopt the technology. The necessary resources to adopt QST are a compatible smartphone, internet connection, and power supply. A compatible smartphone is required to install the QST application. An internet connection is necessary to synchronise data and access some features, such as community sharing and purchasing additional features like reminders. Power supply is essential as it is required to power up mobile devices, internet routers, and other qualified self-technology devices. If diabetic patients are not equipped with these resources, they will not adopt the technology. Governments and healthcare institutions must provide these resources to people with diabetes, especially the unemployed and those with financial constraints. Understanding how the unavailability of these resources might impede adoption is necessary before imposing the technology.

Affordability of the technology

Affordability of the technology was influenced by the high cost of devices, subscription fees for applications and hidden costs. Diabetic patients who cannot afford the costs associated with the technology, such as purchasing a smartphone, broadband, glucose sticks, and subscriptions, will not adopt it. It is important to incentivise diabetic patients to utilise these apps fully. Only those who have supporting families who assist in financial aid might utilise the technology. There is a need to provide free applications for chronic diseases in resource-constrained contexts. Technology must not be discriminatory but inclusive to everyone.

Technology Anxiety

Technology anxiety was influenced by fear of seeking assistance and technology dependence. Patients must not continuously feel the need to seek assistance when utilising technology, as they may find it burdensome. In addition, technology must be designed so that patients still feel in control of their health and life rather than too dependent on it. When QST constantly brings reminders and notifications, overtaking diabetics' normal lives and not bringing peace to their daily routine, they will not use it.

5.10.3 Social Norms

Social norms pertain to the informal, self-enforcing rules and established patterns of behaviour within a social group or community that govern individual conduct and significantly influence how individuals accept and use new technologies or exhibit specific behaviours (Okati-Aliabad et al., 2024; Schretzlmaier et al., 2022). Social norms are factors that influence the adoption of QST, including social influence and social support. Evidence for including these social norms factors in the proposed framework was uncovered from literature analysis (Section 2.6) and data analysis (Section 4.6), as presented in Table 5.3

Table 5.3: Social Norms

Social Norms		**Evidence from literature analysis and research findings**
Social Influence	• Positively Influence • Negative Influence	• Chapter 2 (Literature analysis)- Section 2.6.9; 2.8.5 • Chapter 4 (Data analysis) – Section 4.6; Section 4.6.1 • Chapter 5 (Discussion) – Section 5.6.1
Social Support	• Technical Support • Financial Support	• Chapter 2 (Literature analysis)- Sections 2.6.10; Section 2.8.5 • Chapter 4 (Data analysis) – Section 4.6; Section 4.6.2 • Chapter 5 (Discussion) – Section 5.6.2

Social Influence

Social influence can be a positive influence or a negative influence. These influences emanate from diabetics' families, medical practitioners, social groups, and religious groups. The perspectives of these individuals are important to people with diabetes. People with diabetes want to feel a sense of belonging. This sense of belonging makes them part of different groups with similar values. Positive social influences provide positive reinforcement and support, increase patient motivation and engagement, and foster the willingness of people with diabetes to use the technology. People with diabetes need to belong to groups that provide a positive influence by motivating their members to utilise QST, which will, in turn, improve their quality of life. When people with diabetes belong to groups that do not share beliefs about technological use but have divergent views, cultural norms, and beliefs, they will provide negative influences that discourage the person with diabetes. A deviation from these values may lead to stigma and unintended consequences, such as secret monitoring or non-adoption of the technology. It is important to educate the public on the importance of technology, as social influences are associated with non-adoption. Medical practitioners are often the first source of healthcare that patients turn to when sick. Medical practitioners need to be educated on the benefits of technology in fostering healthcare. Medical practitioners must be aware that technology complements them, not replaces them. It is also important for community members and friends of individuals with diabetes to be educated about the impact of technology. Positive Influences and a conducive, holistic environment foster a positive attitude towards QST adoption among individuals with diabetes.

Social Support

Social support in using QST can be in the form of technical support or financial support. Quantified self-technology, like the mySugr app, requires subscription fees for features like reminders. A supportive family is necessary to cover these costs and ease the financial burden on a diabetic who cannot afford it. In addition, some diabetics are not technology adept; thus, they require technical support from their family members and social groups to mitigate technical challenges encountered during use. This will, in turn, foster continued use of the technology and better management of diabetes.

5.10.4 Perceived Benefits

Perceived benefits are the advantages or favourable results people think they will obtain from utilising a certain technology or adopting a particular conduct. Diabetic patients who know and realise the benefits of using QST are more likely to adopt it. Perceived benefits that influence the adoption of QST are monitoring, adherence, cost saving, data collection and sharing, and motivation. Evidence for including these perceived benefits in the proposed framework was uncovered from literature analysis (Section 2.4) and data analysis (Section 4.7), as presented in Table 5.4

Table 5.4: Perceived Benefits

Perceived Benefits		**Evidence from literature analysis and research findings**
Monitoring		• Chapter 2 (Literature analysis)- Sections 2.4.3.1; Section 2.8.4 • Chapter 4 (Data analysis) – Section 4.7; Section 4.7.1 • Chapter 5 (Discussion) – Section 5.7.1
Adherence		• Chapter 2 (Literature analysis)- Sections 2.4.4.3; Section 2.8.4 • Chapter 4 (Data analysis) – Section 4.7; Section 4.7.2 • Chapter 5 (Discussion) – Section 5.7.4
Cost saving		• Chapter 2 (Literature analysis)- Sections 2.4.4.2; Section 2.8.4 • Chapter 4 (Data analysis) – Section 4.7; Section 4.7.3 • Chapter 5 (Discussion) – Section 5.7.5
Data Collection and Sharing	• Trend Analysis • Medical Practitioner-Patient Communication	• Chapter 2 (Literature analysis)- Sections 2.4.4.4; Section 2.8.4 • Chapter 4 (Data analysis) – Section 4.7; Section 4.7.4 • Chapter 5 (Discussion) – Section 5.7.3
Motivation	• Goal setting • Gamification • Shared Community	• Chapter 4 (Data analysis) – Section 4.7; Section 4.7.5 • Chapter 5 (Discussion) – Section 5.7.2

Monitoring

Diabetic patients will only utilise QST if it helps them monitor their chronic condition. To help manage diabetes, monitoring involves monitoring blood glucose levels, physical activities, and exercise. Diabetes, a lifestyle disease, is intricately linked to poor lifestyle choices. Good blood glucose control entails eating healthily by avoiding unhealthy eating habits and maintaining a healthy body mass index through regular exercise. Thus, when the QST helps with diabetes by monitoring their blood glucose levels and gives warning signals when they have deviated from the accepted glucose control levels, they will adopt it.

A*dherence*

Diabetic patients take medication to help them manage their diabetes. This medication is in the form of pills or insulin that must be injected and taken on time. Adults who are usually on complex regimes and are also prone to other diseases like high blood pressure often forget to take their medication. Quantified self-technology presents opportunities for these people to leverage reminders and notifications on the apps to take their medication on time. Consistent and timely medication adherence is crucial for managing diabetes. Without this benefit being realised, the technology will not be adopted.

Data collection and sharing

The power of QST lies in its ability to collect, analyse, and store data received from the patient. This data, which translates into patterns or trends, can be used by the diabetic patient and their medical practitioners to make informed decisions. This can markedly improve practitioner-patient communication, fostering a collective management of diabetes. The collected data can provide further insights into what triggers high blood glucose levels and offer recommendations on managing this condition. In addition, through data collection and sharing, patients learn more about the disease and understand their health situation. Continued usage is prone to occur when the QST presents this opportunity.

Cost Saving

Users of any technology are eager to reduce the costs associated with healthcare. The ability to monitor their health effectively consequently leads to reduced hospital visits and complications associated with diabetes. Early detection and curbing of these complications reduces diabetes-induced comas and hospitalisation costs. When people with diabetes cut costs and use the saved money for other necessities, they will continue to utilise the QST.

Motivation

Highly motivated patients will adopt the QST. Motivation can be enhanced through goal setting, gamification, and shared community. When the QST enables diabetic patients to set goals in their diabetes management, attaining these goals motivates them. Moreso, the incorporation of gamification elements that reward and give incentives to diabetics after achieving a specific healthcare goal motivates them to continue adopting the technology. Furthermore, apps that feature community sharing aspects, allowing patients to compare their data with others and motivate each other, are highly welcomed by patients. Thus, developers may investigate the motivational factors behind technology use and incorporate them into the technology to create an environment that fosters continued use.

5.10.5 Usability of the Quantified Self-technology

Usability refers to the effectiveness, efficiency, and satisfaction of using QST. Usability factors that influence the adoption of QST are perceived usefulness, ease of use, and enjoyment. Evidence for including these usability factors in the proposed framework was uncovered from literature analysis (Section 2.6) and data analysis (Section 4.8), as presented in Table 5.5

Table 5.5: Usability

Usability		**Evidence from literature analysis and research findings**
Perceived Usefulness		• Chapter 2 (Literature analysis)- Section 2.6.13; Section 2.8.3 • Chapter 4 (Data analysis) – Section 4.8; Section 4.8.1 • Chapter 5 (Discussion) – Section 5.8.2
Perceived Ease of Use		• Chapter 2 (Literature analysis)- Sections 2.6.12; Section 2.8.3 • Chapter 4 (Data analysis) – Section 4.8; Section 4.8.3 • Chapter 5 (Discussion) – Section 5.8.1
Perceived Enjoyment	• Gamification Components • Incentives • Social Engagement	• Chapter 2 (Literature analysis)- Sections 2.6.11; Section 2.8.3 • Chapter 4 (Data analysis) – Section 4.8; Section 4.8.2 • Chapter 5 (Discussion) – Section 5.8.3

Perceived Usefulness

Diabetic patients want to use technology that is useful in their day-to-day lives. For the QST to be useful to diabetics, it must provide them with quality information, such as how to manage their diabetes and what to do when there are deviations from good blood glucose control. Furthermore, there must be useful features, such as the ability to enter and keep a health data record. From this data, people with diabetes must get personalised insights. When the QST provides generic information, it may be deemed unnecessary; however, when it offers individualised content, it fosters a mutual relationship and attachment to the technology, making it more useful. In addition, incorporating features that resonate with the diabetic context, such as dietary recommendations found in the diabetic context, can make the technology more useful and goals achievable. Moreso, the QST must be reliable by providing timely, accurate and consistent information. By underscoring this fundamental component, the framework emphasises the necessity of developing QST solutions that provide clear, immediate, and tangible usefulness to the patient, ensuring that the promised usefulness of these technologies is readily perceived and comprehended by individuals managing a complex, chronic condition.

Perceived Ease of Use

Perceived ease of use related to the quantified self-technology being easy to use, having ease of access, and simple instructions. Diabetics want the QST to be user-friendly and intuitive to facilitate more effective adoption processes. Conversely, complex commands and interfaces and unclear information lead to abandonment issues. Despite their physical capabilities, patients must be able to use the technology. Diabetes often leads to visual impairment challenges; thus, apps designed for people with diabetes must have the ability to adapt to these challenges. Appropriate font sizes and colours must be used to accommodate these users. Any technology that requires people with diabetes to go through complex learning curves will not be adopted.

Perceived Enjoyment

Perceived enjoyment pertains to the pleasure or fun that diabetics realise when using QST. Quantified self-technology should not be viewed as "work" for diabetics but as something they can integrate seamlessly into their daily lives. Enjoyment can be achieved through gamification components, incentives, and social engagement features. When the technology brings boredom to users, they will not adopt it. Incorporating fun elements is essential for continued use.

5.10.6 Cybersecurity Risks

The sensitivity of patient data and the potential for cybersecurity risks can elicit considerable anxiety among users. Cybersecurity risks that influence the adoption of QST are financial risks, data breaches, and privacy breaches. Evidence for including these cybersecurity factors in the proposed framework was uncovered from literature analysis (Section 2.6) and data analysis (Section 4.9), as presented in Table 5.2

Table 5.6: Cybersecurity Risks

Cybersecurity Risks		**Evidence from literature analysis and research findings**
Cybersecurity Risks	• Financial Risks	• Chapter 2 (Literature analysis)- Section 2.6.16; Section 2.8.6 • Chapter 4 (Data analysis) – Section 4.9; Section 4.9.1 • Chapter 5 (Discussion) – Section 5.9.1
	• Data Breach	• Chapter 2 (Literature analysis)- Sections 2.6.15; Section 2.8.6 • Chapter 4 (Data analysis) – Section 4.9; Section 4.9.2 • Chapter 5 (Discussion) – Section 5.9.2
	• Privacy Breach	• Chapter 2 (Literature analysis)- Sections 2.6.14; Section 2.8.6 • Chapter 4 (Data analysis) – Section 4.9; Section 4.9.3 • Chapter 5 (Discussion) – Section 5.9.3

Data Breach

A data breach pertains to stealing patients' sensitive data, such as personal data, medication intake, prescription dosages, and credit card details. Addressing data breaches is crucial for QST adoption. Consequences of a data breach include impersonation through identity theft and cybercrimes. People with diabetes must be informed about their data and assured that it will not fall into the wrong hands. When diabetic patients think that their data will be stolen and used to commit malicious activities, they will not adopt it. Transparency regarding how personal health data are used is crucial for continued use.

Financial Risks

Unauthorised access to health data poses financial risks to diabetic patients, which may hinder the adoption of QST. Stolen data about the diabetic could be used to access bank accounts, establish credit lines, or acquire medical services in the victim's name, leading to financial loss. When diabetic patients think that they will suffer financial losses by utilising QST, they will not adopt it.

Privacy Breach

Privacy breaches are a significant concern in the adoption of QST. When patients' privacy is breached, exposing their health data and other sensitive information, they will not use it. Patients use the technology under the impression that the responsible parties will not divulge it to third parties. Any slight breach of privacy will disqualify the technology from being part of the patient's daily routines. Thus, unauthorised data sharing breaches trust with patients. Patients must use technology with the assurance that they will remain anonymous and will not be de-identified because of the technology.

5.11 Summary of Chapter

The adoption of QST by diabetic patients is affected by several interconnected factors. By understanding and addressing user characteristics, technological preparedness, social norms, the usability of quantified self-technology, perceived benefits, and cybersecurity risks related to quantified self-technology concerns, healthcare practitioners and developers can cultivate a conducive environment that promotes the successful use of QST. The study proposes a contextually grounded framework that may offer useful guidance for understanding and supporting the adoption of QST for diabetes management in developing-country settings, as reflected in participants' perceptions of its relevance and applicability. Building on this interpretive analysis, the next chapter outlines the theoretical, methodological, and practical contributions of the study, together with its limitations and directions for future research.

Chapter 6 : RESEARCH CONTRIBUTION, AUDIT TRAIL, LIMITATIONS, AND CONCLUSIONS

6.1 Introduction

Building on the discussion and interpretation of findings in Chapter 5 above, this chapter presents the contributions of the study to theory, methodology, and practice. It reflects on how the findings and the proposed conceptual framework advance understanding of quantified self-technology adoption in developing-country contexts. The chapter also outlines the research rigour and audit trail, reflects on the researcher's PhD journey, and discusses the study's limitations and directions for future research.

6.2 Research Contribution

This research contributes to the body of knowledge, theoretically, practically and methodologically.

6.2.1 Practical Contribution

This study highlights how QST can play a real and necessary role in improving diabetes care in developing countries. By enabling people to track their blood glucose, diet, and activity in real time, QST supports more informed daily decisions and helps reduce the risks linked to inconsistent testing and manual data recording. In settings where healthcare resources are limited, these tools can ease the burden on patients and families by encouraging proactive self-care and preventing avoidable emergencies.

Beyond individual benefits, the findings offer important direction for health policy. If incorporated into national diabetes programmes, QST could reduce complications, hospital visits, and treatment costs. To achieve this, governments should consider policies that support device affordability, patient digital literacy, secure data integration with health systems, and clear privacy regulations. Strategic investment in QST would not only improve care but also shift diabetes management towards prevention rather than crisis response.

6.2.2 Theoretical Contribution

This study makes four key theoretical contributions to understanding the adoption of QST in diabetes management.

First, it develops a contextually grounded conceptual framework that explains the key components influencing QST adoption in developing-country settings. The framework integrates six interrelated themes: user characteristics, technology preparedness, social norms, usability, perceived benefits, and cybersecurity concerns, thus extending existing adoption theories, which often treat these factors in isolation.

Second, the study highlights the contextual significance of technology anxiety and training as underexplored determinants, while extending existing constructs such as digital literacy and motivation through their empirical operationalisation within diabetes self-management. This contributes to refining the understanding of adoption constructs in resource-constrained environments.

Third, the study advances theory by explicitly integrating perceived benefits as a central explanatory construct. Unlike traditional models such as TAM and UTAUT, which emphasise behavioural intention, this study demonstrates that tangible health-related outcomes (e.g., improved glucose control and reduced hospital visits) are critical in shaping sustained adoption. Finally, the study contributes to theory by offering a context-sensitive explanation of QST adoption that captures the interaction between individual, technological, and socio-contextual factors. This provides a foundation for future theory development and empirical testing in digital health adoption, particularly in developing-country contexts.

6.2.3 Methodological Contributions

This study contributes methodologically by demonstrating the value of a theory-guided qualitative approach in examining technology adoption in healthcare contexts. In contrast to the predominance of quantitative, cross-sectional designs identified in Chapter 2, this study employs an interpretivist paradigm and qualitative data collection methods to capture the lived experiences and contextual realities of diabetic patients.

The use of thematic analysis enabled the identification of nuanced patterns and meanings that are often overlooked in survey-based studies, thus addressing the limitation of prior research that focuses primarily on predictive relationships rather than explanatory depth. This approach provides richer insights into how and why adoption occurs in practice, particularly in resource-constrained settings.

In addition, the study demonstrates how a conceptual framework derived from a systematic literature review can guide qualitative inquiry. Rather than serving as a testing instrument, the framework functioned as an analytical lens for organising data and interpreting findings. This illustrates a structured yet flexible methodological approach that bridges deductive and inductive reasoning.

By explicitly linking literature synthesis, qualitative data collection, and thematic analysis, this study offers a methodological pathway for future researchers investigating complex socio-technical phenomena. This approach is particularly useful in contexts where existing theories are insufficient to capture local realities and where deeper contextual understanding is required.

6.3 Research Audit Trail

Ahmed (2024) asserts that the foundation of trustworthiness in qualitative research is established through the audit trail. The audit trail process in qualitative research originates from Lincoln and Guba (1985) who propose that by establishing an audit trail, an auditor or external party can familiarise themselves with the qualitative study, its methodology, findings, and conclusions, enabling them to evaluate the research decisions and the methodological and analytical processes of the researcher upon completion of the study, thus validating its findings. Carcary (2009) asserts that an audit trail must comprise a thorough record detailing the decisions taken during the research process, enabling other researchers to replicate the study and ensuring the reliability and traceability of the results. To guide the development of an audit trail, Carcary (2020) provides a template and notes that there must be two audit trails in a study: the physical audit trail and the intellectual audit trail. A physical audit trail records the phases of a research project and illustrates the key methodological decisions made during the research process. In contrast, an intellectual audit trail assists a researcher in contemplating the evolution of their thought process throughout a qualitative investigation. The comprehensive audit trail for this research is guided by an adaptation of Carcary (2020) audit trail template and is presented as follows:

6.3.1 The Physical Audit Trail

6.3.1.1 The Research Problem

The research problem for this study was identified and delineated during the first year of the researcher's PhD program, when the researcher was required to prepare a research proposal.

6.3.1.2 The Research Proposal

The subsequent stage was to develop a research proposal upon formulating the research problem. The proposal was formulated and presented to the relevant ethics committee of the institution, specifically the CAES Human Research Ethics Committee (HREC), for approval. The proposal primarily contained the aim, objectives, research questions, problem statement, a mini-literature review, proposed methodology, data analysis techniques, and ethical considerations. The committee approved the research proposal.

6.3.1.3 The Literature Review

The researcher conducted a systematic literature review. This review investigated the QST phenomenon, examining the factors that influence its adoption, the opportunities it presents, the theoretical models used to understand it, the methodologies employed in past research, the research gaps identified in previous studies, and the development of a conceptual framework.

6.3.1.4 The Research Methodology

The researcher employed a qualitative approach to explain the intricate experiences of diabetic patients in adopting QST to manage their diabetes. The researcher established the inclusion criteria for participants: those with type 2 diabetes, smartphone ownership and aged 18 to 65. Purposive sampling and self-selected sampling were utilised to recruit diabetic patients. A gatekeeper's letter was requested from a hospital in Bulawayo and subsequently authorised. Ethical issues were delineated, and authorisation was obtained from the CAES HREC to execute this investigation. The ethical approval was obtained through an online application process.

6.3.1.5 The Interview Schedule

The researcher developed a semi-structured interview guide as the principal method of data collection, informed by similar research studies. The conceptual framework guided the interview schedule. The interview schedule underwent pre-testing through pilot interviews to assess informants' comprehension of the questions and the complexity of the research inquiry. It was refined based on feedback from the pilot interview.

6.3.1.6 Data Collection

Participants were first requested to provide informed consent. Interviews were conducted face-to-face. Audio recordings were transcribed using the open-source software “Transcribe.app” and then verified by the researcher and the participants. The researcher translated some interviews conducted using the native language into English. All interview recordings and transcriptions were securely backed up online and on the researcher's laptop in an encrypted folder. Thirty-five principal interviews were deemed suitable for this study following meticulous evaluation. The participants' anonymity was always maintained.

6.3.1.7 Data Analysis of Empirical Evidence

The gathered data was analysed with ATLAS.ti software. The researcher utilised Braun and Clarke's thematic analysis to establish themes. Six primary themes, backed by the conceptual framework, were identified as influencing the adoption of QST.

6.3.1.8 Development of the New Theory

By re-examining the overarching themes and contemplating the results, the interconnections among the themes were established. This entailed repeated contemplation of the relationships and refinement of the theory. These contributions enhanced the existing theoretical understanding of QST.

6.3.2 The Intellectual Audit Trail

6.3.2.1 Positioning the Philosophical Stance

After a comprehensive systematic literature review, a gap was identified: studies tended to be quantitative, hence a positivist stance. Their efforts to reduce reality and generate generalisations similar to physical laws were limited in addressing this study's research problem and formulating new theories. Comprehensive insights into intricate societal concerns of QST have been investigated in the literature review and these could not be adequately represented through the positivist perspective. Following extensive reading on research methodologies and participation in the university's online seminars and workshops, the researcher determined that the interpretivist stance provided a suitable basis for the investigation. This arose from its comprehensive approach to capturing contextual richness and its acknowledgement of the challenges in achieving value-free research and comprehending the social world through physical laws.

6.3.2.2 Creating Alternatives for Data Analysis

After examining qualitative data analysis techniques, content analysis, narrative analysis, and grounded theory analysis were excluded as they were unsuitable for the present study.

Comprehensive research indicated that the researcher should use thematic analysis, employing the pre-established themes from the conceptual framework. This rigorous analysis process enhanced the rigour of this study.

6.3.2.3 Evidence Interpretation and Theory Development

ATLAS.ti software enabled the creation, connection, and hierarchical organisation of codes. Subsequently, Microsoft Excel was employed to identify themes, as ATLAS.ti could not correlate code groups. Adhering to the interpretivist philosophical perspective, a continual process of reflection was essential. Examining the main links among the six key themes identified facilitated the development of the novel QST framework for managing diabetes.

6.4 A Reflection of the Rigour of this Research Study

In Chapter 3, Section 3.12 of this research, the researcher explains how trustworthiness is achieved in qualitative research, guided by four main factors: credibility, transferability, dependability, and confirmability. This research achieved all these through the following:

6.4.1 Credibility

- The researcher conducted a systematic literature review to gain an understanding of the Quantified Self phenomenon. This was a credible research technique that revealed important aspects as well as research gaps. Using a systematic literature review ensured that the findings of this study could be replicated by any researcher and a comparison could be made regarding the credibility of the researchers' results. This also frees the research from bias.
- The researcher established rapport with the study participants to foster trust and gain deeper insights into their beliefs and perspectives. The training enabled a closer relationship and trust with the participants. This prolonged engagement enabled richer answers during the interview.
- Triangulation was achieved through systematic literature review and conducting semi-structured interviews.
- The researcher acknowledged that her personal bias could be prone and constantly reflected on these biases to achieve an objective stance.
- Thirty-five research interviews were utilised to gain a deeper understanding and avoid researcher bias.

6.4.2 Transferability

- This study's research context was identified as a hospital in Bulawayo, Zimbabwe, a developing country. Data were collected from diabetic patients at the largest referral public hospital in Bulawayo, the second-largest province in Zimbabwe.
- Participants self-selected to be part of the study. Purposive sampling was used to select participants with diabetes, to maintain ethical integrity and prevent researcher bias in sample selection.

6.4.3 Dependability

- Chapter 3 presented the methodology of this study, including the justification behind the approaches used, the data collection techniques employed, and the data analysis methods utilised in the study.
- The research audit trail was presented for traceability.

6.4.4 Confirmability

- After transcribing the audio recordings, the researcher reverted to the participants to verify if what was transcribed was a true reflection of their insights, “member checking.”
- After coding, the researcher asked her colleagues to peer review her coding framework and the results of her study.
- Memos in Atlas.ti, sticky notes and a journal were used by the researcher to document her thoughts, reflection process, decisions made and potential biases.
- The researcher had weekly MS Teams meetings with two professors (researchers' supervisors) to discuss and confirm her findings and thought processes.
- The researcher presented part of this research at four conferences and a postgraduate symposium.
- The researcher published five papers from the onset of this research: one peer-reviewed book chapter, three journal articles (Ndlovu et al., 2024; Mutunhu et al., 2024b; Mutunhu et al., 2024a; Ndlovu et al., 2025; Mutunhu and Chipangura, 2026)
- Preliminary findings of this research were shared with some of the research participants, thus substantiating the research results.
- The findings of this research were submitted to a journal for publication, and the editor of the Journal and two reviewers gave their comments, which helped refine this research thesis. The Editor highlighted how filling in a COnsolidated criteria for REporting Qualitative research (COREQ) checklist would enhance the findings of qualitative

research. Thus, a COREQ checklist is a "*32-item tool used to standardise the reporting of qualitative research, specifically for interviews and focus groups. It helps researchers ensure they are transparently reporting important aspects of their study, such as their own characteristics, the methods used, and how data was analysed and interpreted".* This helped the researcher write this thesis and ensure it included all aspects of qualitative research.

Of interest were the following reviews:

Positive Reviews

"This qualitative study highlights contextual aspects of the use of QSTs in a developing country.
This is a well-conducted study, therefore informative.
This research is very important research.
The rational and methodologies are appropriate.
A few minor points could be considered:"

Reviews for Improvement

"To enhance comprehension, I would suggest you define what QST is considered in your context early in the manuscript. Are you considering only self-tracking with technology, or also the community of users of self-tracking tools?"
"To help with generalisability, it would be useful to understand who your sample in term of socio-demographic information was. You allude to age in the text. What was the minimum and maximum age of your participants? To which gender they identify with? What type of diabetes are you referring to? Only type 2 diabetes or also type 1?"
"Please add more information about the limitations that your recruitment method may lead to. It looks like it was people interested in discussing those applications that would have contacted you. More information about the information provided to potential participants would also be relevant to better understand their motivation in participating in this study."

Some of the reviews for improvements had already been included in the thesis but were not included in the manuscript. Those missing in the thesis were incorporated to improve it, and those missing in the manuscript were also incorporated.

6.5 Future works

Future research studies can do the following:

- Empirically evaluate the developed theoretical framework to augment our comprehension of the complexities inherent in QST adoption, yielding pragmatic insights for professionals endeavouring to optimise technology integration within the healthcare sector.
- Explore the long-term impact of QST on clinical outcomes and patient well-being in diabetes management by integrating this technology with existing healthcare systems.
- Explore methods to reduce technology anxiety and leverage intrinsic motivation further to encourage widespread use of QST.
- The research was done in the context of Zimbabwe. An opportunity to carry out the research in other countries and make comparisons based on the results obtained can be explored.
- Conducting longitudinal studies could help in examining factors that affect long-term usage of QST. Identifying factors that lead to sustained adoption can support sustained engagement and motivation, and enable cross-country comparative studies to explore how contextual, socio-economic, cultural, and infrastructural differences influence adoption across developing nations.
- The high proportion of participants requiring training suggests a need for improved user-centred design and accessible technology solutions. Future studies should focus on developing intuitive and user-friendly technology interfaces that individuals with varying levels of technological literacy can easily adopt.

6.6 Limitations

Study Limitations

- The sample population represents diversity in terms of age and education level; however, the gender disparity might affect the generalisability of the findings. Although the study included both male and female participants, the higher proportion of female participants (63%) may have influenced the findings, particularly if women were more motivated to engage in health-management behaviours or had different perceptions of QST compared to male participants, potentially biasing the findings towards more favourable views of adoption and usage.
- The research has limitations in terms of the sample population, which consists of people obtained from a public hospital in Bulawayo, Zimbabwe, and might affect the generalisability of the findings to other countries. Although the findings cannot be statistically generalised, they may provide analytical generalisation for similar low-

resource, high-diabetes-prevalence settings in sub-Saharan Africa and other developing nations in other regions, as Zimbabwe shares certain socio-economic, infrastructural, and healthcare challenges with many developing-country contexts. Sub-Saharan African countries display substantial mobile digital expansion, which is the main means of internet connectivity and telecommunications; nevertheless, all countries have irregular power supplies, which affect several aspects of human life. Sub-Saharan nations are considered developing nations; they are characterised by enormous gaps between the rich and the poor. Given the level of poverty in most nations, governments bear responsibility for funding the healthcare systems of most of the population. This research accepts that although there exist several aspects in which the countries appear similar, there exists no similar economic, social, and technical environment. The issue at hand has important aspects to reveal in the case of the Zimbabwean society; nevertheless, we expect that if conducted in other sub-Saharan African nations or any developing country, the results may differ slightly owing to contextual considerations.

- This research applied purposive sampling with self-selection. Although this sampling technique was suitable for this exploratory study, self-selection bias may have occurred, as participants who volunteered may have been more health-conscious, technologically inclined, or more motivated to manage their diabetes than non-participants. This may have influenced the findings towards more positive perceptions of QST adoption.
- The population of diabetic patients aged 18-65 who own smartphones excludes people beyond said age range or diabetics who use other devices for self-monitoring. Using such a population might not cover all diabetic patients, as it leaves out those who are much older or much younger and do not have access to smartphone technology to aid in diabetes management. By such targeting, other people dealing with the same challenges in managing diabetes might not have had the chance to contribute to the sample, as their viewpoints include important aspects.
- Another limitation of this study is that participants received prior training on the use of the QST application before the interviews. This may have positively influenced their perceptions of usability and ease of use compared to real-world contexts, where users may receive limited or no formal training.
- Finally, the study focused on the mySugr application, which enabled an in-depth examination of one QST tool. However, this may limit the transferability of the findings to other diabetes-related QST applications, which may differ in functionality, usability, and user experience.

Researcher's Limitations

The researcher had limited funding to conduct the research. In recognising the importance of resources in comprehensive qualitative research, such as in-depth interviewing of vulnerable populations, it can be stated that the researcher in this PhD study had limited resources because of the constraints imposed by the restricted budget.

6.7 Reflection of my PhD Journey

A personal experience with diabetes in my close circle motivated this research expedition. My background in Information Systems and Computer Science, and my desire to comprehend how technology can help people with diabetes, led me to begin my doctoral journey. It was through rigorous immersion in the literature that I shaped my research questions, developed a conceptual framework, designed interview instruments, and analysed the data. Throughout the process, I kept detailed journals of my readings, workshop discussions, supervision discussions, reflections, and the tasks undertaken. I even began tracking my own menstrual cycle to gain a deeper understanding of QST from the user's perspective.

However, the PhD journey was far from smooth. Towards the end of the first year, my first supervisor moved to another institution. With this sudden change, I was compelled to redirect my research and rebuild my study again from scratch, a rather daunting and demoralising situation. During this academic turmoil, I also suffered a stroke (Bell's palsy), which impacted my ability to communicate effectively. Nevertheless, I pushed through these difficult times. Through physiotherapy, hard work, determination, and renewed focus, I recovered and returned to my studies with clarity and tenacity. Only by looking back can these challenging moments truly emerge as moments of growth.

Alongside working on my thesis, I published journal articles and book chapters, presented at symposiums and conferences, and learned from the reviewers' feedback, which helped me build overall academic confidence in research and writing. Arguably, the most validating moment was when an anonymous reviewer said, *"This is a well-conducted study and a very important study."* To feel acknowledged after so many years of doubting my own academic merit from an independent academic authority made that moment especially significant. It validated the rigour of my work and reminded me that my research had real value.

Looking back at my PhD journey, what started out as uncertainty has led to the emergence of a resilient and confident scholar, one who has built a solid body of work and is ready to embrace the challenges of academia. This experience has been arduous and painful, yet ultimately rewarding and meaningful!!!!!!

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APPENDICES

Appendix A –Similarity Index Report from Turnitin

PAPER NAME	AUTHOR
BELINDA FINAL THESIS AFTER EXAMIN ATION.docx	BELINDA MUTUNHU

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Appendix B –Editors Certificate for Proofreading

Independent Editor
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landamasuku@gmail.com
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Professional EDITORS Guild

CERTIFICATE OF EDITING

This document certifies that a copy of the thesis whose title appears below was edited for proper English language usage, grammar, punctuation, spelling, and overall style by Dr Nhlanhla Landa whose academic qualifications and professional affiliation appear in the footer of this document. The research content and the author's intentions were not altered during the editing process.

TITLE: A QUANTIFIED SELF TECHNOLOGY FRAMEWORK FOR MONITORING AND MANAGING DIABETES

AUTHOR: BELINDA MUTUNHU (STUDENT NUMBER: 69970777)

Note: The edited work described here may not be identical to that submitted. The author, at their sole discretion, has the prerogative to accept, delete, or change amendments made by the editor before submission. The completeness and accuracy of the reference list remain responsibilities of the client. Equally, the overall quality of the document is the responsibility of the client.

DATE: 14 January 2026

EDITOR'S COMMENT

The author was advised to effect suggested corrections regarding clarity of terms, consistency in structure and logic, and expression. The reference list was not edited.

Signature

PhD Applied Linguistics (UFH), MA Applied Linguistics (MSU), BA (Honours) English and Communication (MSU)
Professional Membership: A member of the Professional Editors Guild, South Africa

Appendix C—Permission letter to hospital

Request for permission to conduct research at a Hospital, Bulawayo

"QUANTIFIED SELF: TOWARDS A ZIMBABWEAN FRAMEWORK FOR MONITORING DIABETES"

The Clinical Director

Bulawayo, Zimbabwe

14 November 2023

RE: REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT A HOSPITAL

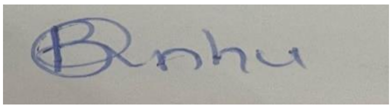
Dear Hospital Clinical Director

I, Belinda Mutunhu Ndlovu, am a Ph.D. student at the University of South Africa in the Department of Information Systems. We are inviting you to participate in a study entitled "Quantified Self: Towards a Zimbabwean Framework For Monitoring Diabetes". The research I wish to conduct for my Doctoral thesis involves the development of a quantified self-technology framework for managing diabetes. This project is to be conducted under the supervision of Prof. B Chipangura and Professor S Singh with an ethics clearance number NHREC Registration #: REC -170616-051, Ref #: 2023/CAES_HREC/1791

The study aims to develop a framework for the adoption of quantified self-technology in monitoring diabetes. The study will entail investigating the factors influencing the adoption of quantified self-technology in managing diabetes. The benefits of this study are that diabetic patients can leverage technology to better manage their diabetes which requires consistent monitoring for improved quality of life. Potential risks are low as we won't be collecting any medical data but factors that influence diabetics to use technology in monitoring their diabetes.

I am hereby seeking your consent to interview several diabetic patients at your hospital aged between (18 to 65) years old to participate in this project. These participants will contact me if they are willing to be a part of my study. I have attached an invitation letter to participants which you can share with them. I have provided you with a copy of the interview questions to be asked, and consent forms to be used in the research process. Furthermore, I have attached proof that I am a registered student at UNISA.

Yours sincerely



Belinda Mutunhu Ndlovu (Student : School of Computing)

Appendix D—GateKeepers letter from hospital

[redacted] ZIMBABWE [redacted]

Ministry of Health & Child Care
[redacted]
Bulawayo

17 January 2024

Attention: Belinda Mutunhu Ndlovu

RE: REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT [redacted] HOSPITAL: QUANTIFIED SELF: TOWARDS A ZIMBABWEAN FRAMEWORKFOR MONITORING DIABETES

Reference is made to your minute on the above matter.

Th institution has no objection in you undertaking your study

May you give us the results of your study.

Yours Faithfully

[redacted] DIRECTOR
19 JAN 2024
P.O. BOX 20[redacted]
ZIMBABWE

Appendix E –Participant Invitation Letter

Invitation Letter to participate in an academic research study

"QUANTIFIED SELF: TOWARDS A ZIMBABWEAN FRAMEWORK FOR MONITORING DIABETES"

Dear Prospective Participant,

I, Belinda Mutunhu Ndlovu, am a Ph.D. student at the University of South Africa in the Department of Information Systems. We are inviting you to participate in a study entitled "Quantified Self: Towards a Zimbabwean Framework for Monitoring Diabetes". The research I wish to conduct for my Doctoral thesis involves the development of a Quantified Self-framework for the monitoring of Diabetes in Zimbabwe. This project is to be conducted under the supervision of Dr. B Chipangura and Professor S Singh.

The study will entail investigating the factors influencing the adoption of quantified self-technology in monitoring diabetes. You will be given a diabetes management app by me, namely "mySugr", to use for a 6 months. If you do not mind incurring costs or have free Wi-Fi, this app is freely available for you to download on the Google Play Store and App Store. I will be communicating with you during these 6 months via a platform you prefer (WhatsApp, phone call, or email) to get updates/progress/answer any questions related to the app so that you can effectively use this app during these 6 months. After this, I will conduct interviews with you at your convenient time and location where you feel most comfortable. The questions are about your experiences whilst using this app and have nothing to do with your medical data. Prior to conducting the interview, you will be required to read an information sheet about the study and then sign an informed consent form that has details about the study and that you voluntarily participated in my study. If you are under the care of a caregiver, your caregiver will also be required to sign the informed consent form. The benefits of this study are that diabetic patients can leverage technology to better manage their diabetes, which requires consistent monitoring for improved quality of life. No payment or reward will be offered to you if you choose to be part of this study.

Potential risks are low as we won't be collecting any medical data but factors that influence diabetics to use technology in monitoring their diabetes.

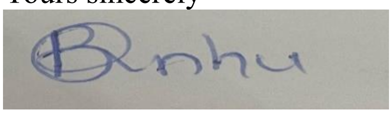
Please note that the use of the app does not replace your normal treatment regime or current diabetes management strategies.

Should you be willing to be part of my study kindly contact me on any of the following:

Mobile: 0772775077

Email: 69970777@mylife.unisa.ac.za / belindamutunhu@gmail.com

Yours sincerely



Belinda Mutunhu Ndlovu

Ph. D Student: School of Computing

Appendix F—Ethics Approval

College of Agriculture and Environmental Sciences_Health REC

NHREC Registration # : REC-170616-051
Ref #: 2023/CAES_HREC/1791
Name: Ms Belinda Mutunhu
Student #: 69970777

Date: 04/10/2023

Dear: Ms Belinda Mutunhu

Decision: Ethics Approval from 04/10/2023 to 30/09/2028

Researcher: Ms Belinda Mutunhu
69970777@mylife.unisa.ac.za 00263772775077

Supervisor: Dr Baldreck chipangura Chipab@unisa.ac.za

Co-Supervisor: Professor Shawren Singh singhs@unisa.ac.za

QUANTIFIED SELF: TOWARDS A ZIMBABWEAN FRAMEWORK FOR MONITORING DIABETES

Qualification: PhD in Information Systems

Thank you for the application for research ethics clearance by the College of Agriculture and Environmental Sciences_Health REC for the above mentioned research study. Ethics approval is granted for five years, **subject to submission of yearly progress reports. Failure to submit the progress report will lead to withdrawal of the ethics clearance until the report has been submitted. Due date for progress report: 30 September 2024**

The **medium risk application** was **reviewed** by College of Agriculture and Environmental Sciences_Health REC on 03 October 2023 in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.

Appendix G—Participant information sheet and consent letter

PARTICIPANT INFORMATION SHEET

Ethics clearance reference number: NHREC Registration #: REC -170616-051,
Research permission reference number (if applicable): Ref #: 2023/CAES_HREC/1791

5 JANUARY 2024
Title: QUANTIFIED SELF: TOWARDS A ZIMBABWEAN FRAMEWORK FOR MONITORING DIABETES

Dear Prospective Participant

My name is Belinda Mutunhu Ndlovu and I am doing research with Dr. Baldreck Chipangura and Professor Shawren Singh, lecturers in the Department of Information Systems towards my Doctoral Degree in Information Systems at the University of South Africa. We are inviting you to participate in a study entitled "Quantified Self: Towards a Zimbabwean Framework for Monitoring Diabetes".

I am conducting this research to investigate the factors influencing the adoption of quantified self-technology in monitoring your diabetes. This study is expected to collect important information that could help in developing a Quantified Self technological framework which if followed provides a practical solution to help diabetic people better manage their diabetes without the need to constantly visit the doctor. Quantified Self-technology involves self-tracking or self-monitoring of one's diabetes through the use of Quantified Self-technology such as mobile health apps. Furthermore, this study can help you better manage your diabetes. **Please note that the use of the app does not replace your normal treatment regime or current diabetes management strategies.**

You were selected to participate in this study because you are diabetic and are in the age range of 18 to 65 years. You were further selected because you contacted me after receiving an Invitation letter from the hospital to be a part of my study. Upon contacting me you were asked to use the app "mySugr". This app was provided to you by the researcher (the researcher provided the app and installation services) / you willingly downloaded it from the Play Store/Appstore using your data. You used this app for a minimum period of 6 months after agreeing to be recruited in this study. and we have been communicating to get updates on your progress/challenges during these 6 months. You were further selected through purposive sampling i.e. you are a diabetic patient from this hospital in Bulawayo province. You were also chosen for this study because you voluntarily agreed to be part of this study (self-selecting sampling). The number of participants to be interviewed for this study is approximately 45 (forty-five).

The study involves semi-structured interviews, which were conducted 6 months after using the app. Questions related to the benefits and challenges you face using Quantified Self/ Self Tracking Technology will be asked. The full list of interview questions is attached for your perusal before the interview. If you choose to participate in this interview, it will take up no more than an hour and 30 minutes of your time. I will first schedule an appointment telephonically with you. Interviews will be conducted at a place you feel the most comfortable (e.g. home or workplace) and will be face-to-face. The researcher will record you with your permission using a recorder and take notes of the interview without revealing your identity. Please answer the questions as honestly and comprehensively as you can. There is no right or wrong answer to these questions.

Participating in this study is voluntary and you are under no obligation to consent to participation. If you decide to participate, you will be given this information sheet to keep and asked to sign a written consent form. You are free to withdraw at any time and without giving a reason. The interview is developed and recorded to be anonymous, meaning that we will have no way of connecting the information that you provide to you personally. Consequently, you cannot withdraw from the study once you have answered all the questions. Any identifying information that is obtained in connection with this interview will remain confidential and will be disclosed only with your permission or as required by law.

We do not foresee that you will experience any negative consequences by completing the interview. Your time is the one to be taken. However, there won't be any monetary compensation for loss of time.

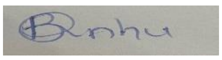
You have the right to insist that your name will not be recorded anywhere and that no one, apart from the researcher and identified members of the research team, will know about your involvement in this research OR your name will not be recorded anywhere and no one will be able to connect you to the answers you give. Your answers will be given a code number or a pseudonym, and you will be referred to in this way in the data, any publications, or other research reporting methods such as conferences.

Your answers may be reviewed by people responsible for ensuring that research is done properly, including the transcriber, external coder, and Research Ethics Review Committee members. Otherwise, records that identify you will be available only to people working on the study, unless you permit other people to see the records.

Your anonymous data may be used for other purposes, such as a research report, journal articles, and/or conference proceedings. Hard copies of your answers will be stored by the researcher for a minimum period of five years in a locked cupboard/filing cabinet *at my home* for future research or academic purposes; electronic information will be stored on a password-protected computer. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable. Hard copies will be shredded and/or electronic copies will be permanently deleted from the hard drive of the computer through the use of a relevant software program.

No payment or reward will be made. The costs you may incur in the study include the cost of broadband to download the Quantified Self App. However, we value your time and input in improving the understanding of Quantified Self technologies in monitoring diabetes.
This study has received written approval from the Research Ethics Review Committee of the School of Agriculture and Environmental Sciences, Unisa. A copy of the approval letter can be obtained from the researcher if you so wish.
If you would like to be informed of the final research findings, please contact the primary researcher, Belinda Mutunhu Ndlovu during office hours at 69970777@mylife.unisa.ac.za. The study leader, Dr. B Chipangura ChipaB@unisa.ac.za; and Professor S Singh Singhs@unisa.ac.za, can be contacted during office hours. Should you have any questions regarding the ethical aspects of the study, you can contact the College of Agriculture and Environmental Science Ethics Research Committee,vwkmj@unisa.ac.za. Alternatively, you can report any serious unethical behavior at the University’s Toll-Free Hotline 0800 86 96 93.

Thank you for taking the time to read this information sheet and for participating in this study.
Thank you.



Belinda Mutunhu Ndlovu

CONSENT TO PARTICIPATE IN THIS STUDY

I, __________________ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits, and anticipated inconvenience of participation. I will use the app "mySugr" for 6 months and understand that the use of the app does not replace my normal treatment regime or current diabetes management strategies.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications, and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

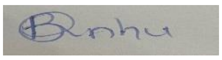
I agree to the recording of the face-to-face interview which has been done at a place I chose and was comfortable.

I have received a signed copy of the informed consent agreement.

Participant Name & Surname………………………………………… (please print)

Participant Signature……………………………………………..Date…………………

Researcher's Name & Surname……Belinda Mutunhu Ndlovu………………………………

Researcher's signature………………………..Date 18 SEPTEMBER 2023………

Appendix H--The interview schedule guide

<u>Interview Schedule for Diabetic Patients at a hospital in Bulawayo</u>

Name of Interviewee:____

Interviewer : Belinda Mutunhu

INTRODUCTION

My name is Belinda Mutunhu. I am a PhD candidate at the University of South Africa. I am researching how people use technology to manage their diabetes. You are a good candidate for this interview because I know you are a diabetic patient at this hospital and have been using technology to manage your diabetes. This interview will take approximately an hour of your time. Whatever information I obtain from you will be for my study only and nothing else. No one will know your real name or be able to associate what you will say with you. Please feel free to use any language you are comfortable with. Please feel free to ask if you need an interpretation of Ndebele/Shona for the question. I hope you are comfortable so that we begin this interview.

I would like your permission to interview you and record you.

<u>Main Objective</u>

I would like to hear your perspectives as to what you consider to be the important issues with regards to managing your diabetes using diabetes. Specifically, the factors that influence you to use technology in monitoring diabetes.

<u>Target Informants</u>

This interview will be used to interview people who are diabetic

<u>Duration</u>

It is expected that the required evidence will be collected within 60 minutes.

SPECIFIC INTERVIEW QUESTIONS

1. Can you tell me how long you have had diabetes and how you have been managing it?

- What information technologies do you use to help you manage your diabetes?

2. Using technology requires you to be computer literate and have the necessary resources, can you tell me, how did you prepare/teach yourself to use this app?

- What help did you receive with setting up the app on your mobile device?

3. Can you explain how are you using the technology to manage your diabetes? Which tools do you mostly use?
4. Which challenges do you face when using the app and what support would be necessary for you to effectively use this app?

5. In what ways is the use of the app supporting/helping you to manage your diabetes?

- How has the app changed/influenced the way you manage your diabetes?

6. With respect to members of the community/family/friends where you live, what are their perceptions on the use of technology to monitor diabetes? Are they supporting you?
7. How would you feel if the information you have shared in this interview is shared with other people? Why?
8. Is there anything else I have not mentioned that you would like to talk about?

CONCLUSION

Thank you very much for spending your valuable time doing this interview.

Appendix I –Sample of Transcribed Interview

Date: 3 May 2024
Location: The interview was done at her workplace in her office
Duration of interview: 59mins 11seconds

00:00 Interviewer:
Good afternoon.
00:02 P1:
Afternoon.
00:03 Interviewer:
My name is Belinda Mutunhu Ndlovu. I am a PhD candidate at the University of South Africa. I am researching how people use technology to manage their diabetes. You are a good candidate because I know you are a diabetic patient at this hospital and have been using technology to manage your diabetes. I would like your permission to interview you and record you. This interview will take approximately an hour of your time. Whatever information I obtain from you will be for my study only and nothing else. Please feel free to use any language you are comfortable with. Should you need an interpretation of Ndebele/Shona for the question please feel free to ask. I hope you are comfortable so that we begin this interview.

00:36 P1:
Sure, you can record and I am very comfortable.
01:04 Interviewer:
Q1 . Can you tell me briefly about yourself, how long you have had diabetes, and how you have been managing it?
01:10 P1:
I am a widow aged 54 years with a secondary school education. I discovered seven years ago that I was diabetic. I was using tablets and was put on insulin last year because my blood glucose levels were high and were not fluctuating to normal. I used to go hospital every time when I was not well especially when my sugar was too high or too low, but I have never had problems with low blood sugar levels. My sugar levels can be very high such that I have headaches and swollen feet and this worries me a lot. So I decided to take herbs because I love them. I heard that you can take "dorofiya" so I take it as it stabilises my diabetes. I also used to take peaches leaves for blood pressure. These leaves are so good that my blood pressure

remains at a normal level. The challenge with these herbs is that there are no prescribed dosages such that when one takes too much of them it can cause health problems. The blood pressure levels would drop to below normal and cause more problems Healthwise. I now take these herbs with precautions just drink half a cup after 2 weeks.

02:11 Interviewer:

(Q1b)What information technologies do you use to help you manage your diabetes?

01:10 P1:

So when I heard about this app called Mysgr from the form you gave the hospital, and then I called you and you explained to me the way Mysgr works, I got interested, especially since I can use these apps in the comfort of my home or wherever I am. I had not been using any app or technology for my diabetes but for other diseases I was. I was using Dr Blood and Samsung Health. Dr Blood for monitoring blood pressure and Samsung health for my health in general making sure my weight is in check. Maybe I was using Samsung Health for my diabetes even though it is not a diabetes app. I would use it to check if my weight is normal and if I am exercising and how many calories I have burnt after certain steps. You know diabetes requires weight control so somehow it reminded me to keep my weight in check

03:31 Interviewer:

Q2. Using technology requires you to be computer literate and have the necessary resources, can you tell me, how did you prepare/teach yourself to use this app?

03:59 P1:

After my son downloaded and installed the app, there was a user manual, that enabled me to learn how the application works making everything easy. So I made sure I read the manual. I made sure my phone is now charged all the time and am always connected to my work WIFI. So now I also make sure I check my glucose levels on a daily basis.

5:42 Interviewer:

Q2b.What help did you receive with setting up the app on your mobile device?

6:00 P1:

The MySugr application you introduced to me was not difficult to download, although l can download the app by myself through Play Store since l am also educated, l had to ask my son to download it for me since l am always busy in my garden. I noticed one can easily follow the steps for installation of the app. If I want to download any application if I am not busy, I simply go to Play Store, search for what I want then start downloading as I follow the instructions.

6:17 Interviewer:

Q3.Can you explain how are you using the technology to manage your diabetes? Which tools do you mostly use?

06:42 P1:

I now use this app to check my glucose levels daily. Sometimes I do it two to three times a day. After testing using my glucometer I capture the readings into the app, the app tells me what needs to be done about my blood glucose levels, if too high or too low, I get recommendations on how to stabilise the blood sugar level, either by taking medication or eating a sweet or a fruit. I also follow the recommended diet so my glucose level are on normal levels. Normal levels range from 7 to 9. The app advises on how to control sugar levels and diet. I use insulin injections every day, whether sugar levels are low or high. I get one month supply of insulin supply, also, I take metformin everyday, to stabilise the glucose levels. As a diabetic patient one has to control their weight and therefore the need to exercise regularly. So the app recommends that diabetic people should do physical exercises so as to maintain a certain weight. There are also reminders, as you know older people are forgetful, we need to have those so we do not forget to take medications. I love gardening which is my hobby and I spend most of the time in the garden if I am not at work so the reminders that come in the form of alarms or alerts, on hearing these, I then know that it is time to take my medication.

12:42 Interviewer:

Q3b. Which tools (features and qualities) do you mostly use?

13:00 P1:

This app, MySgr was very useful to me because of some tools it had. It was extra convenient to have an app that tells you that your blood glucose level is high. You know cramming these figures and knowing ranges is difficult. But now I know ranges and can tell anyone what normal or not-normal levels are. It also provided me with lots of information that made me understand my diabetes better. This was useful. I liked the part where it would tell me about me and me alone and not other people. It will recommend things that are specifically for me not for every diabetic. This was wonderful. I have had time to learn more about my diabetes because of this app.

15:27 Interviewer:

Q4.Which challenges do you face when using the app and what support would be necessary for you to effectively use this app?

15:56 P1: It's very easy to move around the app and very easy to follow the steps. You either press going forward or backward and that’s it. Nothing complicated. This made me use it. If I had to figure out a lot of things, I doubt il use it. So I cannot really say I faced challenges while using the app. This app was very reliable for me, making it easy for me. I haven't come across a situation where the application failed to respond or did not do what I asked it to do while in use, maybe in the future. You know, when you set an alarm for medication administration they will always remind you at that set time, they do not change because maybe you would have left the phone behind so the alarm has to change. Whenever alarm has to ring it will always ring. What was difficult might have been some words they were using like “hypos”, “deviations”.I did not really understand what that meant. I am not a doctor so I can understand such complicated words even if I'm educated.

(Q4b) What support would be necessary for you to effectively use this app?

Further support or resources l would need to effectively use this app are Wi-Fi. I only rely on Wi-Fi when l am at work and when l am at home l I’ll be forced to buy bundles which are very expensive. I would need a constant supply of electricity and backup power like solar as there is always load-shedding of electricity. We spend most of the time without electricity, so I must make sure my phone is fully charged. When my phone is fully charged, I will not miss any updates on my app as well as reminders or alerts to take medication.I also need to upgrade my phone to accommodate certain features. Solar system is a requirement as we have load shedding all the time and you end up reserving your battery for phone calls and messages

20:55 Interviewer:

Q5. In what ways is the use of the app supporting/helping you to manage your diabetes?

21:19 P1:

This application has helped me so much, especially in controlling my blood sugar levels. As l mentioned earlier, l use it to monitor my health whenever I want depending on how I am feeling. When I feel better I check once or don’t even bother . My sugar levels are stable they now range between 7 and 9. Before using the app the sugar levels would escalate above 27. This just stressed me and I would think l will die in my sleep. However, this app has taught me to be always alert on taking medication and follow all the recommendations. Alarm reminders are the best, even when I am outside the house, my grandchildren assist me by bringing the phone to me screaming and shouting telling me about the alarm. At times I’ll be in the garden busy watering my plants, I would see my phone being brought to because of the alarm. This is because they are also aware of my condition and know the importance of taking medication on time. Because of age we have become very forgetful, and we do a lot of things around the community. I am so much motivated by this. The app keeps records of my blood sugars levels and blood pressure, which l then show or send to the doctor. The doctor makes informed decisions from the trends and reports sent or shown to him, to prescribe the suitable medication. More so, my visits to the hospitals have since reduced owing to the usage of the app but my doctor checks on me especially when I don't communicate. I told my doctor that I cannot frequent the hospital because of the assistance I get from the app. I can only send him the report instead as per when the need arises. After he goes through my report, he then makes an informed decision, including rechecking blood glucose levels, the amount and kind of food to eat. I communicate with my doctor whenever necessary, maybe once a month, and I also when l am in need of a prescription for medication supply. I get a one month supply of Metformin, insulin and Nifedipine medication from the hospital so the reason I want to communicate with him

26:37 Interviewer:

Q5b.How has the app changed/influenced the way you manage your diabetes?

26:43 P1:

The diet recommendations I get from the app have helped me a lot. I no longer eat anyhow, my food is prepared differently now, we are encouraged to eat traditional foods such as brown rice, millet, sorghum, rapoko and whole wheat foods. I do not take tea with sugar anymore, instead I use some supplement tablets to substitute sugar. For someone who is diabetic am encouraged not to starve, so my eating habits have changed too. I eat frequent healthy meals but in small quantities. I was the kind of person who never used to like physical exercise, but to reduce weight especially on diabetic people, exercising is a priority to reduce weight. I always thought that doing house chores was enough exercise but the app introduced to me completely different physical exercises to keep me fit.

33:42 Interviewer:

Q6. **With respect to members of the community/family/friends where you live, what are their perceptions on the use of technology to monitor diabetes? Are they supporting you?**

34:01 P1:

I get a lot of support from my family, relatives, friends, workmates. In my neighbourhood there are a number of support groups for different chronic diseases and at church, we have a support group for diabetics, where we interact helping each other on how to improve our health.My family members are very supportive, they ensure my battery is full by lending me their power banks, they encourage me to keep using these apps as they have seen the difference in improvement in managing these ailments. They also support by sending money so that l can buy data bundles. Although their efforts to send me money to keep me afloat, I sometimes divert the funds to cover up other expenses. Thus, sometimes funds come through my son who sometimes also diverts funds because he also has his commitments. I feel like I am not supposed to burden my children with my other financial commitments since l am also gainfully employed. I am not supposed to always rely on their money as they have their own responsibility. My relationship with my children is not affected by these money diversion as they do understand. I got to appreciate this application that I introduced to other family members. Diabetes is hereditary in my family as my father, sisters and some brothers have it. After seeing all good things about the app such as reminders to take medication, physical activity and dietary recommendations, l couldn't help it but share the good news to my family members. I taught them about it, where I got it from and they showed appreciation of the app. My father who stays in Kadoma, is suffering from quite a number of chronic diseases such as, diabetes, hypertension, heart problem and his kidneys are failing. He has shown gratitude after he started using these apps, he is now able to control his blood pressure and diabetes, he also monitors his heart rate regularly. I also have brothers and sisters who are diabetic.They are all happy with apps and blamed me for not telling them about these all along. I had to explain to them that it was because of you doing your research that I got an easy way to manage and control my conditions.So we now motivate each other to eat healthily and monitor our diabetes regularly. Nothing negative is being said about these apps, everyone is happy about them.

I also introduced these apps to my churchmates, the women's group in particular. We usually have meetings every Saturday from 2 to 4 pm doing bible study and have slots for other life lessons and empowering each other as women. The group consists of the young married women and older women. The women's group has also embraced this technology as preaching is also done through social media platforms. We now support each other as women to live healthily and enjoy our lives whilst managing these diseases.I hope you do not mind as I have given others your contacts your contacts for further clarity. Maybe you can visit our ladies group if its possible.

I also get support from my doctor although it didn't start on a good note. The doctor checks on me, if i do not communicate for a long time .So when l first started using the app, the doctor wasn't happy but l realised that these doctors are after money. This is because every time an appointment is booked for me it's mandatory to pay consultation fee and if there are further tests to be done l need to pay again. So during my scheduled visits, my sugar is now okay and I told him it's the app. We are now both happy as I have managed to control my diabetes and blood pressure. My doctor encourages and motivates me to continue using the app. If it was not fulfilling its purpose, maybe the doctor would have stopped me from using it and booked weekly appointments to come to the hospital. But anyway I do not care what he thinks as it is working for me.

We have support groups that provide opportunities for people to share information and experiences. These groups tend to help and encourage people to live a better and healthy life. People join these groups depending on their medical condition, a lot of people have diabetes and hypertension, hence our group is very large. I have not visited the other groups because they do not affect me, however, we are the envy of other groups and people ask how other groups such as the cardiovascular group are managing their conditions without such apps. Social groups have been a great help as we are there for each other, we update each other on new features and try them together. We also taught each other about taking herbs as a natural way of managing these conditions. I used to take prickly-pear-cactus (dorofiya) for diabetes, and peach leaves for hypertension, and I do not take these in large volumes, as my glucose levels lower so much. Using the app I don’t think I need these things as I stopped wanting to see if the app is of any benefit.

53:05 Interviewer:

Q7.How would you feel if the information you have shared in this interview is shared with other people? Why?

53:33 P1

I do not want this, especially without my knowledge. Negative comments that will be shared by other people after gaining access to my data without my permission will affect me badly. It's as if having diabetes is a death sentence yet it’s not, I don’t like it when people judge others because of their ailments. But now if my data is used for the right reasons maybe at a hospital or research I will allow them to. What becomes a problem is when the data is misused and they use it to get money instead of helping or finding solutions with it. Diabetes is an illness not a laughing matter, information should be used to help other diabetics by encouraging them. There are other things you do not want people to know about you as they may use it against you. I might actually not get covered by my insurance because they will think am dying tomorrow. I don't want information that is just published for no reason. Also, when my information is sent on social platforms such as other groups or you find yourself in a Whatsapp group you didn’t join it means somebody took my information and gave it to somebody. Now you will be getting funny suggestions like hee pay so much and we pray for you to get miraculous healing. You know after stealing your information, they even steal your identity. You find them now using your details or even your picture saying hee this diabetic got healed from our prayers or herbs yet I do not know anything about it. If my data is shared on social media like a church WhatsApp group without my consent, I would get mad and take matters into my own hands or take legal action. Who wants to be known that they are using herbs. You know what at church it is like. We pretend we don't know about herbs yet we are using them privately. Now imagine people at my church knowing Im using herbs' .I do not know what I will do.

59:07 Interviewer:

Q8.Is there anything else I have not mentioned you would like to speak about?

No, I do not have anything but wish you the best in your studies.

59:11 P1:

Thank you very much for spending your valuable time doing this interview.

Appendix J –Literature Review Search Results

AUTHOR	THEORY	METHODOLOGY	ORIGIN	FACTORS	OPPORTUNITIES	TECHNOLOGIES	MAIN FINDINGS
(Call et al., 2024)		Qualitative	USA	• Social identity • Privacy concerns • Perceived usefulness • Data misuse	• Trend Analysis	• Apple Watches • Oura rings • continuous glucose monitors • mood-tracking applications • digital food diaries	The findings reveal that: • Self-tracking may reveal personal information, prompting ethical issues around privacy and data ownership. • Individuals derive significance from personal health data within a communal context and the wider societal ramifications of this behaviour. • Participants manage the conflicts between personal self-monitoring and the advantages of communal assistance. • Their interactions facilitate the extraction of meaning from personal data while contending with overarching societal concerns around digital monitoring and corporate dominance over personal information. • The community's dedication to open scientific methods affects their data communication and enhances their collective comprehension of self-tracking.
(Leuenberger, 2024)		Qualitative	Europe	• Perceived Reliability • Privacy concerns • Perceived Usefulness	• Trend analysis	• Health and activity trackers	The findings reveal that: • Technology may yield vast amounts of personal information, but the quality and relevance of such information frequently fall short, particularly for underprivileged populations. • When the information is precise and pertinent, there exist ethical and pragmatic justifications for seeking self-knowledge through technology, since it may result in enhanced personal insights and superior life decisions.

AUTHOR	THEORY	METHODOLOGY	ORIGIN	FACTORS	OPPORTUNITIES	TECHNOLOGIES	MAIN FINDINGS
							• The significance of relational self-knowledge highlights the necessity for openness in information technology, particularly with algorithms employed in individual decision-making.
(Aviraj et al., 2024)		Quantitative	India	• Ease of Use • Access to Resources • Age • Gender	• Chronic disease management • Monitoring the impact of treatment • Knowledge about the disease • Reduced hospital costs • Trend Analysis	• Mobile health app	The findings reveal that: • The feasibility, impact, and acceptability of the One Health application through quantifiable outcomes, including the percentage of patients attaining control of hypertension and diabetes, alongside statistical analyses of the data gathered over six months. • A notable decrease in mean diastolic blood pressure and glycosylated hemoglobin levels suggests favourable health consequences from utilising the program. • Factors impacting adoption were the frequency of data submission by patients, the technology's usability, access to resources, gender and age.
(Jacobs-Basadien et al., 2024)	UTAUT2	Qualitative	South Africa	• Subjective norms • Performance expectancy • Access to Resources • Perceived Enjoyment	• Chronic disease management • Disease tracking	• Mobile health application	The findings reveal that: • Masculinity-femininity adversely affected adoption, although indulgence exerted a beneficial effect. • The recognised cultural influences impacted adoption by moulding individuals' views and intentions around technology usage. • Cultures characterised by high masculinity may deter the utilisation of health technology, but those with high indulgence may encourage it. • Patients with a low socio-economic standing find it difficult to adopt the technology. • Applications are enjoyable if they make them achieve their goals • Medical Practitioners have a negative influence on the use of technology

AUTHOR	THEORY	METHODOLOGY	ORIGIN	FACTORS	OPPORTUNITIES	TECHNOLOGIES	MAIN FINDINGS
(Okati-Aliabad et al., 2024)	Self Determination Theory	Quantitative	Iran	• Affordability of the technology • Educational level • Technology self-efficacy • subjective norms	• Trend analysis • Chronic disease management • Reminder to take medication • Monitoring physical activity and exercise	• mobile health app	The study revealed that: • Patients who engage in exercise had superior glucose management. • Patients with improved access to resources, enhanced self-efficacy, and greater education readily accepted technology. • Patients with greater spousal support exhibited enhanced comprehension of their conditions, resulting in increased adherence and glycemic regulation.
(Zhang et al., 2024)		Qualitative	China	• knowledge about the disease • educational level • age • social identity	• Chronic disease management	• Continuos gluose meter	The findings revealed that: • Participants gained information through health education, peer sharing, and internet resources, which substantially influenced their self-management. • The participants (elderly) inadequate educational background constrained their capacity to understand and utilise health information. • Age-related memory impairments hindered participants' recollection of health education material, indicating a necessity for repetitive and diverse instructional strategies for the patients.
(Zivkovic et al., 2024)		Quantitative	Germany	• Perceived usefulness	• Chronic disease management • Monitoring the impact of treatment • Tracking of the disease • Trend Analysis • Improved Patient-Doctor Communication	• Smartphone-based diabetes self-management application. • real-time continuous glucose monitoring (rtCGM)	The research indicated that: • The shift to rtCGM led to a statistically significant decrease in average glucose levels, especially among those with type 2 diabetes. • The integration of a mobile health application with rtCGM allowed additional enhancements in glycemic regulation. • The research highlighted the significance of real-world data in assessing the efficacy of medical devices and digital solutions for diabetes management. • It also emphasised the capacity of real-world data to drive healthcare recommendations and assist regulatory choices.

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(Rochmah et al., 2024)		Quantitative	Indonesia	• Awareness • Educational level	• Chronic disease management • Enhanced Medication Adherence through reminders • Tracking of the disease	• Finger Stick Devices • Capillary Glucometer	The findings revealed that: • Fewer than 50% of children complied with the recommended self-monitoring of blood glucose recommendations. • Regular self-monitoring and adherence to blood glucose are associated with improved glycemic regulation, as seen by reduced HbA1c levels. • Consistent monitoring enables prompt modifications in therapy, perhaps mitigating problems. • The study observed that although 96% of patients were aware of self-monitoring technology only 27% engaged in the practice. This mismatch implies that knowledge alone may not ensure adoption, suggesting that further instruction and incentive may be required to convert awareness into practice. • The educational level was identified as a crucial determinant affecting SMBG practice. The research indicated that those with university education were more inclined to engage in self-monitoring of blood glucose (65.1%) than those with lesser educational qualifications. This indicates that greater education is associated with improved comprehension and involvement in diabetes care strategies.
(Kim et al., 2024)		Quantitative	South Korea	• Perceived usefulness • Affordability of the technology	• monitoring • reduced costs • reminders • adherence through reminders to take medication	Rt CGM	The study revealed that: • rt-CGM yielded an increase in self-monitoring and cost-effective outcomes • Despite elevated initial costs, patients look at the long-term health advantages and enhancements in their quality of life.

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(Ramadaniati et al., 2024)		Quantitative	Indonesia	• Access to Resources • Affordability of the technology • Awareness	• Chronic disease management • Knowledge about the disease • Personalised feedback	• Analogue insulin SMBG Devices	The study revealed that: • Insulin availability was greater in public healthcare institutions than in private pharmacies, although Self-Monitoring of Blood Glucose SMBG devices was more accessible in the private sector. • Access to insulin and self-monitoring blood glucose monitors enables patients to manage their diabetes more efficiently. Self-monitoring enhances awareness of blood glucose levels, facilitating prompt treatments. • Analogue insulin and SMBG devices were deemed costly for low-income persons, irrespective of the purchase source. • A comprehensive strategy is necessary to tackle the challenges of availability, cost, and affordability of these vital diabetes control tools.
(Adeleke et al., 2024)		Quantitative	Nigeria	• Education level • Age	Chronic disease management	• Glucometers	The findings reveal that: • There exists considerable heterogeneity in the practice of SMBG among patients, with urban patients exhibiting greater rates of SMBG than their rural counterparts. • The study revealed that individuals with greater educational attainment, especially those with tertiary education, were more inclined to engage in self-monitoring of blood glucose (SMBG) compared to those with no formal education, who exhibited lower rates of practice. • Higher educational attainment frequently corresponds with enhanced health literacy, empowering patients to comprehend medical information, grasp the significance of their blood glucose levels, and acknowledge the necessity of regular monitoring for efficient diabetes management.

AUTHOR	THEORY	METHODOLOGY	ORIGIN	FACTORS	OPPORTUNITIES	TECHNOLOGIES	MAIN FINDINGS
							• The study revealed that age did not exhibit a statistically significant correlation with the practice of SMBG.
(Molaee et al., 2024)		Quantitative	Iran	• Affordability of the technology	Cost-effective outcomes	• Continuos glucose meter	The findings reveal that: • Various costs are linked to complications arising from diabetes. • Individuals with diabetes who engage in self-monitoring of their blood sugar levels tend to experience lower costs in comparison to those who do not. • In addition, diabetic patients who engage in self-monitoring demonstrate an extended life expectancy compared to those who do not. • To achieve more cost-effective results, resources for self-monitoring related to diabetes, such as glucose strips, should also be reduced.
(Sehgal et al., 2024)		Qualitative	New Zealand	• Perceived ease of use • Perceived Usefulness • Access to resources • Perceived reliability • Affordability of the technology	• Chronic Disease Management • Reminders to take medication • Trend analysis	• xDrip+ app • Fit bit • Smartwatch • Continuos Glucose meter	The findings reveal that: • Participants perceived that using CGM improved both glycaemic control and aspects of quality of life. • Alarm and trend functionality allowed participants to perceive reduced glycaemic variability overnight and following meals. • The addition of a smartwatch increased discrete access to glucose information. • There was a high degree of trust in DIY-CGM. • Challenges while using DIY- -CGM included signal loss during vigorous exercise, alarm fatigue and short battery life.
(Robinson et al., 2024)		Quantitative	USA	• Social Identity • Awareness • Educational level • Age	• Chronic disease management • Tracking of the disease	• Glucometer • smartphone	The findings reveal that: • Cultural, social, and religious beliefs, lack of knowledge and language barriers are some of the factors identified that impact self-management among Arabic Speaking Background (ASB) individuals.

AUTHOR	THEORY	METHODOLOGY	ORIGIN	FACTORS	OPPORTUNITIES	TECHNOLOGIES	MAIN FINDINGS
				• Access to Resources			• It is suggested that a diabetes self-management education program tailored to ASB immigrant culture may be an effective way to encourage them to uptake self-management strategies. • Lifestyle monitoring is associated with enhanced disease management and a reduced risk for chronic diseases and mortality.
(Shaban et al., 2024)		Quantitative	Egypt	• Self-efficacy • Age	• Knowledge of the diseases • Chronic disease management • Adherence through medication reminders	• Mobile health application	The findings reveal that: • Self-tracking resulted in significant enhancements in participants with diabetes knowledge and self-efficacy levels. • Moreover, the intervention group demonstrated marked improvements in various self-care behaviours encompassing diet, exercise, medication adherence, blood glucose testing, and foot care. • Regression analyses highlighted age as a consistent factor associated with knowledge, self-efficacy, and specific self-care behaviours.
(Sergel-Stringer et al., 2024)		Qualitative	New Zealand	• Perceived ease of use • Affordability of the technology	• adherence to medication through auto pill fill reminders • chronic disease management • Knowledge of the disease	• real-time continuous glucose monitoring (rtCGM) (Dexcom,	The findings reveal that: • rtCGM is a facilitator of improved health behaviours • ease of use of rtCGM systems compared to capillary blood glucose testing makes them acceptable • Barriers to the continual usage of rtCGM technology include connection difficulties, the longevity of the sensors, and local cutaneous reactions to the sensor adhesive.
(Kytö et al., 2024)		Quantitative	Finland	• Perceived usefulness	• Chronic disease management	• Mobile application • continuous glucose monitor • activity tracker	The findings reveal that: • Self-tracking of lifestyle factors and glucose levels without additional guidance improves self-management and the treatment of gestational diabetes, which also benefits newborns. • this study supports the use of digital self-management and education tools.

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(Almulhem, 2023)	Healthcare Technology Acceptance Model (H-TAM)	Qualitative	Saudi Arabia	• Perceived Usefulness • Perceived Ease of Use • Subjective Norms • Education Level • Experience	• Cost-effective outcomes • Assist elders • Reduced Clinic visits • Improved patient-doctor communication	• Mobile application	• The findings reveal that: • Participants articulated that utilising self-tracking applications not only offers time savings by avoiding the need for physical hospital visits for appointment scheduling but also enables convenient access to medical information through virtual consultation services. • The consensus among participants is that mHealth significantly bolsters health management efficacy and fosters seamless healthcare service accessibility. • Elderly people or those with mobility impairments may encounter challenges in accessing healthcare owing to transportation limitations, thus highlighting the utility of mobile applications and technology in overcoming such barriers. • The perceived advantages encompass heightened access to clinical services and patient records, process optimisation, and diminished wait times, thus serving as compelling reasons to sustain engagement with mHealth platforms and technologies.
(Yan et al., 2023)		Qualitative	China	• Access to resources • Experience • Perceived Usefulness • Subjective Norms • Social Identity • Technology self-efficacy	• Chronic disease management • Knowledge of the disease • Trend analysis • Monitor physical activity and exercise • Personalised feedback	• Tablet-based self-monitoring system	The findings reveal that: • Patients with diabetes and hypertension anticipated positive results from utilising Quantified Self-technology. • They articulated that the utilisation of the system boosted their mental well-being, enhanced the comprehension of their medical condition, and supported them in effectively handling their health status. • Furthermore, they were able to self-monitor their diseases and get more information through data auto-recorded thus giving them feedback and insights.

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(Irace et al., 2024)		Quantitative	Italy	• Perceived usefulness • Perceived ease of use • Perceived Reliability	• Chronic disease management • Doctor-patient engagement • Trend analysis • Medication adherence • Personalised feedback	• Mobile health app	The findings reveal that: • Self-monitoring of blood glucose results in enhanced glucose control, patient adherence, and delivering feedback on blood glucose levels therefore assisting in the management of diabetes. • Remote patient monitoring (RPM) allows healthcare providers to sustain regular communication with patients, oversee medication regimens, and ensure the continuity of care for individuals with diabetes, ultimately leading to enhanced management and outcomes. • The incorporation of a specialised digital platform in clinical settings enables healthcare providers to gather, analyse, and monitor data in a user-friendly manner, promoting cooperation and timely adjustments in medication therapy. • Concerns regarding the dependability and precision of these glucose monitoring systems could impact the confidence and acceptance of these technologies.
(M. Lin et al., 2023)		Quantitative	China	• Access to Resources • Affordability of the Technology	• Chronic disease management	• continuous glucose meter	• The findings reveal that: • among 1388 T2DM patients, only 26.2% (363/1388) patients reached the SMBG standard, indicating low compliance with SMBG. • Given that SMBG is one of the individual predictors of type 2 risk in prediabetes patients, this result suggests that the SMBG adherence rate needs to be improved.
(Kytö et al., 2023)	Unified Theory of Acceptance and Use of Technology (UTAUT)	mixed methods	Finland	• Perceived usefulness • Perceived Ease of Use • Perceived Reliability	• Chronic disease management Knowledge of the disease • Trend Analysis	• continuous glucose monitor (CGM) • activity bracelet • hip-worn sensor	The findings reveal that • The continuous glucose monitor (CGM) was the most effective sensor for the self-discovery process, particularly in understanding the correlations between glucose levels and nutritional consumption.

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					• Monitoring Physical activity and exercise • Personalised feedback	• electrocardiography sensor	• Patients have difficulties in utilising data from continuous glucose monitors and physical activity sensors to facilitate self-discovery. • Essential elements are absent, including the ability to measure light physical activity and various forms of exercise beyond walking. • Data inconsistencies existed across various Quantified Self-technology tools along with disparities in the perceived and observed measurement of physical activity.
(G. Ma et al., 2023)		Quantitative	China	• education level • age • access to resources	• knowledge of the disease • Personalised feedback	• smart devices	The findings reveal that: • Education level, age, and complications were identified as significant factors influencing self-quantification among patients with hypertension. • Patients without medical insurance, with lower education levels, older age, and no complications tended to have lower levels of self-quantification. • There is a necessity for targeted interventions to improve self-quantification in these specific patient groups. By addressing the identified influencing factors, healthcare providers can implement measures to enhance self-quantification among patients with hypertension. Abbreviation:
(Fayyaz et al., 2023)		Quantitative	Iran	• Affordability of the technology • Subjective Norms • Awareness • Age	• Chronic disease management	• glucometers	The findings show that: • The price and availability of glucometer strips influenced glucose level monitoring. • In univariate analysis, only age and HbA1C levels showed a negative correlation. • however, parents' consistent checking showed a positive correlation with the frequency of daily, weekly, or monthly glucose checking.

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(Zhang & Mao, 2023)	Theory of Reasoned Action (TRA) & Technology Acceptance Model (TAM)	Quantitative	USA	• perceived usefulness • Perceived ease of use • Technology self-efficacy • Subjective Norms • Affordability of the technology	• chronic disease management	• Wearable fitness device	The findings show that: • Three factors—cognitive, affective, and motivational—have emerged as key determinants of consumers' intention to adopt wearables, with affective factors having the most explanatory power. • Individuals' attitudes affect their intention to adopt wearables, whereas perceived subjective norms do not. We create a broad affective-cognitive-social-motivational approach to understanding consumer adoption of technology by incorporating the third and fourth determinants, affective and motivational factors.
(Zhang et al., 2023)	protection motivation theory (PMT)	Quantitative	Pakistan	• Perceived Usefulness • perceived ease of use • Perceived Enjoyment	• knowledge of the disease	• wearables devices (smartwatch, fitness tracker	The findings show that: • Wearable healthcare devices (HWDs) are strongly influenced by the PEOU of the technology and hedonic motivation during COVID-19. • Senior citizens are highly receptive to perceived usefulness, accurate information accuracy, self-efficacy, perceived severity, health consciousness, and perceived vulnerability.
(Martínez-Ibáñez et al., 2023)		Quantitative	Spain	• Perceived Usefulness • Technology Self Efficacy • Educational Level • Awareness • Affordability of the technology	• Chronic Disease Management • Cost-effectiveness outcomes	• Continuous Glucose Monitor	The findings show that. • Self-monitoring techniques are useful in blood pressure management. • Self-monitoring reduces healthcare costs as the patient doesn't need hospitalisation. • High-level patient empowerment/awareness strategies are required for self-monitoring to be effectively done as only those with high technology self-efficacy and high educational levels understand the importance of self-monitoring.
(Jakowski, 2022)		• Quantitative	Germany	• Perceived Usefulness • Age • Awareness	• Tracking of Physical Activity and Exercise • Trend Analysis	• Smartphone app • wearables	The findings reveal that: • The use of Self Tracking technology namely a sleep app among the assessed athletes was unexpectedly low, with fewer than 20% actively

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					• Personalised feedback		utilising sleep tracking tools. This signifies an absence of involvement with self-tracking devices in this setting. • The use of these technologies exhibits minimal variation across diverse athlete demographics. • Self-tracking devices may enhance athletes' self-awareness and accountability about their rehabilitation. Nonetheless, there is a significant deficiency of data about user behavior and contemporary sleeping patterns among athletes. • Some respondents concurred that sleep-tracking applications are advantageous, but others were ambivalent or disagreed.
(Kimura et al., 2022)		Qualitative	Japan	• Perceived Usefulness • Subjective Norms • Technology Self Efficacy • Affordability of the technology • Perceived Ease of Use	• Monitoring of physical activity and exercise • Collaborate with doctors • Cost-effectiveness outcomes • Chronic Disease management • Reduced Cost	• intermittently scanned continuous glucose monitoring	The findings reveal that: • Family and patient involvement is crucial in promoting the use of self-monitoring technologies. • Self monitoring reduces costs associated with hospitalisations • The advantages of self-monitoring identified were precise evaluations of physical activity and nutrition, a heightened desire for self-management, and the development of a strong rapport with the attending physician. • The Complexity of the application may hinder adult adoption. • Reasons for non-adoption included time constraints, forgetfulness, and self-consciousness.
(Grosová et al., 2022)	(UTAUT)2	Mixed Methods	Czech Republic	• Performance Expectancy • Habit • Affordability of the technology	• Trend Analysis • Monitoring of physical activity and exercise	• wearable electronics (fitness watch) • smartphone applications.	The findings showed that: • The factors influencing the adoption of self-tracking technologies are habit, social influence, performance expectancy, effort expectancy and personal health motivations

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				• Effort expectancy • subjective norms • Facilitating conditions • Perceived Enjoyment	• Personalised Feedback		• Consumers don't just consider the price but the design, convenience and benefits of the device • Wearable gadgets offer tailored feedback and insights derived from user data, assisting individuals in making educated choices regarding their health and fitness regimens. • Fitness watches can incentivise consumers to participate in consistent physical exercise. • Numerous users see that monitoring their progress and receiving prizes or points for accomplishing objectives introduces a gamified aspect to their fitness regimens, enhancing the enjoyment of exercising.
(Schretzlmaier et al., 2022)	UTAUT2	Qualitative	Germany and Austria	• Perceived Usefulness • Social Influence • Access to Resources • Habit • Age • Facilitating conditions • Perceived Enjoyment • Perceived Ease of Use	• Chronic disease management	Mobile health app	The findings reveal that: • It is crucial to get support from medical professionals for the long-term acceptance of self-tracking mobile applications • There is a necessity for apps to have help functions such as video tutorials as they encourage continued use • Apps will be used if they are deemed essential in diabetes management and providing feedback on blood glucose levels • Two additional constructs that may also need to be considered to predict mHealth acceptance better: are trust and perceived disease threat. • Perceived enjoyment and habit were highlighted as essential for the acceptance and long-term use of mHealth self-management apps in diabetes.

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(Chittem et al., 2022)		Qualitative.	India	• Subjective Norms • Affordability of the technology • Education Level • Technology Self-efficacy • Awareness • Social Identity	• Chronic disease management • Adherence to medication • Knowledge of the disease		The findings reveal that: • Patients had confusion with the use of self-tracking resulting in non-adherence. • Owing to social constraints to avoid stigma, intrusiveness, and being misunderstood, family members often promote alternative therapy. • Cost is considered a crucial adoption factor as money is to be spent on medication only. • There is a need for awareness of the benefits of self-tracking among diabetics, physicians, and communities.
(Utesch et al., 2022)	Social Cognitive Theory	Quantitative	German	• Perceived Usefulness	• Monitoring of physical activity and exercise	• Smartphone application • Fitbit	The findings reveal that: • Activity tracking using fitness trackers and externally assigned goals does not drive greater physical activity behaviour. • substantial individual differences that should be targeted in future studies to better understand individual behavioural processes boosting or hindering daily activity.
(Findeis et al., 2021)		quantitative	Germany	• Privacy Concerns • Affordability of the technology • Data Misuse • Perceived Ease of Use • Reliability • Access to Resources • Age • Educational Level	Trend Analysis	• smartphones • wearable tools • mobile applications	The findings reveal that: • The cost of constantly gathering and integrating data, as well as perceived pressure to share data and discomfort with the information disclosed, is the most often cited reason for giving up Self Tracking (ST). • ` These considerations are often accompanied by frustration over unmet success expectations. • Losing interest in the device was one of the less common causes mentioned. • Socioeconomic indicators showed that self-trackers had no gender bias.

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(Lupton, 2021)		Qualitative	Australia	• Privacy concerns • Data misuse • Perceived Usefulness	• Trend Analysis. • Monitoring of Physical activity and exercise	• Mobile applications	The findings reveal that: • Self-tracking activities are intricately connected to notions of data privacy and interpersonal interactions. • Participants frequently exhibit a lack of knowledge about data privacy concerns, notwithstanding their education on possible data damages. • The context of sharing self-tracked data is very changeable and impacted by interpersonal connections and the perceived significance of the information.
(Mak et al., 2021)		Quantitative	China	• Educational Level • Access to Resources • Age • Technology Self-Efficacy • Perceived Usefulness • Age	• Monitoring • Disease management • adherence		The results show that: • Self-monitoring of blood glucose is beneficial since it promotes adherence. • Adoption and adherence to blood glucose guidelines are influenced by internal psychological and educational factors. • It is necessary to conduct more research on the various aspects impacting blood glucose self-monitoring.
(Zhao et al., 2021)	Cognitive-Motivational-Relational Theory	Quantitative	China	• Perceived Enjoyment • Perceived Usefulness • Personalised feedback	Trend Analysis	• smartwatches • smart glasses • wearable devices	The findings show that: • Consumers cognitively assess the perceived value (utilitarian and hedonic values) associated with their disruptive innovations, according to the findings (appraisal process). • Customers will feel satisfied (an emotional response) if the results are favourable, which will in turn encourage behaviours like word-of-mouth advertising (coping activity).

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(Lu et al., 2021)	Social Cognitive Theory	Qualitative	China	• perceived usefulness • subjective norm • data misuse concerns • perceived ease of use • data privacy concerns • experience • technology self-efficacy	• Disease management • Knowledge of the disease • Cost-effective outcomes	• wearable blood pressure monitoring systems including • wrist- band devices • mobile phone app programs. • smartphones	Their findings imply that: • People's decisions to track and select tools are often influenced by content/ reviews they encounter on social platforms such as the usefulness of the app, the risks, and the ease of use of utilising the technology. • they then leverage social platforms to share their tracking data or progress
(Jean François De Moya et al., 2021)	Extended Valence Framework	Quantitative	Europe	• perceived usefulness • perceived ease of use • data misuse • subjective norm • Privacy concerns • Reliability of the technology	• Data collection • Reduce medical expenses. • Disease management • Knowledge about the disease • Assist elders. • Patient-physician communication	• Mobile applications • Wearables (activity trackers, wearable fitness trackers, wearable fitness technology, smart wristbands, or smart bracelets)	Their findings reveal that: • Factors influencing the adoption of ST should be categorised into technological factors, societal factors, and health dimensions. • the perceived benefits and advantages surpass the physical, performance, and privacy threats. • Vulnerabilities include privacy risks, time-wasting, and reliability.
(Lv et al., 2021)	Self and Family Management Framework	Quantitative	China	• Age • Access to Resources • Awareness • Technology Self Efficacy • Subjective Norms	• Adherence to medication	Continuous Glucose Monitor	Their findings reveal that: • The low adherence of young people with T1DM to self-tracking of their blood glucose is concerning in China, where there is a dearth of awareness regarding young adults' self-monitoring. • Patients with families with high income and social support are more adherent to SMBG.
(Almegbel & Aloud, 2021)	(UTAUT)	Quantitative	Saudi Arabia	• perceived usefulness • perceived ease of use • subjective norm	• Trend Analysis • Cost-effective outcomes	Mobile apps	• According to the study, the adoption of the Quantified Self is positively impacted by perceived worth.

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				• Affordability of the technology • Subjective Norms • Perceived Reliability • Social Identity	• Tracking of the disease • Personalised feedback		• Quantified Self-technology is more likely to be adopted if there is an emotional benefit to using the technology.
(Chebolu, 2021)	Technology Acceptance Model and Self-Determination Theory	Quantitative	USA	• Social influence • Technology self-efficacy • Data Misuse	Trend Analysis	Chip implants	The study reveals that: • Technological trust is a crucial component of implanted technology utilization. • Trust, usability, computer self-efficacy, and the usage of technology all significantly correlated.
(Wilkowska et al., 2021)	Technology Acceptance Model	Quantitative	Germany	• Gender • Age • perceived usefulness • perceived ease of use • experience • technology self-efficacy	• Trend Analysis • Knowledge of the disease • Personalised feedback	• wearable sensors	The findings demonstrate that: • The primary determining factor for user acceptance of lifelogging is prior lifelogging experience. • The adoption of lifelogging for daily activities is greatly increased by high levels of technological experience and self-efficacy. • Age and gender also indirectly influence acceptance.
(S. M. M. Lee & Lee, 2020)	• TPB • UTAUT2 • Knowledge, Attitudes, Practices, and Beliefs (KAPB)	Quantitative .	Korea	• Awareness • Attitude • Social Identity • Technology self-efficacy	Perceived usefulness	• Mobile app • Wearable device (Smartwatch)	The findings reveal that: • Knowledge, attitudes, and beliefs about internal determinants had a favourable impact on how people use wearables and applications for healthcare. • In addition, the study discovered associations between actual use behavior, technological characteristics, and social aspects that were favorable.
(Liu et al., 2020)		Quantitative	Austria	• Perceived Usefulness • Perceived Ease of Use		Mobile app	The findings show that:

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					• Adherence through reminders • Chronic disease management • knowledge about the disease • data collection • monitoring of activity and physical exercise		• One of the benefits derived from digital self-tracking for cardiac rehabilitation patients since they consider the applications helpful for managing their condition, reminders and adhering to their medication. • Several intervention features were supportive of self-management, including blood glucose, blood pressure, and medication monitoring, communication with health care providers, automated feedback, personalised goal setting, reminders, education materials, and data visualisation.
(Dulaud et al., 2020)			Europe	• Perceived Usefulness	Personalised feedback	Fitbit app	The findings suggest that : • Challenges in self-tracking include wrong tools and not collecting the right data. • Positivity from self-quantification experiences can be considerably increased with a strong grasp of one's habits. • Although there are theoretical models for the quantified self, they are too abstract to serve as a design framework for efficient user adoption systems. • Multi-factor user models should be used in modeling strategies.
(Ajana, 2020)		Quantitative	USA/UK	• Social identity • Perceived usefulness • Privacy • Data Misuse	• Monitoring of Physical Activity and Exercise	• Digital Tracking Devices(Smartwatch) • FitnessApps • Fitbit devices • Smartwatch	The findings reveal that: • Keeping track of one's progress has a variety of advantages for the user, especially in terms of boosting and promoting a healthier and more active lifestyle. • Self-tracking helps inspire people to achieve their goals. • The data-driven and quantified features of self-tracking can occasionally result in excessive self-monitoring that puts pressure on the user to perform following specific health standards, leading to feelings of

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							inadequacy and making it difficult to enjoy the exercise activities themselves. • The lack of worry regarding the utilisation and dissemination of self-tracking information with external entities appears to be the dominant aspect of participants' views towards privacy and data protection.
(Heyen, 2020)		Qualitative	Germany	• Perceived usefulness	• Trend Analysis	• Smartphones • Mobile apps	The findings provide evidence that: • self-tracking is useful as knowledge is produced, however not just 'through numbers' but rather by detailed, sophisticated self-tracking activities that could be referred to as "personal science".
(Brohi et al., 2020)		Quantitative	Pakistan	• Awareness • Experience • Affordability of the technology • Subjective Norms	Chronic disease management		The results indicate that: • It is necessary to be aware of the benefits of SMBG. • Patients should be educated and encouraged to self-monitor by doctors because they trust doctors' advice. • Affordability and inconvenience owing to a lack of awareness were significant barriers to self-tracking. • Experience, a desire to observe the results of dietary modifications, a wish to win over the doctor, and family motivation were the facilitators.
(Gangadharbatla, 2020)	TAM	Quantitative	USA	• Age • Gender • Technology self-efficacy • Experience • Perceived Usefulness • Perceived Ease of Use • Perceived Risk	• Trend Analysis • Personalised feedback	• Wearable smartwatches • Fitness tracking bands like Fitbit, Runtastic • smart glasses	The results show that: • People are increasingly considering changing their natural bodies, despite the ethical, moral, and legal implications. • perceived simplicity of use, technology self-effectiveness, gender (primarily males), age (mainly younger users) and privacy considerations are mainly considered before the adoption of wearable technologies.

AUTHOR	THEORY	METHODOLOGY	ORIGIN	FACTORS	OPPORTUNITIES	TECHNOLOGIES	MAIN FINDINGS
(Breil et al., 2019)	Unified Theory of Acceptance and Use of Technology	Quantitative	German /Austria	• Performance expectancy • Perceived Ease of Use • Technology Self-Efficacy • Experience • Age • Gender • Subjective Norms • Access to Resources	• Disease management • Reminders • Cost-effective outcomes	Mobile health apps	The findings reveal that: • Perceived health threats, openness to new experiences, and performance and effort expectations are factors that influence people with hypertension's acceptance of mHealth apps for self-management. • In contrast to gender, which was unimportant, age revealed a negative connection with use. • Self-efficacy was not found to be a factor in people's acceptance of mHealth.
(Lupton, 2019)		Qualitative	Australia	• Perceived usefulness • Awareness Perceived Enjoyment	• Better disease management • Monitoring • Knowledgeable about the disease • Self-awareness and self-control	• Mobile health apps • Smartphones • tablets • Wearable gadgets • fitness tracking bands • smartwatches	The findings reveal that: • Self-tracking in health and illness proved beneficial in achieving knowledge, awareness, problem-solving; taking control; and feeling better. • Many participants' tracking of the biographical, interpersonal, and situational aspects of their lives served as a foundation for both their desire to carefully monitor some areas of their lives and their drive to carry on.
(Zhang et al., 2019)		Quantitative	China	• Awareness • Privacy • Age • Educational level • Affordability of the technology	• Disease management • Doctor-Patient Communication	Mobile app	The results show that: • Consumers who distrust the data collected by Quantified-Self devices are more inclined to dismiss the technology and favour diagnoses provided in a medical setting. • The majority of individuals are oblivious to diabetic mellitus applications.

AUTHOR	THEORY	METHODOLOGY	ORIGIN	FACTORS	OPPORTUNITIES	TECHNOLOGIES	MAIN FINDINGS
							• Age, type of diabetes, educational attainment, family income, and geographic location were all associated with app usage among adult patients. • Unawareness, legalities, mistrust, and financial concerns were some of the obstacles.
(Zhang et al., 2019)	Extended (UTAUT)	Quantitative	China	• Awareness • Access to Resources • Affordability of the technology • Technology Self Efficacy • Data misuse	Chronic Disease management	Mobile app	The findings reveal that: • To comprehend patients' behavioural intentions, context-related determinants should be considered. • The primary barriers to utilising the Quantified Self-technology include insufficient awareness of potential healthcare tools, inadequate internet access in remote areas, perceptions regarding the seriousness of their current diabetes management, costs, a deficiency in technological proficiency, and a diminished level of trust.
(Riggare et al., 2019)		Mixed Methods	Sweden	• Perceived Usefulness	• Disease management • Tracking of Diseases	• Wearable tech • (Smartwatch • Pedometers • activity Tracker)	The findings show: • The importance and effectiveness of Quantified Self technologies in managing Parkinson's disease (PD), particularly tracking motor symptoms, as well as other critical parameters like medication use, stress levels, food, and sleep.
(Khakurel et al., 2019)	• Wearable Acceptance model and UTAUT	Quantitative	Finland	• Privacy Concern • Gender	Trend Analysis	Wearable tech	The findings reveal that: • depending on gender, the intention to use and embrace self-quantification technology is significantly influenced and important by privacy concerns and risks.
(Kim et al., 2019)		Qualitative	Korea	• Perceived Usefulness Perceived Ease of Use	• Data collection leads to self-knowledge. • Disease tracking	Mobile application	The findings reveal that:

AUTHOR	THEORY	METHODOLOGY	ORIGIN	FACTORS	OPPORTUNITIES	TECHNOLOGIES	MAIN FINDINGS
					• Personalised feedback		• Utilising the smartphone application OmniTrack illustrates that the Quantified Self approach aids autistic individuals in managing negative emotions and anxiety during interactions with the tracker. • and observing detailed settings, causes, and repercussions of troublesome circumstances. • Self-tracking was beneficial. Teens with autism learned more about themselves.
(Mishra et al., 2019)		Qualitative	USA	Perceived Usefulness	Knowledge of the disease	Smartphones apps	• The findings reveal that: • self-tracking technologies can assist people with Parkinson's disease (PD) in coping with changes in their condition, planning for their decline and dealing with it healthily, overcoming their ingrained avoidance tendencies, and facing the reality of their condition.
(Jeffrey et al., 2019)	• Health Belief Model (HBM) and HITAM	Qualitative	Australia	• Perceived Usefulness • Perceived Reliability • Attitude • Perceived Ease of Use • Experience • Awareness • Access to resources • Affordability of the technology	• Chronic Disease management • Trend analysis	Mobile phone application	The findings reveal that: • While older individuals who believe Quantified Self is simple to learn will be more likely to want to learn how to use it, older adults who believe it is too difficult to use, or a waste of time will be less likely to want to adopt this technology. • Opinions of adults' own experiences and perceived usefulness were viewed as facilitators and barriers to the usage of mobile applications for diabetic self-management. • User-friendly design and visible fonts supported use. • Lack of awareness impeded the adoption of Quantified Self-technology.
(Yu et al., 2019)		Quantitative	China	• Perceived Usefulness • Perceived Ease of Use	• Chronic disease management • Personalised feedback	Mobile applications	• The findings reveal that: • Individuals' health can be considerably improved by using a diabetes mobile health application namely Diabetes-Carer

AUTHOR	THEORY	METHODOLOGY	ORIGIN	FACTORS	OPPORTUNITIES	TECHNOLOGIES	MAIN FINDINGS
							• Through personalised feedback, diabetic patients can improve their blood glucose levels.
(Apolinário-Hagen et al., 2018)	UTAUT	Quantitative	German	• perceived usefulness • perceived ease of use • subjective norm • Experience • Technology Self-Efficacy	• Disease management • Adherence to medication	Mobile health apps	• The findings reveal that: • Quantified Self-technology is advantageous in controlling multiple sclerosis by enhancing adherence, self-management capabilities, and fatigue regulation. • MS apps must be useful and have PEOU for them to be used. • Technology Self-efficacy is not an influential factor in the adoption • of Quantified Self-technology.
(Schroeder et al., 2019)		Mixed Methods	USA	• Perceived Usefulness • Subjective Norms	• Tracking of diseases • Disease management • Knowledge of the disease • Monitoring of diseases		• They discovered that: • Individuals suffering from migraines employ Quantified Self-technology to gain insights into their condition, predict and avert future episodes, and cultivate motivation and social acceptance. • They further identified that the Quantified Self presents opportunities to learn more about their disease thus effectively managing it. • Support from practitioners to suggest self-quantification to patients
(Rupp et al., 2018)	Self Determination Theory (SDT)	Quantitative	USA	• Perceived Usefulness • Age • Subjective Norms • Technology self-efficacy • Data Misuse • Perceived Ease of Use	Tracking of diseases	Wearable Fitbit	The findings reveal that: • Age, computer self-efficacy, and Perceived Ease of Use (PEOU) affect behavioural intention to embrace self-tracking technology. • Older adults often have more difficulty than younger adults learning new technology as they may not trust the technology and have lower self-efficacy. • Because they may lack confidence in the technology and have

AUTHOR	THEORY	METHODOLOGY	ORIGIN	FACTORS	OPPORTUNITIES	TECHNOLOGIES	MAIN FINDINGS
							poorer self-efficacy, older folks may have more trouble than younger adults understanding new technologies.
(Kooiman et al., 2018)		quantitative	Netherlands	• Perceived Usefulness • Technology Self-efficacy • Subjective norms	• Tracking of diseases • Adherence to medication	• Activity tracker • Fitbit zip	• The findings reveal that: • The perceived usefulness of self-tracking was realised through physical activity amongst type 2 diabetes. • Social norms led to adherence as the diabetics got family support.
(Zhao et al., 2018)		Quantitative	China	• perceived usefulness • perceived ease of use • subjective norm • data misuse • age • awareness	• Disease prediction and management • Monitoring	Mobile health app	The findings show that: • Different age groups have moderating impacts on the uptake of mobile health services. • For middle-aged and older consumers, perceived ease of use, perceived vulnerability, and perceived severity are crucial considerations while using mobile health services.
(Lee & Lee, 2018)	• Theory of Planned behaviour (TPB) • Social Cognitive Theory (SCT)	Quantitative	South Korea	• Subjective Norms • Affordability • Self-efficacy • Awareness	Chronic disease management	Wearable healthcare devices	The findings reveal that: • People with high self-efficacy are more aware of technology and more likely to adopt it. • Self-efficacy is the highest influencer of wearable tech adoption. • The desire to use a wearable fitness tracker is significantly and favourably correlated with interpersonal influence, individual inventiveness, self-efficacy, attitudes about the equipment, health interests, and perceived cost of the gadget. • Respondents who were aware of self-tracking showed higher adoption rates.
(Maltseva & Lutz, 2018)	Stage-Based Model of	Quantitative	Norway	• Privacy • Trust	Trend Analysis	• wristbands • smartwatches	The findings reveal that:

AUTHOR	THEORY	METHODOLOGY	ORIGIN	FACTORS	OPPORTUNITIES	TECHNOLOGIES	MAIN FINDINGS
	Personal Informatics					• mobile applications	• Self-tracking app users and wearable gadget users are also more prone to provide personal information in other situations. • Personality traits, trust issues, and privacy concerns all have a negative impact on self-quantification.
(Allouch & van Velsen, 2018)		Quantitative	Netherlands	• Age • Perceived ease of use	• Collaborate with doctors • Trend analysis	• wearable technologies	The findings reveal that: • The uptake of Quantified Self-technology by sports physiotherapists is rather low but the intention to adopt Quantified Self-technology by sports physiotherapists is quite high. • Collected data can be used in collaboration with their therapists to make informed decisions.

Appendix K-Proof of Editing After Examination

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Professional EDITORS Guild

CERTIFICATE OF EDITING

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TITLE: A QUANTIFIED SELF TECHNOLOGY FRAMEWORK FOR MONITORING AND MANAGING DIABETES

AUTHOR: BELINDA MUTUNHU (STUDENT NUMBER: 69970777)

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DATE: 26 May 2026

EDITOR'S COMMENT

The author was advised to effect suggested corrections regarding clarity of terms, consistency in structure and logic, and expression. The reference list was not edited.

Signature

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