

**Business model innovation for digital health
entrepreneurship in primary healthcare in South
Africa**

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requirements for the degree of Master of Management in the field of
Digital Business**

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ABSTRACT

Introduction and Background:

The study investigates the real-life encounters of entrepreneurs in the digital health sector in South Africa, with a focus on their innovative approaches in improving primary healthcare services. It compares seven different digital health ventures (A - G), and explores the challenges related to accessing high quality healthcare, examining how incorporating digital health technologies (DHTs) and developing creative business models is improving Primary Healthcare services in South Africa.

Research Problem and Objectives:

The central research question examines how digital health entrepreneurs can enhance the accessibility and quality of healthcare services through innovative business models, thereby addressing the challenges identified in primary healthcare.

Methodology:

For this research a qualitative approach was taken, involving a multiple case study of the seven digital health ventures operating in South Africa. The data collection comprised semi-structured interviews with CEOs/Founders and performing document analysis. The Business Model Canvas and Systems Thinking frameworks were employed in analyzing the gathered data.

Key Findings:

Accessing Quality Healthcare Challenges:

Digital health ventures are tackling geographical and socio-economic challenges through telehealth and mobile health (mHealth solutions). Real world experiences demonstrate how these digital health ventures connect healthcare professionals with specialists, enhancing access for rural and underserved areas that make use of Primary Healthcare services in South Africa.

The focus is on personalized and community specific interventions that prioritize patient centered care adapted to local settings, going beyond the generic digital health tools analysed in existing literature on digital health entrepreneurship.

The incorporation of Digital Health Technologies (DHTs)

The digital health ventures demonstrate real world use cases of DHTs like using AI based analysis, for treatment and telehealth for monitoring from a distance. These uses are in line with. going beyond the knowledge found in current research on Digital Health.

Research results illustrate the significance of customizing DHT implementations to address community requirements shedding light on the obstacles and possibilities of merging technologies, in various healthcare settings.

Innovative Business Models:

The digital health ventures employ unique and customized revenue models, such as subscription fees and strategic partnerships, that go beyond the generic models discussed in the literature.

Case studies based on the digital health ventures, illustrate the practicalities of partnership models, showcasing collaborations with healthcare providers and public health organizations, which enhance the understanding of business model adaptability in the digital health ecosystem.

Conclusions and Implications:

The study concludes that innovating business models, in primary healthcare could transform healthcare services in South Africa. Digital health entrepreneurship not only improves primary healthcare outcomes, but also enhances patient engagement. The research also emphasizes the significance of forming partnerships, establishing sustainable revenue models, and implementing supportive policies to maximize the advantages of digital health solutions.

KEYWORDS

Digital health, primary healthcare, business model innovation, telemedicine, mHealth, South Africa.

DECLARATION

I, Dalitso Chindongo, declare that this research report is my own work as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Management in the field of Digital Business at the University of the Witwatersrand, Johannesburg. It has not been submitted before, for any degree or examination in this or any other university.

Name: Dalitso Chindongo

Signature: DChindongo

Signed atRandburg.....

On the28th..... day of ...February..... 2024.....

DEDICATION

This work is wholeheartedly dedicated to my wife, Gertrude, and our two sons, Kondwani and Bupe. Gertrude, your unwavering support, love, and belief in me have been the bedrock upon which I've built my aspirations. To Kondwani and Bupe, your joy, curiosity, and boundless energy have been my greatest source of inspiration and motivation. In the moments of doubt and challenge, it was the thought of you three that reminded me of my purpose and fueled my determination. This achievement is not just mine but ours, a reflection of our shared dreams, sacrifices, and love. Thank you for being my constant light and for making every effort worthwhile.

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LIST OF ACRONYMS

BMC – Business Model Canvas

BMI – Business Model Innovation

BM – Business Model

DH – Digital Health

DHT – Digital Health Technologies

NCD – Non-Communicable Disease

PHC – Primary Health Care

SRQ – Sub Research Question

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CHAPTER 1. INTRODUCTION

1.1 Statement of purpose

The research explores how digital health entrepreneurs in South Africa, go about creating innovative business models that address identified challenges and improve access to and the quality of primary healthcare. Through in-depth interviews with the entrepreneurs, and looking at other sources, the research aims to uncover the motivations, strategies, and potential impact of the digital health entrepreneurs in shaping more inclusive and effective primary healthcare solutions through the vehicle of digital health entrepreneurship.

1.2 Background Context

The primary healthcare system in South Africa faces significant hurdles, such as disease burden brought about by HIV/AIDS and tuberculosis, inequalities in healthcare access and limited resources especially for those in the rural areas (Maphumulo & Bhengu, 2019) . Additionally there are shortages of staff and infrastructure in the public health system (Rensberg, 2021). Similar to other developing countries South Africa also grapples with the gap that separates those with access to modern technology from those without (Chomunorwa et al., 2023). This digital divide presents a barrier, for entrepreneurs working in rural regions aiming to implement digital health solutions. Despite these obstacles, digital health entrepreneurs have developed business models that effectively address these challenges. Their innovative business models are tailored to meet the local needs of South African primary healthcare. This has been made possible by leveraging digital health technologies that are widely used across both rural urban areas of the country(Vassen, 2014) .

The research project investigates seven digital health ventures each offering solutions that address the described challenges. These innovations encompass telemedicine platforms and mobile applications designed for disease management and patient education.

1.2.1 Entrepreneurial Environment

The entrepreneurial landscape in South Africa, particularly within the digital health sector, is expanding steadily despite encountering various obstacles. Securing funding for health startups can be challenging, impacting the growth and scalability of these ventures (Plummer et al., 2016).

Navigating the health sector's regulatory framework can be complex for new entrepreneurs (Mgozi & Weeks, 2015). While there is growing acceptance of digital health solutions, factors like internet connectivity, digital literacy, and cultural acceptance vary across different regions, and these act as barriers to technology adoption (Cheng et al., 2020).

1.2.2 Contextual Uniqueness: South Africa vs. Developed Countries

Conducting this study in South Africa offers unique insights due to the country's specific healthcare challenges, such as its high disease burden and healthcare access inequities. In contrast to more advanced nations with standardized and well-equipped healthcare systems, South Africa is in a unique position where the implementation of digital health solutions could greatly benefit underserved communities where most of the health challenges occur (Maphumulo & Bhengu, 2019).

1.2.3 Relevance To Similar Contexts

Findings from this study could be relevant to other emerging economies with similar healthcare challenges. The discussed possibilities of implementing health solutions could offer scalable frameworks to improve primary healthcare in areas, with limited resources. This research therefore seeks to provide insights, into developing innovative business models for digital health in resource constrained settings

1.3 Research problem

The healthcare system in South Africa faces numerous challenges, including a shortage of healthcare personnel and limited availability of high-quality healthcare services. These issues are particularly problematic for individuals residing in remote and rural areas, who struggle to access primary healthcare. Additionally, underlying structural factors have further contributed to the declining quality of healthcare services (Maphumulo & Bhengu, 2019).

In response to these challenges, the advent of digital health ventures provides a promising avenue for improving the provisioning of quality healthcare. (Sony et al., 2023)

This study explores how entrepreneurs, in digital health are adapting their business models to tackle healthcare issues. The main goal is to understand how these entrepreneurs implement solutions that improve access to and the quality of healthcare services especially for marginalized communities. Through an analysis of their methods, the study seeks to offer insights, into the approaches and tactics used by digital health entrepreneurs for innovating business models.

These insights will be beneficial not only for aspiring entrepreneurs but also for policymakers and stakeholders who are looking to leverage digital health to improve primary healthcare in South Africa. The study's findings could inform future strategies and policies aimed at overcoming the existing barriers in the healthcare sector and ensuring that quality healthcare is accessible to all, especially those in underserved areas.

1.3.1 Foundational Context

To build the foundation and context for this study, a mix of seminal and recent references is essential:

Seminal References on Business Model Innovation

Prominent practitioners in their book "Business Model Canvas", introduce a framework for understanding and innovating business models which can be

applied to business model innovation in healthcare (Osterwalder & Pigneur, 2010). The Business Model Canvas is widely recognized as a tool for creating, analyzing and evolving business models. Its significance lies in its capacity to assess and compare the dynamics of business models in health ventures examined in this research project. By using the Business Model Canvas one can gain an understanding on how digital health ventures are transforming the healthcare industry by accenting improved accessibility and quality of healthcare services.

In his exploration of business models the author delves into the complexities of opportunities and challenges within this domain highlighting the importance of business model innovation in economic and entrepreneurial contexts (Chesbrough, 2010). The concept of Open Innovation suggests that companies should embrace both external ideas as well as internal and external pathways to markets when aiming to advance their innovations. This idea holds significance for health entrepreneurs who could benefit from incorporating innovation practices into their innovative business models (Chesbrough, 2010).

Seminal References on Digital Health Entrepreneurship

Christensen, Grossman, and Hwang's groundbreaking book, "The Innovators Prescription; A Disruptive Solution, for Health Caren" offers a framework for exploring how disruptive innovation can make changes in the healthcare industry. This influential work is crucial for digital health startups as it explains how new technologies and business model innovation can lead to effective, affordable and accessible healthcare solutions (Christensen et al., 2009). This directly relates research project and drawing on foundations and practical insights from the book, illustrates how innovative business models can transform primary healthcare services.

Disruptive Innovation in Healthcare

In the field of healthcare "The Innovators Prescription" focuses on the idea of innovation. This concept involves introducing innovations that enhance the accessibility and affordability of products and services by establishing markets or

transforming existing ones. Within the healthcare sector disruptive innovations have the potential to broaden access, to services delivering care to underserved communities (Christensen et al., 2009). For entrepreneurs in health in South Africa grasping and implementing these principles is essential, for creating business strategies and models that cater to the needs of primary healthcare.

Key Concepts and Their Relevance

Value Networks and Disruptive Innovation

According to Christensen and colleagues' innovations that alter the way value is provided can disrupt value networks, which consist of suppliers, producers and consumers (Christensen et al., 2009). In South Africa it is key for digital health ventures to identify and utilize value networks. For instance telemedicine and mobile health applications have the potential to revolutionize healthcare services by offering consultations and real time health tracking catering to the requirements of rural and underserved communities (Agarwal et al., 2021; Narula, 2020).

Business Model Innovation:

Christensen and his colleagues also stress the importance of business models, for innovations to succeed. This aligns with the study's focus as entrepreneurs in health need to revamp their business models to offer long lasting solutions. Through incorporating income sources, like subscription plans or collaborating with public health organizations digital health startups can secure stability and widen the reach of healthcare services (Christensen & Hwang, 2008).

Patient-Centered Care:

Christensen emphasizes the move, towards patient focused healthcare, where patients play an active role in managing their health (Christensen et al., 2009) digital health platforms that equip patients with tools to track their health, view records, and. interact with healthcare providers support this concept. In the context of South Africa adopting this strategy, could help tackle issues by

promoting increased involvement and commitment, to treatment regimens (Backman et al., 2023).

Eric J. Topol's groundbreaking book, "The Creative Destruction of Medicine; How the Digital Revolution Will Improve Healthcare" delves into how digital technologies are set to transform the healthcare field. This book is a resource, for digital health startups showcasing how innovations like genomics, big data, mobile health and artificial intelligence can enhance healthcare services (Topol, 2012). Topol's perspectives offers insights for the study on "Innovative Business Models for Digital Health Startups in Primary Healthcare in South Africa " The book sheds light on how digital health solutions can tackle the specific challenges such as those encountered by primary healthcare providers, in South Africa (Topol, 2012).

The Creative Destruction of Medicine

Topol's idea of "destruction" describes how digital innovations shake up and overhaul healthcare systems substituting them with more effective individualized and patient focused methods (Topol, 2012) . This notion holds importance for entrepreneurs, in the health sector striving to revolutionize primary healthcare business strategies.

1.3.2 Problem Statement

The problem to be addressed involves the innovation of business models in the digital health sector that will effectively deal with challenges and opportunities in South African Primary Healthcare. This encompasses the following key dimensions:

Integration of Digital Health Solutions: How digital health ventures are able to effectively integrate their solutions within the existing healthcare infrastructure, the diverse socio-economic and geographical landscapes notwithstanding.

Sustainability and Scalability: How business models ensure not only the financial sustainability of digital health ventures but also allow for scalability and

extending reach of the digital health solutions to broader population, especially underserved communities.

Leadership and Strategic Management: How leadership in these digital health ventures is structured to enable innovation, while adapting to rapidly changing technology landscapes, and navigating the complex regulatory and ethical considerations of digital healthcare?

Technology Adoption and User Engagement: How digital health ventures handle the deployment of digital health technologies among healthcare providers and patients, considering the varying levels of digital literacy and access.

Differentiating among a problem statement, a research problem and a statement of purpose is central to organizing and directing a study. Each plays its distinct role in the research process, aiding in creating a cohesive and targeted exploration as outlined below.

The problem statement offers an overview of the issue or gap that the research aims to address. It underlines the importance of the problem. Establishes the context, for the study (Creswell & Creswell, 2023). For example when examining digital health entrepreneurship in South Africa the problem statement emphasizes challenges in primary healthcare access and quality of the digital technologies notwithstanding. The research problem will therefore involve crafting questions or hypotheses that will drive the study's investigation. This aspect helps narrow down the research focus and provides a path for data collection and analysis.

1.4 Research questions

1.4.1 *Primary Research Question*

How do business model innovations by digital health entrepreneurs improve the accessibility and quality of primary healthcare services in South Africa?

1.4.2 Sub Primary Research Questions

1. What are the primary barriers to accessibility and quality in South African primary healthcare?
2. Which digital health technologies are being used in South Africa's primary healthcare settings to improve accessibility and quality?
3. What business model innovations are digital health entrepreneurs using to overcome barriers in South Africa's primary healthcare?

1.5 Rationale

1.5.1 The Relationship Between Theoretical Frameworks and Delimitations

Theoretical Framework

A theoretical framework lays the foundation with the theories and concepts that support the research study. It serves as a perspective, for examining the research project and aids in identifying variables and their connections steering the processes of data collection and analysis (Creswell & Creswell, 2023).

Delimitations

Boundaries and scope of the study are outlined by delimitations. They establish what will be included and excluded in the research offering a direction, for the study (Coker, 2022). Researchers typically determine delimitations based on factors, like time, resources and data availability (Coker, 2022).

Relationship Between Theoretical Framework and Delimitations

The theoretical framework and delimitations are interrelated in several ways:

Defining Scope: The theoretical framework plays a role, in shaping the research scope by pinpointing concepts and variables that guide the scope. For instance when incorporating theories, on business model innovation into the framework the limitations will center on elements concerning business model innovation

specifically than diverging into other unrelated forms of innovation (Creswell & Creswell, 2023).

Guiding Focus: The framework acts as a guiding lens narrowing down the research, to theories and models to the topic. This focus is evident, in the delimitations, which define the areas that the research will address. For example by incorporating the Business Model Canvas into the framework the research limits itself to examining aspects of business models that will inform the entrepreneurial strategies (Osterwalder & Pigneur, 2010).

Ensuring Coherence: Delimitations help to keep the research organized and coherent in line, with the theoretical framework, to ensure that all parts of the study are connected and meaningful. This consistency aids in maintaining an approach that ensures that the research stays within the defined scope (Coker, 2022).

In conclusion, the theoretical framework and delimitations work together to influence the research project. The framework offers the perspective and direction while the delimitations establish the scope in which the research will take place, ensuring its practicality and alignment, with the theoretical foundations.

1.5.2 *Justification for the Study*

South Africa's diverse and unequal socio-economic landscape presents both challenges and opportunities for digital health entrepreneurship in South Africa's Primary Healthcare. The insights from this research could significantly contribute to the development of effective, sustainable, and inclusive digital health solutions, not only in South Africa but potentially in other similar contexts.

Interest, in this subject is driven by the factors described below (Please keep in mind that the list is not exhaustive):

The growing significance of digital health solutions, which were accelerated by the COVID 19 pandemic have now gone mainstream (Modgil et al., 2022). This

therefore underscores the importance of understanding how digital health can be effectively integrated into healthcare systems in developing countries like South Africa, where healthcare services are fragmented (Chuma & Sibiya, 2022). In view of the state of healthcare services in Primary Healthcare, there is need to find ways by which the business desired business outcomes can be achieved through tried and proven digital health practices.

The South African healthcare system face a myriad of challenges which include limited resources, unequal access to healthcare and a high disease burden (Coovadia et al., 2009) . While digital health solutions offer solutions to the identified challenges, they require business strategies for effectiveness and long-term viability. Collaboration among stakeholders such as the Department of Health and digital health ventures is essential for overcoming these obstacles. Collaborative efforts are instrumental, in establishing an efficient network that caters to the needs of healthcare and social support services promoting comprehensive care (Chuma & Sibiya, 2022).

Empirical Rationale:

The reason, for conducting this study is grounded in real world evidence as explained below:

Context Specific Insights: The research aims to provide insights into how digital health ventures can tailor their business models to meet the needs and challenges of South African Primary Healthcare.

Bridging Practice: By applying business model frameworks in a setting of the lived experiences of digital health entrepreneurs, this study will investigate how the theories can be put into practice in real world scenarios contributing to academic knowledge and practical application.

Stakeholder Perspectives: Exploring the perspectives of various stakeholders such as patients, healthcare professionals and policymakers will enrich discussions on integrating digital health solutions into primary healthcare systems.

This study seeks to advance both applications and theoretical understanding in business and healthcare management by:

Introducing Innovative Business Model Approaches: Through the exploration of innovative business models and how they are implemented in real world settings, this study provides valuable insights for entrepreneurs and leaders in the digital health sector potentially revealing future strategies, for other digital health entrepreneurs. The research contributes to expanding the understanding of groundbreaking business models in environments with limited resources.

Policy Implications: The findings could inform policy decisions related to healthcare providing the foundation for shaping frameworks that will support successful digital health solutions.

1.6 Delimitations of the study

Included in the Research Project:

Focus on Primary Healthcare: The research specifically targets digital health ventures that are engaged in primary healthcare services in South Africa.

Selected Digital Health Ventures: The study concentrates on seven digital health ventures, examining their business models and strategies.

Business Model Innovation: The research explores innovative business models in the digital health sector.

Contextual Factors: The study considers contextual factors specific to South Africa, such as economic conditions, healthcare infrastructure, and other challenges that are unique to South Africa.

Stakeholder Perspectives: Insights from key stakeholders such as healthcare providers, patients, regulatory bodies, and venture leaders are to be included.

Theoretical Frameworks: Utilization of established business model frameworks and theories, namely Osterwalder's Business Model Canvas, and other contemporary literature on business model innovation will be used to analyze and propose innovations in business models.

Excluded from the Research Project:

Non-Primary Healthcare Ventures: Ventures focusing on secondary or tertiary healthcare are not included.

General Digital Health Technology Assessment: The study will not delve into the technical details of digital health technologies unless directly relevant to business model considerations.

International Comparisons: The research will be specific to the South African context, and other emerging economies similar to South Africa thus limiting comparative analysis with digital health ventures in other countries.

Clinical Efficacy of Health Technologies: Clinical or medical effectiveness of the technologies used by the ventures will not be a focus area.

Conceptual/Theoretical Delimitations:

In the realm of business model innovation in Primary Healthcare in South Africa, the interaction between Conceptual/Theoretical Delimitations plays a crucial role in comprehending and advancing healthcare systems. Business model innovation in healthcare entails the development and implementation of new approaches to enhance care and service delivery. Speith and colleagues emphasize that business model innovation is a dynamic and highly pertinent phenomenon, offering a promising avenue for research. This indicates that exploring novel business models within the healthcare sector can lead to substantial enhancements in service delivery and patient outcomes (Spieth et al., 2014).

On the other hand Oni and colleagues delve into adapting existing models to tackle chronic diseases in South Africa, stressing the integration of community, patient, healthcare, and policy perspectives (Oni et al., 2014). This underscores the significance of considering diverse stakeholders and environmental factors when innovating healthcare business models. Other authors such as de Villiers stress on the importance of comprehending effective care provision models in various contexts to tailor and implement them suitably in South Africa (de Villiers,

2021). This highlights the critical role of contextual factors in shaping healthcare innovations.

In summary, the interaction between Conceptual/Theoretical Delimitations in business model innovation in Primary Healthcare in South Africa involves grasping the evolving nature of innovation, customizing existing models to local contexts, considering multiple stakeholders, and exploring innovative approaches to enhance healthcare provision. By integrating theoretical frameworks, contextual insights, and innovative strategies, healthcare systems can be revolutionized to better address the population's needs.

1.7 Assumptions

The study aims to explore how innovations, in business models within the realm digital health entrepreneurship can improve the accessibility and standard of healthcare services in South Africa. The forthcoming assumptions will serve as guiding principles for the research laying a groundwork for the study's approach, analysis and interpretation of results.

Relevance of Digital Health Technologies

It is posited that digital health innovations, such as telemedicine, mobile health apps, electronic medical records and AI driven diagnostic tools are pertinent and practical within the context of healthcare in South Africa. These innovations are anticipated to tackle healthcare obstacles like access to services, service quality and resource management.

Impact of Business Model Innovation

The research presupposes that innovative business models play an important role, in implementing and sustaining digital health innovations. These models are projected to offer structures for integrating digital health technologies into the primary healthcare framework while enhancing operational efficiency, patient involvement and overall healthcare outcomes.

Influence of Socio-Economic and Cultural Contexts

The impact of socio-cultural factors, on health technologies and business model innovations in South Africa is considered significant. Elements such as income levels, education, digital literacy and cultural attitudes towards technology and healthcare are expected to play a role in shaping the outcomes of this study.

Regulatory and Policy Support

Regarding policy support, it is assumed that there is the potential for frameworks and policies to support the adoption and integration of digital health technologies.

Innovation Driven by Local Needs

It is assumed that business model innovations in digital health entrepreneurship will be driven by the specific needs and challenges of the South African healthcare system. The research presumes that local contexts and conditions will be central to the development and implementation of these models.

Economic Conditions:

Lastly with respect to economic conditions the research posits that economic factors in South Africa such, as GDP growth, unemployment rates and inflation will impact the feasibility and adoption of digital health business models.

1.8 Definition of terms

Accessibility: In the realm of healthcare, accessibility pertains to how individuals can access healthcare services. It is a concept that considers not the proximity of healthcare facilities but also factors like affordability, responsiveness of the healthcare system and availability of pertinent services. Ensuring accessibility is critical for reaching populations that require healthcare services, especially those residing in remote or underserved areas (Chowdhury & Ravi, 2022).

Business Model Innovation: A process in which an organization modifies its existing business model or creates a new one to enhance its value proposition, improve efficiency, or generate new revenue streams (Foss & Saebi, 2017).

Critical Success Factors: Critical Success Factors (CSFs) in digital health refer to the essential elements or conditions that contribute to the successful implementation, adoption, and sustainability of digital health solutions (Yusif et al., 2017).

Digital Divide: The digital divide signifies the disparity, in access to information and communication technologies (ICTs) among individuals, households, businesses and regions with varying socio statuses. This difference covers issues like unequal technology access and varying levels of proficiency in utilizing digital tools and their resulting impacts (OECD Digital Economy Papers, 2001).

Additionally the digital divide often mirrors disparities. Marginalized populations such as individuals, residents of areas and economically disadvantaged groups tend to face more significant discrepancies in accessing and using digital resources. These disparities can worsen existing socio difficulties hindering these groups full participation, in society (Vassilakopoulou & Hustad, 2023).

Digital Health: Digital health, also known as digital healthcare, represents a comprehensive and interdisciplinary paradigm that emerges from the intersection of technology and healthcare. It involves the application of digital transformation principles to healthcare, encompassing various forms of software, hardware, and services. Components of digital health extend to mobile health (mHealth) applications, electronic health records (EHRs), electronic medical records (EMRs), wearable technology, telehealth, telemedicine, and individualized medicine. The digital health ecosystem comprises a diverse array of stakeholders, including patients, healthcare practitioners, researchers, application developers, and manufacturers and distributors of medical devices (Bernstein, 2021).

Digital Health Entrepreneurs: Individuals or organizations that create, develop, and promote innovative digital health solutions to improve healthcare delivery and patient outcomes (Wulfovich & Meyers, 2020). Known for their pursuit of opportunities amidst uncertainty, these innovators are recognized for their commitment to generating value for healthcare stakeholders. The deployment of

digital health innovations, a domain in which they excel, is seen as instrumental in shaping the future of healthcare (Wulfovich & Meyers, 2020).

Primary Barriers: The term 'primary barriers' refers to the core hurdles or obstacles that obstruct access to healthcare services or compromise the quality of care provided. These barriers can be complex encompassing issues such as constraints, insufficient infrastructure, disparities in location, cultural and social influences and limitations in policies (Harris et al., 2011).

Primary Health Care (PHC): PHC is the initial touchpoint for individuals, families, and communities within the national health framework, striving to bring health care within arm's reach of where people dwell and toil. The ambitious goals of these reforms are multi-dimensional –enhancing access, expanding coverage, elevating the quality of healthcare, and driving the health system towards greater efficiency and cost-effectiveness (Prade et al., 2023).

Quality in Healthcare: Quality, quality in healthcare encompasses multi dimensions, it reflects how effectively health services contribute to improving health outcomes for individuals and communities. The quality of healthcare plays a role, in providing effective patient centered, timely, efficient and fair care. It is essential for the healthcare system to meet the needs and expectations of the public and is closely tied to its performance (Maphumulo & Bhengu, 2019).

CHAPTER 2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Background discussion

In the South Africa's healthcare sector, business model innovation (BMI) stands out as a transformative force, capable of changing the way current healthcare services are provided for the better (Osterwalder & Pigneur, 2010). BMI involves reshaping how healthcare services are delivered (Osterwalder & Pigneur, 2010). Chesbrough one of the prominent authors on BMI highlights the impact of BMI in driving business changes positioning it as a catalyst for comprehensive transformation of businesses (Chesbrough, 2010). This is particularly relevant for resource constrained environments like South Africa, where there is need to address the grand challenges in healthcare through innovative means (Chuma & Sibiya, 2022).

The concept of 'digital health entrepreneurship' is often linked to exploring opportunities and creating healthcare solutions using digital technologies. Agarwal and colleagues elaborate on this construct as the convergence of technologies such as AI, telemedicine, mobile health apps and other emerging tools to tackle healthcare challenges (Agarwal et al., 2018). This perspective holds relevance in the African context, where digital health entrepreneurship is seen as a promising avenue, for addressing persistent healthcare barriers related to accessibility and quality (Agarwal et al., 2018).

2.2 Introduction

This section proceeds to evaluate existing literature on the topic of innovating business models in South Africa's digital healthcare focusing on primary healthcare. The structure of the review aligns with the research questions so as to maintain consistent analysis during the review. It is important to highlight that each section of the review does not just summarize existing literature but engages it critically by examining the sources, influential authors, key debates, core ideas and fundamental theories. When exploring how digital health

entrepreneurs innovate their business models, the aim will be to discover how their actions are improving access and quality of healthcare services in South African Primary Healthcare.

The discussion below covers the organization and details of approach that will be followed in responding to the research questions:

Primary Barriers to Accessibility and Quality in South African Primary Healthcare: This section looks at the barriers that impact the accessibility and quality of healthcare in South Africa. It reviews the findings by other scholars on barriers that focus on issues such as infrastructure inadequacy, staffing challenges, financial constraints, policy implications and socio-cultural factors. By shedding light on the root causes and consequences of these barriers the section offers insights into how the challenges impact Primary Healthcare in South Africa.

Digital Health Technologies in South African Primary Healthcare Settings: The focus then shifts to digital health technologies, both mainstream and emerging ones. Their utilization in primary healthcare settings is also examined. An all-inclusive assessment is conducted to explore how these technologies can be adapted and leveraged effectively within the context of South African Primary Healthcare.

Business Model Innovations by Digital Health Entrepreneurs: This section looks at the business models introduced by digital health entrepreneurs in South Africa's primary healthcare sector. It evaluates how these business models strive to address challenges encountered in the public health domain and analyses their suitability and potential impact on the country's healthcare landscape.

2.3 Literature review: Business Model Innovation for Digital Health Entrepreneurship

Introduction:

Primary healthcare (PHC) in South Africa is marked by numerous challenges, including limited access to quality care and systemic inefficiencies (Maphumulo & Bhengu, 2019). Business model innovation (BMI) by digital health

entrepreneurs presents a viable strategy to address these issues. This literature review explores how BMI improves PHC in South Africa, addressing the primary research question: "How do business model innovations by digital health entrepreneurs improve the accessibility and quality of primary healthcare services in South Africa?" This analysis is structured around three sub-primary research questions: identifying primary barriers, examining current digital health technologies, and exploring specific BMIs to address these barriers.

2.3.1 *Barriers to Accessibility and Quality in South African PHC*

SR1: What are the primary barriers to accessibility and quality in South African primary healthcare?

Primary healthcare in South Africa is hindered by several barriers that affect both accessibility and quality:

Resource Constraints: The provision of effective primary healthcare (PHC) services in South Africa is severely hindered by limited financial, human, and infrastructural resources. Financial constraints means that there is insufficient funding to support essential healthcare services, procure necessary medical supplies, or maintain healthcare facilities. This financial shortfall often results in inadequate equipment, outdated technology, and insufficient medications (Harris et al., 2011; Maphumulo & Bhengu, 2019). Human resource limitations further exacerbate the problem. There is a significant shortage of healthcare professionals, including doctors, nurses, and support staff (Maphumulo & Bhengu, 2019). This scarcity leads to high patient-to-provider ratios, which in turn affects the quality and consistency of healthcare. Overburdened healthcare workers are often required to manage large numbers of patients, resulting in increased long wait times, reduced time per patient, and ultimately, a decline in the quality of care provided (Harris et al., 2011; Maphumulo & Bhengu, 2019).

Geographic Disparities: Significant disparities exist between urban and rural areas in terms of healthcare access. Rural populations often face the challenge of traveling long distances to reach healthcare facilities. This is due to the scarcity

of healthcare centers in remote areas, which exacerbates the problem. As a result, obtaining timely medical attention becomes increasingly difficult for those living in these regions (Chowdhury & Ravi, 2022). The lack of nearby healthcare facilities means that rural residents must often undertake lengthy and costly journeys to access medical services. This can lead to delays in receiving care, particularly in emergency situations, where time is of the essence. Furthermore, the burden of travel can deter individuals from seeking preventative care or regular medical check-ups, contributing to poorer health outcomes over time (Chowdhury & Ravi, 2022). Ensuring accessibility to healthcare is especially crucial for populations living in underserved areas. These communities are often more vulnerable and have higher healthcare needs due to a combination of socio-economic factors and limited local resources. Without accessible healthcare, the disparities between urban and rural health outcomes are likely to widen, leading to increased rates of illness and mortality in rural areas (Ned et al., 2017).

Healthcare Workforce Challenges: South Africa faces a critical shortage of healthcare professionals, particularly within the public health sector. This shortage includes essential personnel such as doctors, nurses, and specialists, which significantly impacts the consistency and quality of healthcare services available to the population (Coovadia et al., 2009). The shortage of these key healthcare providers means that many patients are unable to receive timely and adequate care, leading to suboptimal health outcomes. High turnover rates and uneven distribution of healthcare workers further complicate service delivery (Coovadia et al., 2009). The situation is further exacerbated by high turnover rates among healthcare workers. Many professionals leave the public health sector due to factors such as poor working conditions, inadequate remuneration, and high levels of job-related stress. This high attrition rate disrupts the continuity of care, as patients often have to deal with frequent changes in their healthcare providers. It also places additional strain on the remaining staff, who must handle increased workloads, leading to burnout and further turnover (Maphumulo & Bhengu, 2019).

Socioeconomic Factors: Poverty, unemployment, and low educational attainment contribute to poor health outcomes and limit access to healthcare services (Gordon et al., 2020). Socioeconomic challenges also lead to health disparities, where low-income populations experience higher disease burdens and lower access to healthcare (Gordon et al., 2020). According to the study by Gordon and colleagues, there are economic disparities in accessing healthcare. and that individuals with limited resources generally experience unsatisfactory healthcare outcomes and perceive greater healthcare needs (Gordon et al., 2020). On the other hand users of healthcare who are well off, express higher satisfaction with healthcare services. The study emphasizes that affordability and financial capability pose challenges to ensuring access to healthcare (Gordon et al., 2020). These discrepancies are further pronounced in South Africa's tiered healthcare system, where private care is predominantly accessed by individuals who are well off while public care is more commonly used by those with limited resources (Gordon et al., 2020; Rensberg, 2021).

Systemic and Historical Obstacles: Systemic and historical issues in healthcare are thoroughly examined by Coovadia and colleagues who explore the economic factors that have shaped South Africa's healthcare system (Coovadia et al., 2009). They discuss how various regulations, from colonial times through the apartheid era and subsequent apartheid reforms, have left a lasting impact on the nation's health sector and medical services (Coovadia et al., 2009). The legacy of colonialism and apartheid has resulted in deep-seated inequalities within the healthcare system (Coovadia et al., 2009). During these periods, healthcare policies and regulations were designed to benefit a minority, leading to significant disparities in access and quality of care for the majority of the population (Coovadia et al., 2009). These historical injustices have contributed to ongoing challenges in the present-day healthcare landscape (Coovadia et al., 2009). One of the critical issues highlighted is the chronic shortage of human resources. The healthcare system is plagued by insufficient numbers of trained professionals, which hampers the ability to provide adequate and consistent care to the population. This shortage is particularly acute in rural

and underserved areas, exacerbating the disparities in healthcare access and outcomes (Coovadia et al., 2009).

In addition to human resource constraints, inadequate management practices have further weakened the healthcare system (Mogakwe et al., 2020). Inefficient administrative processes and poor resource allocation have led to wastage and reduced the overall effectiveness of healthcare delivery (Mogakwe et al., 2020). These management issues are compounded by shortcomings in leadership and governance. The healthcare system suffers from a lack of strong leadership to drive necessary reforms and ensure accountability and transparency in operations. (Mogakwe et al., 2020). This evidently underscores the need for improved governance and leadership within the healthcare system. Effective leadership is crucial for implementing strategic changes, improving management practices, and optimizing the use of resources to enhance healthcare delivery (Mogakwe et al., 2020).

Addressing these systemic and historical issues requires a comprehensive approach that includes policy reforms, investment in human resources, and the strengthening of management and governance structures. By tackling these fundamental problems, South Africa can work towards a more equitable and efficient healthcare system that better serves all its citizens (Mogakwe et al., 2020).

2.3.2 Proposition 1. Barriers to Accessing Quality Healthcare

The aim of this research is to explore the difficulties, in obtaining Primary Healthcare in South Africa, which stems from barriers and socio-economic factors. By examining these challenges and assessing health solutions the study seeks to uncover the creative approaches employed by digital health innovators to enhance access to and quality of Primary Healthcare.

2.3.3 Digital Health Technologies used in South African PHC

SR2: Which digital health technologies are being used in South Africa's primary healthcare settings to improve accessibility and quality?

Digital health technologies are increasingly integrated into PHC settings in South Africa to address the described barriers above:

Mobile Health (mHealth): Mobile apps and text message services play a role in improving and accessing healthcare by providing a variety of features designed to cater to various groups of people. These tools share health details like material on illnesses, ways to prevent them, and tips for leading a healthy lifestyle directly on users' phones. Having access to health information enables individuals to make informed choices, about their well-being and healthcare. (Mbunge et al., 2022).

Furthermore mobile apps and text message services are used to send reminders about taking medication and attending appointments. These reminders enable patients stick to their treatment plans and show up for their scheduled visits. This is especially important for managing long term health conditions as it assists patients in staying on track with their medication routine and reduces the chances of missing appointments, which could result in health complications (Gurol-Urganci et al., 2013). By delivering these reminders to people's smartphones, mobile apps and SMS services fill the gap for individuals who may have limited access to healthcare facilities. (Gurol-Urganci et al., 2013). This is particularly beneficial in areas where healthcare resources are scarce or where reaching health centers is difficult due to geographical or financial constraints (Gurol-Urganci et al., 2013). . Mobile health technologies ensure that crucial healthcare services are within reach, for everyone regardless of where they're located. (Schwebel & Larimer, 2018)

In general incorporating apps and SMS services into the healthcare system is crucial, for broadening access, to healthcare services enhancing compliance with treatments enabling remote consultations and offering personalized health management tools. Through the use of these technologies, healthcare providers can offer more convenient care to all demographics, those residing in distant or underserved regions. (Mbunge et al., 2022).

Electronic Health Records (EHRs): Electronic Health Records (EHRs) play an important role, in managing information by creating a detailed digital record of their medical background, treatments and health details. These systems aid healthcare providers in making informed decisions by granting easy access to accurate patient data. This accessibility leads to diagnosis, treatment strategies and ongoing patient care decisions.(Chakraborty et al., 2021). Moreover EHRs promote coordination among healthcare professionals by centralizing patient data. This centralized approach allows doctors, nurses and specialists to efficiently share and access patient information. By streamlining communication EHRs help prepare for tests and procedures thereby reducing treatment delays and improving the efficiency of healthcare services.(Shickel et al., 2018).

Effective implementation of EHRs has proven to enhance healthcare quality through improved time management practices, adherence to guidelines and a reduction, in medication errors and adverse drug events.(Campanella et al., 2016).

Telemedicine: Telemedicine services allow patients to have consultations, with healthcare professionals thereby doing away with the need to visit a clinic or hospital. This technology is helpful for people in areas with limited access to medical attention that requires in person visit. By making use of telemedicine, patients are able to receive advice, diagnoses and treatment recommendations from specialists located from a distance thereby overcoming geographical barriers that often prevent healthcare access (Alboraie et al., 2021; Chakraborty et al., 2021). Other than granting access to healthcare care telemedicine also minimizes the need for patients to make unnecessary costly trips to healthcare facilities. This is especially helpful for individuals with mobility issues, suffer from chronic conditions and have limited means of transportation. Through consultations telemedicine enables patients obtain healthcare without the inconvenience of long travel thereby enhancing their overall health outcomes and quality of life (Alboraie et al., 2021).

Furthermore telemedicine enables the support and management of care for individuals with chronic illnesses requiring regular monitoring and follow ups.

Healthcare providers are able to monitor patient's health status remotely and adjust treatment plans accordingly where needed. Such services prevent complications and lowers hospital readmission rates contributing to desirable health outcomes (Bitar & Alismail, 2021).

Health Information Systems (HIS): Healthcare systems are essential in today's field as they streamline tasks and enhance efficiency. These systems automate processes like registration, appointment scheduling, billing and inventory management allowing healthcare professionals to focus on care rather than paperwork. By reducing work and paperwork healthcare systems decrease the chances of errors. The HIS also speeds up administrative processes making the healthcare environment more effective. (Matlebjane & Ndayizigamiye, 2022).

The healthcare systems also play a role in supporting data driven decision making in healthcare management. These systems. organize large volumes of data from different sources offering valuable insights to administrators and practitioners on patient care, resource usage, and overall performance. By analyzing trends, in data healthcare, providers can make decisions regarding treatment plans, resource distribution and strategic initiatives. (Matlebjane & Ndayizigamiye, 2022).

Wearable Health Devices: The rise of healthcare technology presents an opportunity to greatly improve people's health. Through the use of advanced information technology, devices like smartwatches, fitness trackers, and other health monitoring tools offer real time health data that is essential for health management and early intervention (Dunn et al., 2018). These wearables continuously. analyze health indicators such as heart rate, blood pressure, activity levels, and sleep patterns. By delivering feedback on their health status these devices empower individuals to make choices about their health and daily habits. For example if a wearable device detects an increase, in heart rate it can alert the user to seek guidance promptly, potentially preventing more severe health issues. (Dunn et al., 2018).

The inclusion of digital health technology, into people's lives presents advantages, such as monitoring health in real time, actively handling chronic illnesses, boosting patient involvement, and improving communication with medical professionals. These innovations could revolutionize healthcare by encouraging measures that subsequently enhance health outcomes. (Cheung et al., 2019).

2.3.4 Proposition 2 - Digital Health Technologies (DHTs) used in Primary Healthcare

- Digital health entrepreneurs, in South Africa's Primary Healthcare are making use of mobile health (mHealth), telemedicine, and other modern technologies to enhance the availability, affordability and tailored nature of healthcare services. These creative approaches aim to address the requirements of communities, in addressing health challenges while also remaining cost effective.

2.3.5 Business Model Innovations by Digital Health Entrepreneurs

SR3: What business model innovations are digital health entrepreneurs using to overcome barriers in South Africa's primary healthcare?

Digital Business Environment: The digital health landscape, in South Africa holds promise for digital health entrepreneurship through the creation of a platform that addresses noted systems fragmentation in healthcare and brings about the integration of data into the processes that will bring about innovation. This type of framework enables entrepreneurs to develop and avail health solutions where there are needed most, thereby enhancing overall healthcare service provision (Chuma & Sibiya, 2022; Wulfovich & Meyers, 2020).

Innovative healthcare solutions are key to transforming healthcare delivery, bringing to light the importance of using technology to improve health outcomes and patient care while also reducing costs (Wulfovich & Meyers, 2020).

The use of innovative business models in the healthcare sector is important for digital health ventures for them to gain an advantage in today's landscape, with

entrepreneurship playing a fundamental role in bringing about innovative solutions (Gao et al., 2022).

Digital health entrepreneurs, in the health industry, in South Africa are exploring strategies to transform their business models specifically in the field of primary healthcare (Gao et al., 2022).

South Africa's Primary Health Care (PHC) faces challenges, such as accessibility, in low-income regions, (Sarkar & Mateus, 2022) a scarcity of healthcare professionals and fragmented healthcare services (Chowdhury & Ravi, 2022; Rensberg, 2021). Digital health entrepreneurs have the opportunity to address these issues by focusing on cost effective solutions that prioritize simplicity and affordability while maximizing the use of resources (Sarkar & Mateus, 2022b). Digital health entrepreneurs in the health sector need to consider local factors when reimagining their business strategies. (Engwall et al., 2021).

Business Model Innovations in Digital Health:

Value Proposition Innovation: Emphasizing innovation, in the realm of business, involves prioritizing the development of creative business models than just focusing on products or services (Chesbrough, 2010). This shift is vital for driving changes in processes and achieving groundbreaking innovations. By reorienting towards business models, organizations can revamp their strategies to better align with the changing needs of their target markets (Chesbrough, 2010). This approach allows companies to generate value in effective ways creating an environment that nurtures innovation. Moreover directing attention to business models promotes an understanding of the organization, by incorporating elements like customer relationships, revenue streams and value propositions into the framework. This comprehensive viewpoint is crucial for fostering growth and retaining an edge in today's dynamic business landscape. This approach not only streamlines processes but also facilitates the integration of new technologies and practices paving the way, for significant industry innovation (Sithole & Wotela, 2023).

Entrepreneurs provide customized affordable healthcare options designed to meet the requirements of disadvantaged communities, in South Africa. These solutions aim to tackle the health challenges experienced by these groups,(López-Nicolás et al., 2021).

Revenue Model Diversification: There are various ways to generate income, like offering subscription services, freemium options and collaborating with private and public health sectors. This ensures long term success and accessibility. Having other revenue sources also allows digital health ventures to expand their reach thereby staying financially stable (Zott & Amit, 2010).

Partnerships and Collaborations: Strategic partnerships with government agencies, NGOs, and private sector entities enable resource sharing, scalability, and wider service reach. Collaborative efforts also enhance the impact and sustainability of digital health initiatives (Yue et al., 2022).

Research highlights the importance of healthcare professionals and institutions collaborating to improve services and address challenges in the healthcare system. (Talib et al., 2015) stress the significance of partnerships among schools in Africa emphasizing the shift towards collaborations that prioritize local involvement for lasting success.

Technology-Driven Service Delivery: Utilizing technologies, like Big Data, artificial intelligence (AI), and Blockchain greatly improve the efficiency of healthcare services, safeguards patient data and enhances patient involvement in their healthcare journey. Big Data enables the examination of volumes of health-related data leading to insights that can enhance clinical decision making and operational effectiveness. AI assists in making diagnoses through the analysis of medical images forecasting patient outcomes and suggesting personalized treatment plans based on individual patient information. Meanwhile blockchain technology ensures the security and authenticity of records by offering a tamper proof method for recording and exchanging health data. This secure exchange is vital for upholding confidence and enabling decision making, among healthcare professionals. Collectively these technologies contribute to prompt

diagnoses, highly individualized treatment plans customized to each patients' specific requirements resulting in improved health outcomes and heightened patient satisfaction (Ahuja, 2021, Lee & Yoon, 2017; Raghupathi & Raghupathi, 2014).

Community Engagement and Education: In the healthcare field it is essential to involve customers in creating value to enhance personalized experiences and establish relationships, for improved service delivery and customer satisfaction. Entrepreneurs engage stakeholders in developing health solutions and provide education to promote health literacy and trust (An & Han, 2020; Lei et al., 2019).

Engaging users in the healthcare sector comes with challenges and opportunities shaped by the diverse socio-economic landscape of each country. Factors such as literacy levels, infrastructure readiness and cultural acceptance greatly influence how these innovations are received (Wutz et al., 2023).

Entrepreneurs in South Africa's healthcare industry are adapting their business approaches to meet the needs of their target markets when providing healthcare services (Chuma & Sibiya, 2022). There is a suggestion to implement a Digital Health Ecosystem framework to enhance data sharing among healthcare facilities. This collaborative approach aims to facilitate information exchange for healthcare service delivery. The South Africa's National System of Innovation (NSI) promotes practices like Doing, Using and Interacting (DUI) to encourage learning and strategic business development among users and producers. This approach is particularly beneficial, for health startups as it fosters knowledge sharing and innovative business strategies to address challenges.(Lukhele & Soumonni, 2021).

The Business Model Canvas (BMC) framework has attracted the attention in various fields, including healthcare. It acts as a tool, for managing business operations by providing a framework to understand the elements of any business venture (Holdford et al., 2022). In the healthcare sector the BMC can be used to assess and enhance business models from a practitioner's perspective (Müller, 2019). In healthcare the BMC is valuable for creating business models that

balance environmental and social impacts with economic considerations (Joyce & Paquin, 2016).

To sum up, digital health entrepreneurs in South Africa are rethinking their business strategies by adopting ecosystem driven approaches that promote innovation through platforms and utilizing health technologies while focusing on strategic factors. These steps are crucial for navigating South Africa's healthcare landscape and introducing solutions to address challenges in primary healthcare, in South Africa (Chuma & Sibiya, 2022).

2.3.6 Proposition 3 - Innovations in Business Models by Digital Health Entrepreneurs

Digital healthcare entrepreneurs, in South Africa's Primary Healthcare are bringing about changes, with a fresh perspective on business model innovation. Their methods aim to enhance healthcare accessibility, quality of services, affordability and patient engagement. This shift is reshaping the sector profoundly resulting in comprehensive healthcare provision.

2.3.7 Case Studies and Examples

Studying real life examples where digital health entrepreneurship has been successfully implemented, can offer valuable insights, into how Business Model Innovation (BMI) is put into practice.

Vula Mobile: This app links healthcare workers in distant regions with specialists in cities facilitating prompt consultations and referrals to improve access to specialized healthcare.(Steyn et al., 2022).

MomConnect: This platform is supported by the Department of Health. MomConnect is a mobile health initiative that delivers health information and assistance to expecting mothers and new mothers through text messages (SMS). The program has improved the health outcomes of mothers and children by providing them with accurate health guidance. (Barron et al., 2018).

Peach Health: This digital health venture is involved in improving healthcare services in remote areas. The venture has created an application that connects patients with healthcare providers for remote consultations. This innovative approach has increased healthcare accessibility, for populations that have difficulties in accessing healthcare from remote areas thereby enabling providers to access patient records and offer personalized care. (Modise, 2023).

2.3.8 Patterns and Overarching Themes from the Literature Reviews

This section delves into the patterns noted in the analysis of literature concerning business model innovation (BMI), within the realm of digital health entrepreneurship, in South Africa's Primary Healthcare. These observed patterns are associated with themes that offer insight into how digital health entrepreneurs are improving the accessibility and quality of healthcare services.

Resource Constraints and Inefficiencies

The primary healthcare sector, in South Africa encounters challenges due to resource constraints and inefficiencies, primarily stemming from financial and human resource constraints, as well, as inadequate infrastructure (Harris et al., 2011; Maphumulo & Bhengu, 2019).

Financial and Human Resource Limitations

The efficiency of healthcare services is frequently hindered by a lack of funding and medical staff. These shortages affect the provision of healthcare services resulting in overburdened facilities and stressed healthcare workers (Harris et al., 2011; Maphumulo & Bhengu, 2019). The financial limitations also restrict the purchase of supplies and the upkeep of healthcare infrastructure (Harris et al., 2011; Maphumulo & Bhengu, 2019).

Gaps in Clinic/Hospital Infrastructural

Insufficient healthcare facilities, in regions worsen the difficulties, in delivering high quality medical care. Numerous rural clinics and hospitals face a shortage of facilities, medical tools and crucial technological assistance posing challenges

to providing healthcare services This gap in infrastructure significantly hinders the delivery of primary healthcare to remote and underserved populations (Harris et al., 2011; Maphumulo & Bhengu, 2019).

Geographic and Socioeconomic Disparities

The differences, in access to healthcare and health outcomes among socioeconomic groups and geographic access are significant, in South Africa (Maphumulo & Bhengu, 2019).

Urban-Rural Divide:

There exists a difference, in the availability of healthcare services between rural areas and people living in urban areas. Those living in rural areas often experience long travel distances to reach healthcare facilities resulting in delays, in receiving treatment and worsening health conditions. On the hand those living in urban areas generally have a number of healthcare facilities and resources readily available to them, ultimately contributing to improved health outcomes for them (Ned et al., 2017)

Socioeconomic Barriers:

Financial hardships, joblessness, and inadequate education levels create barriers to healthcare access and lead to undesirable health outcomes. These economic factors are strongly connected to disparities, in health as people, from disadvantaged backgrounds often struggle to pay for medical services and possess limited awareness of preventive health measures.(Gordon et al., 2020).

Systemic and Historical Obstacles

Challenges rooted in history and structural issues still hinder the efficiency of South Africa's Primary Healthcare system especially in the public health sector (Coovadia et al., 2009).

Legacy of Inequality:

The lasting effects of colonialism and apartheid have led to inequalities, in the public healthcare system shaping its non-effectiveness. These past injustices have established entrenched obstacles, within healthcare structures and regulations.(Coovadia et al., 2009; Mogakwe et al., 2020).

Systemic Inefficiencies:

The healthcare systems fragmentation and ineffective management practices also hinder the delivery of healthcare services. Problems like poor leadership and unethical behavior add to the inefficiencies that obstruct the delivery of high-quality healthcare services (Chuma & Sibiya, 2022).

Adoption and Integration of Digital Health Technologies:

Digital health technologies are being adopted and integrated into primary healthcare to address various challenges.

Mobile Health (mHealth): Mobile apps and text message services play a key role, in expanding healthcare services to underserved regions. These tools facilitate the sharing of health information, sending appointment reminders, and conducting consultations all of which are essential, for enhancing healthcare accessibility. (Mbunge et al., 2022).

Electronic Health Records (EHRs): Electronic Health record (EHR) systems improve the way patient information is handled and help streamline healthcare coordination leading to better consistency, in providing healthcare. EHRs offer a system, for storing and retrieving patient data making it easier for healthcare providers to make informed decisions (Chakraborty et al., 2021).

Telemedicine: Telehealth services help with appointments, which lessen the requirement for patients to commute and ease the strain, on medical facilities. This innovation proves advantageous in regions where specialist availability is scarce (Chakraborty et al., 2021).

Health Information Systems (HIS): Hospital information systems enhance the effectiveness of healthcare services by simplifying tasks and enabling decision making based on real time data. They contribute to better resource allocation and overall operational efficiency, in healthcare delivery (Chuma & Sibiya, 2022).

Wearable Health Devices: Wearable devices offer up to the minute health information, aiding in the management of health and early detection. These gadgets allow for monitoring of health issues potentially resulting in successful medical treatments (Cheung et al., 2019).

Innovative Business Models:

Digital health entrepreneurs, within the realm of Primary Healthcare are crafting innovative business models that tackle the obstacles present, in healthcare.

Value Proposition Innovation: digital health entrepreneurs provide customized affordable healthcare options designed to meet the needs of local communities. These solutions seek to enhance involvement and customer satisfaction by tackling health challenges that are common, in various communities (López-Nicolás et al., 2021).

Revenue Model Diversification: Various ways of generating income, like subscription services, offering services with optional paid upgrades and collaborating with public and private sectors play a vital role in ensuring financial stability and expanding the audience reach. By utilizing these approaches digital health startups can maintain a revenue stream while also keeping healthcare services accessible to individuals, at affordable rates (Zott & Amit, 2010).

Strategic Partnerships: Working together with government agencies, NGOs and private organizations boosts the sharing of resources and scalability, for health initiatives. These partnerships allow health tech ventures to tap into resources and knowledge ultimately broadening their reach and influence. (Yue et al., 2022).

Technology-Driven Service Delivery

Utilizing cutting edge technologies greatly improves the provision of services, in the healthcare sector. This section looks at the various cutting-edge technologies used in healthcare.

Artificial Intelligence (AI):

AI advancements enhance the precision of diagnoses and tailor treatment plans to the identified needs. Through the examination of large data sets AI can recognize trends and patterns and offer valuable guidance to aid in clinical decision making.(Raghupathi & Raghupathi, 2014).

Big Data:

Leveraging Big Data analytics improves decision making skills and operational effectiveness. By analyzing health data it is possible to allocate resources effectively and identify trends, in public health.(Raghupathi & Raghupathi, 2014).

Blockchain:

Blockchain technology plays an important role, in safeguarding and ensuring the transparency of data management, which ultimately boosts trust and maintains the integrity of information. The decentralized structure of blockchain contributes significantly to upholding the privacy and protection of records.(Ahuja, 2021).

Community Engagement and Education:

In order for digital health projects to thrive in South Africa's primary healthcare, it is vital to involve and inform the community members, on the benefits of digital health solutions. This strategy is necessary because of the economic, cultural and infrastructural hurdles that the country encounters:

Local Stakeholder Involvement

Engaging community members, in developing and carrying out health initiatives builds trust. It also guarantees that the solutions are culturally appropriate. This

involvement is essential, for customizing healthcare interventions that address the requirements of the communities (An & Han, 2020).

Customer Engagement

Engaging with customers, in creating value boosts service quality and customer satisfaction. When patients participate in shaping health solutions digital health venture can be rest assured that their services are easy to use and produce the desired outcomes, since the digital solutions were co-created with the customers. (Lei et al., 2019).

Impact of COVID-19 on Digital Health Technologies

The COVID 19 outbreak has acted as a catalyst, for the uptake and inclusion of digital healthcare solutions, in South Africa's Primary Healthcare. This progress holds importance considering the health obstacles currently faced by South Africa.

Increased Adoption:

The pandemic has sped up the utilization of health technologies, in providing services, communication and decision making. The demand, for healthcare options became more urgent resulting in the acceptance of telemedicine, mHealth and various digital tools.(Ndayishimiye et al., 2023).

Integration Challenges:

Despite the growing use of health systems there are still hurdles to overcome including issues, with compatibility, privacy worries and securing funding. It is crucial to address these challenges by ensuring that the systems can work together seamlessly and, by securing funding to guarantee the long-term success of these technologies (Ndayishimiye et al., 2023).

The study has pointed out patterns that shed light on the issues and possibilities, in South Africa's primary healthcare system. By tackling limitations in resource

disparities, problems of reach to nearest health facilities due to geography and socioeconomic status inefficiencies, within the system and making use of health technologies and new business approaches there is an opportunity to enhance the accessibility, quality and outcomes of healthcare services.

2.3.9 Overarching Themes in Addressing Healthcare Challenges in South Africa

Addressing Resource Constraints and Inefficiencies

Enhancing healthcare, in South Africa involves tackling the challenges of resources and inefficiencies that impede service delivery. Key obstacles such, as constraints, shortages of professionals and inadequate infrastructure must be addressed to make progress (Harris et al., 2011; Maphumulo & Bhengu, 2019). Dealing with these obstacles typically requires making use of health technologies and embracing appropriate innovative business models. For instance telemedicine platforms and mobile health apps (mHealth) can expand the accessibility of healthcare services to areas, with access is a challenge, thereby maximizing the resources at hand (Cheung et al., 2019; Chuma & Sibiya, 2022; Mbunge et al., 2022). These digital health solutions do not only boost productivity, but also enhance the quality of healthcare services by simplifying operations and easing the strain on current systems (Cheung et al., 2019).

Bridging Geographic and Socioeconomic Disparities

A significant issue that needs addressing in the healthcare system is the necessity to close the gap, between different regions and social classes. Digital health entrepreneurs are leading the way by working towards offering healthcare solutions that are both easily accessible and affordable specifically designed for communities that have been overlooked. By using digital services, like telehealth and electronic health records, medical professionals can provide appointments and efficiently organize patient information making sure individuals in distant areas get the healthcare they need. Moreover overcoming obstacles includes developing affordable healthcare options for users of

Primary Healthcare leading to better health outcomes overall (Gordon et al., 2020; Ned et al., 2017).

Overcoming Systemic and Historical Obstacles

Digital health solutions, in the healthcare sector are also focused on addressing standing inefficiencies and disparities in South Africa's healthcare system stemming from the impacts of colonialism and apartheid which have resulted in enduring inequalities affecting access, to and quality of healthcare services. (Coovadia et al., 2009; Mogakwe et al., 2020). In order to tackle these challenges it is essential to revamp the way healthcare services are provided and enhance how they are managed. This includes not only incorporating cutting edge technologies but also reshaping policies and procedures to guarantee access, to healthcare, for everyone. By enhancing management techniques and ensuring the allocation of resources where they are needed, the healthcare system can enhance its efficiency and inclusivity (Coovadia et al., 2009; Mogakwe et al., 2020).

Leveraging Digital Health Technologies

In enhancing healthcare delivery the incorporation of digital health tools, like health apps electronic health records (EHRs) telemedicine platforms, health information systems (HIS) and wearable gadgets play a vital role in primary healthcare. These tools enable access to services, remotely and improve the handling of data. For instance wearable health gadgets can continuously track patients' vital signs, enabling identification and treatment of identified issues (Cheung et al., 2019). Electronic health records (EHRs) enhance the coordination of care by granting healthcare providers access, to patients' medical histories thereby lowering the chances of errors and enhancing the consistency of treatment (Chakraborty et al., 2021). Telemedicine services allow healthcare professionals to connect with patients, in remote locations decreasing the necessity, for travel and easing the strain on overloaded healthcare centers (Chakraborty et al., 2021).

Innovative Business Models

Transitioning from focusing on products to emphasizing services, in business models, diversifying income sources, and establishing collaborations are essential for maintaining the success of digital health ventures and broadening their influence. Digital health entrepreneurs are now embracing subscription-based offerings, freemium approaches and partnerships, between the private and public sectors to secure financial stability. These innovative business models enable healthcare ventures to reach a broader audience while maintaining affordability and accessibility. Strategic partnerships with government agencies, NGOs, and private entities also enhance resource sharing and scalability, allowing digital health solutions to be implemented more effectively and widely (López-Nicolás et al., 2021; Yue et al., 2022; Zott & Amit, 2010).

Emphasizing Technology-Driven Service Delivery

Cutting edge technologies, like intelligence (AI) Big Data analysis and blockchain are employed to boost the accuracy of diagnoses streamline operations and safeguard data thereby leading to desired patient outcomes. AI tools can sift through datasets to offer diagnoses and personalized treatment plans. Big Data analysis improves decision making by spotting trends and patterns in health data that can guide health strategies and resource allocation. Meanwhile blockchain technology guarantees transparent data handling, fostering trust and data integrity, for upholding patient confidentiality (Ahuja, 2021; Raghupathi & Raghupathi, 2014).

Community Engagement and Education

To make sure that digital health solutions are accepted and effective it is important to involve community members and educate them. By building trust through engagement and education it will be possible to create health programs that resonate with the community's culture therefore making them be well received. When local stakeholders are part of developing and implementing these solutions, the solutions can be tailored to meet the community's needs. Educating the public on the advantages and proper use of health technologies also

encourages acceptance and usage, ultimately improving health outcomes (An & Han, 2020; Lei et al., 2019).

2.3.10 Challenges and Considerations

While digital health technologies offer advantages there are important obstacles that need to be overcome for their effective use and widespread acceptance.

Digital Divide

One major obstacle faced is the digital divide, which highlights the difference, between individuals with access to digital resources and those without. It is crucial to provide access to digital services especially in rural and underserved communities. The rural and remote parts of South Africa struggle to access digital services, due to insufficient infrastructure like having dependable internet access and digital skills. This inequality can worsen disparities, in healthcare leaving marginalized groups not to be able to enjoy the advantages of digital health services. To bridge this gap, targeted investments in infrastructure, as well as initiatives to improve digital literacy among healthcare providers and patients, are essential (Lubinga et al., 2021).

Cost and Affordability

One of the challenges that entrepreneurs face is finding the balance, between the costs and affordability of digital health solutions. They need to manage both investment and operational costs to ensure that their services are sustainable and accessible to all stakeholders. This requires planning in areas like allocating resources efficiently, adopting cost effective practices and managing finances effectively. Entrepreneurs must be diligent in accounting for costs and potential financial risks in their endeavours. There is the need for striking an equilibrium between risks and rewards making sure that any losses incurred can be handled effectively. Establishing strategies for preserving the affordability of digital health solutions and broadening their reach to a wider audience is crucial. (Crick & Crick, 2018).

Resistance to Change

Resistance to change poses a challenge when it comes to introducing new digital health solutions in the healthcare sector. Both healthcare professionals and patients may hesitate to embrace novel health solutions due to factors like unfamiliarity, perceived complexity, or doubts about their effectiveness. To address this resistance effectively it is crucial to implement change management strategies. These strategies should involve training programs for healthcare staff to ensure they feel confident and skilled in utilizing the technologies. Similarly educating patients, about the advantages and user friendliness of health solutions is essential. Moreover building trust by being transparent and showcasing the benefits of these technologies can help alleviate resistance. (Yetunde Aina & Ogegbo, 2021).

Ethical Considerations

Ethical considerations are crucial, in the integration of digital health solutions. Issues concerning data privacy, obtaining consent due to potential biases in AI powered solutions need to be addressed to safeguard patient rights and foster trust in digital health systems. Utilizing the digital systems involves gathering and analyzing huge amounts of personal health information, which raises concerns about data security and confidentiality. It is essential to establish data protection measures and ensure that patients are fully aware of how their information will be utilized. Moreover mitigating biases in AI algorithms is vital, for ensuring impartial healthcare provision. Continuous monitoring and enhancement of AI systems are essential to prevent reinforcing existing healthcare inequalities (Franco D'Souza et al., 2024).

Integration Challenges

Challenges, in integrating digital health technologies still pose obstacles to their widespread adoption. Key issues like ensuring compatibility across systems, addressing privacy concerns, and securing long term funding are hurdles that must be overcome (Ndayishimiye et al., 2023). Establishing compatibility, among health information systems is crucial, for data sharing and efficient care

coordination. Addressing privacy issues involves implementing data protection measures and maintaining data handling practices. Sustainable financial frameworks are necessary to sustain the continued deployment and expansion of health advancements (Ndayishimiye et al., 2023).

2.3.11 Future Directions

The potential, for digital health entrepreneurship in healthcare (PHC) in South Africa is promising, with numerous key areas ready for exploration and advancement. As the digital health field progresses these areas will play a key role, in influencing the wave of innovations designed to improve healthcare services:

Emerging Technologies:

The continuous exploration and integration of technologies such, as artificial intelligence (AI) blockchain and the Internet of Things (IoT) hold promise in revolutionizing the delivery of healthcare services. AI can improve accuracy and customize treatment approaches by analyzing data sets to identify patterns and predict outcomes. (Raghupathi & Raghupathi, 2014).

Blockchain technology offers solutions, for safeguarding and upholding the security and integrity of records enabling them to be stored and shared among authorized parties without the risk of changes. This groundbreaking technology addresses issues related to data privacy and trustworthiness in the healthcare industry.(Ahuja, 2021).

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Collaborative Ecosystems:

In the world of healthcare it is essential, for end users, patients, policymakers, industries and academic institutions to work together. This teamwork is vital, for pushing forward knowledge and developing services and solutions. (Secundo et al., 2019). Innovative collaborations take place in environments, where various individuals collaborate to generate value, while striving for lasting enhancements,

in healthcare using innovation and technological advancements. (Ngongoni et al., 2022).

Impact Evaluation: Thoroughly assessing health interventions is crucial, for creating insights that can guide upcoming projects. Research studies have looked into how these interventions impact aspects of healthcare. For instance in a study by (Backman et al., 2023) conducted a review to investigate the impact of platform based digital health interventions on patient outcomes during transitions, in healthcare. (Mörelus et al., 2021) also examined programs aimed at enhancing health literacy, in parents of children with underlying conditions.

In a study, by (Merchant et al., 2018). In 2018, they examined a health program, for asthma that emphasized satisfaction and usability. The research findings highlight the importance of taking into account patient results and contentment when evaluating health initiatives.

Scalability Models: Developing frameworks for innovation and implementation, in healthcare is crucial in improving their widespread acceptance and effectiveness, in various medical settings. A significant obstacle lies in handling the data outputs produced by healthcare systems. (Arenike Patricia Adekugbe & Chidera Victoria Ibeh, 2024). In order to address this issue solutions, like HealthFog and FHIRChain make use of technologies such, as IoT, fog computing. Blockchain to enable automated disease diagnosis and ensure the sharing of clinical data. (Tuli et al., 2020). These developments enhance not only the ability to grow but also boost data protection and compatibility both needed for making joint healthcare decisions. (Zhang et al., 2018).

Conclusion

The review of existing literature has highlighted the potential, for transformation and the challenges faced in the realm of digital health entrepreneurship within South Africa's primary healthcare sector. A key focus remains in overcoming limitations in resources and inefficiencies with digital health technologies and new business approaches showing promise in improving efficiency and overall

effectiveness. The literature demonstrates the need to bridge gaps in geography and socioeconomic status to ensure access to healthcare especially in rural and underserved areas through customized digital health solutions. Dealing with historical hurdles necessitates holistic strategies to revamp healthcare delivery models and enhance operational practices aiming for a more just healthcare system. The adoption of cutting-edge technologies like AI, blockchain and IoT, alongside business model innovation highlights the evolution of healthcare services, which can lead to improved health outcomes

The use of cutting-edge technologies, combined with the establishment of networks by digital health entrepreneurs underscores the significance of partnerships in promoting lasting enhancements in healthcare. Engaging with the community and providing education are crucial, for ensuring that digital health solutions are embraced, and function effectively tailored to meet the requirements of communities. The rapid spread of digital health solution has been hastened by the COVID 19 crisis shedding light on the advantages and hurdles associated with their incorporation, privacy protection and financial support (Modgil et al., 2022) .

The future prospects, for entrepreneurship in digital health should center on investigating technologies nurturing collaborative environments and creating community driven innovations backed by regulations and policies. By tackling these areas digital health startups can play an important role in enhancing healthcare access, standards and fairness, in South Africa ultimately leading to a more inclusive primary healthcare system.

2.4 ANALYTICAL FRAMEWORK

Given the comprehensive literature review conducted, the most suitable analytical framework for this research project is a combination of Osterwalder's Business Model Canvas (BMC) (Osterwalder & Pigneur, 2010) and Systems Thinking, specifically tailored for complex adaptive systems (Johnson et al., 2020) ; (Jackson, 2019). This dual-framework approach is recommended for following compelling reasons:

2.4.1 Theoretical Framework

The conceptual framework for this study is built on the integration of Osterwalder's Business Model Canvas (BMC) and Systems Thinking. This dual-framework approach offers a comprehensive method for analyzing digital health entrepreneurship within South Africa's primary healthcare sector, providing both micro and macro perspectives on the challenges and opportunities in this field.

Origin of the Conceptual Framework

Osterwalder's Business Model Canvas (BMC)

The Business Model Canvas (BMC) created by Alexander Osterwalder and Yves Pigneur in their 2010 book "Business Model Generation " acts as a tool for entrepreneurs and businesses to visualize, articulate and enhance their business strategies and models. The BMC deconstructs a business model into nine elements: value proposition, customer segments, channels, customer relationships, revenue streams, key resources, key activities, key partnerships and cost structure (Osterwalder & Pigneur, 2010). This systematic method enables an examination of creating or refining business models making it especially beneficial, for analyzing the approaches adopted by digital health innovators .

Systems Thinking

Systems Thinking originating from a blend of disciplines, like biology, engineering and organizational theory became notable during the 20th century thanks to figures such, as Ludwig von Bertalanffy, the creator of General Systems Theory. Subsequently other scholars furthered these concepts by integrating them into social systems (Peter, 2015).

Systems Thinking is a method that examines the connections and responses, within a system, acknowledging that systems consist of interconnected parts that collaborate and alterations in one area can impact the system. In the healthcare field Systems Thinking aids, in grasping the relationships among regulations,

structures, cultural norms and financial elements. (Arnold & Wade, 2015).. In the context of this study, Systems Thinking, as articulated by (Jackson, 2019) and (Johnson et al., 2020), offers insights, into the healthcare sector showing how digital health projects align with the setup. It underscores the importance of being flexible, adaptable and responsive to developments and obstacles.

Development of the Conceptual Framework

Combining BMC and Systems Thinking

The merging of BMC and Systems Thinking when working with business model innovation, creates a framework that covers the dynamics that come into play, when working on innovations in the primary healthcare sector of South Africa. This combined approach comes from recognizing that BMC goes into an examination of business models focusing on specific elements and their relationships (Osterwalder & Pigneur, 2010), whereas Systems Thinking offers a broader view by understanding the dynamic and interconnected nature of the healthcare system (Meadows, 2008). Through the integration of these methodologies the conceptual framework enables an analysis on how digital health entrepreneurs shape and enhance their business models while considering the effects and interactions, within the healthcare environment.

Adaptation to the South African Context

The conceptual framework was customized to better respond to the peculiarities of the South African healthcare system. This modification consisted in pinpointing regional problems like lack of resources, disparities in geography, and inefficiencies within systems; and adopting such applicable technologies as Internet of Things (IoT), Artificial Intelligence (AI), and blockchain to tackle the issues. It was important that the framework remained practical because it should offer implementable suggestions for digital health entrepreneurs so that they can adapt their business models according to what is happening locally while also sparking off creativity among them in view of local dynamics.

Empirical Validation

The framework was arrived at through real-world validation, which included examining research case studies and real-life instances of prosperous digital health initiatives. This method increases the likelihood that the framework is rooted in real world experiences and can aptly steer the evaluation of digital health business models, in South Africa.

2.4.2 Justification for the Framework:

The selected analytical framework is well supported for reasons described: It offers an analysis by integrating Systems Thinking's understanding of the primary healthcare system, with BMC's detailed examination of business model components presenting a balanced and comprehensive approach. The framework is customized to tackle the challenges and opportunities in South Africa's healthcare environment considering the socio economic and infrastructural backdrop to ensure that the conclusions are pertinent and practical. Its adaptable nature can accommodate the ever-changing landscape of the healthcare sector enabling strategies that can adapt to evolving dynamics and emerging patterns. By merging examination, with real world insights this framework provides digital health ventures with the necessary tools to effectively navigate the complexities of healthcare systems enabling them to create innovative and sustainable business models that enhance healthcare provision.

This detailed conceptual framework offers an approach, to examining digital health entrepreneurship in primary healthcare by incorporating practical real-world experiences that enhances its value as a tool for fostering innovation in primary healthcare outcomes, in South Africa.

2.4.3 Conceptual Framework

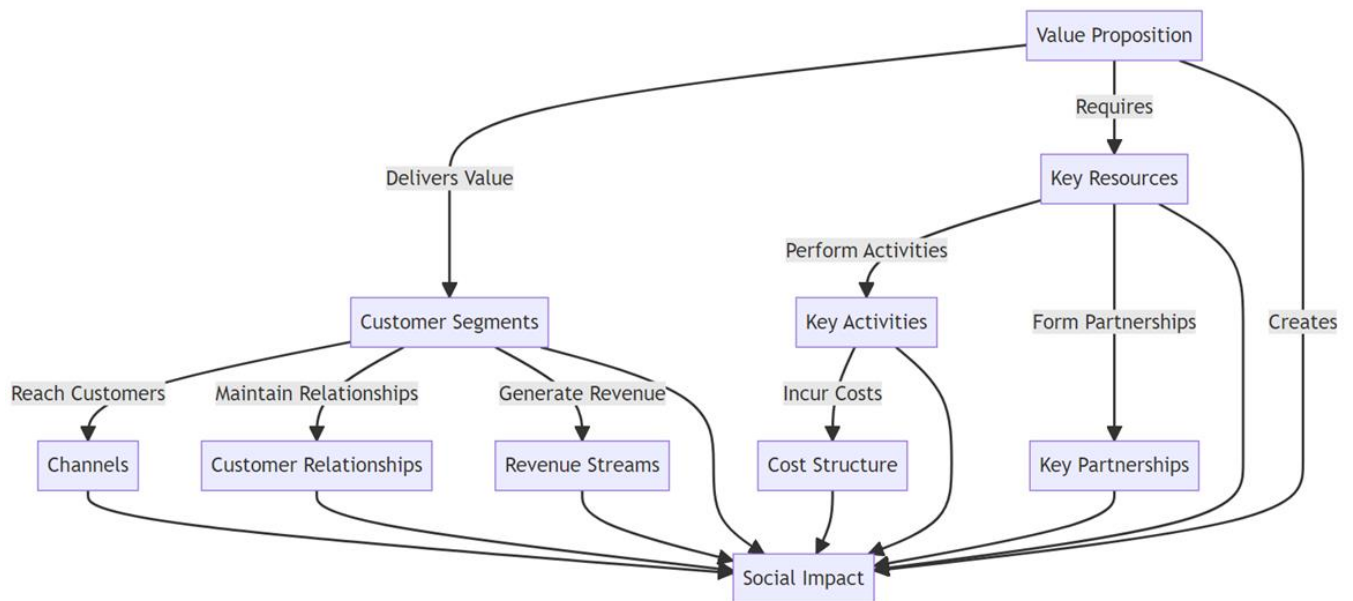


Figure 1: Business Model Canvas adapted (Osterwalder & Pigneur, 2010)

The structure of the framework, in a narrative format (Part a)

The Business Model Canvas (BMC) serves as a tool for entrepreneurs and businesses to strategize, outline and enhance their business models. It dissects the business model into nine core elements: value proposition, target customer groups, communication channels, customer interactions, income sources, vital resources, main activities, strategic partnerships and cost framework. Every element significantly contributes to the operation and prosperity of healthcare initiatives.

Value Proposition: The value proposition highlights the services offered by digital health ventures meant to enhance primary healthcare. These encompass telehealth services, health apps, for devices and AI powered diagnostic tools aimed at improving accessibility, effectiveness and quality of healthcare. The objective is to offer solutions that cater to healthcare requirements in areas with limited access, to medical services.

Customer Segments: Different customer groups, in the health, in South Africa consist of areas such as urban residents and underserved communities that encounter challenges when seeking healthcare services. It is essential to have a good understanding of these segments so as to develop customized solutions that cater to their respective requirements.

Channels: Digital health ventures employ channels to provide their services to customer groups. These channels include telemedicine platforms, mobile apps and community health initiatives that enable connection, with patients and healthcare professionals. The goal is to make healthcare services easily accessible, to those who require them the most.

Customer Relationships: Establishing connections, with clients is crucial for the prosperity of healthcare projects. This involves involving patients, in feedback systems offering support services and engaging in community outreach efforts. By nurturing trust and maintaining interaction digital healthcare projects can improve customer satisfaction and service efficiency.

Revenue Streams: Digital health ventures generate revenue through business models such, as subscription fees, pay per use models and collaborations, with both government and private sectors. Having sources of income ensures stability and contributes to the lasting success of healthcare innovations.

Key Resources: Essential assets such, as systems, medical tools, proficient healthcare staff and intellectual property are crucial, for providing services. These resources support the creation and execution of groundbreaking healthcare solutions.

Key Activities: Essential duties, in digital health ventures involve carrying out tasks, for effective operations. These tasks consist of delivering patient care offering health education, gathering and analyzing data. By engaging in these activities the digital health venture deliver quality healthcare services thereby attaining its goals.

Key Partnerships: Establishing alliances is essential to boost the effectiveness and expansion of digital healthcare ventures. Teaming up with community health organizations, non-profit groups and technology firms can offer resources, knowledge and assistance. These collaborations play a vital role, in expanding healthcare innovations and tackling health issues.

Cost Structure: The cost breakdown details the expenses associated with running the business model. This encompasses costs linked to developing technology training staff, day, to day operations. Ensuring compliance with healthcare regulations. Effectively managing these expenses is crucial, for sustaining stability and making a social impact.

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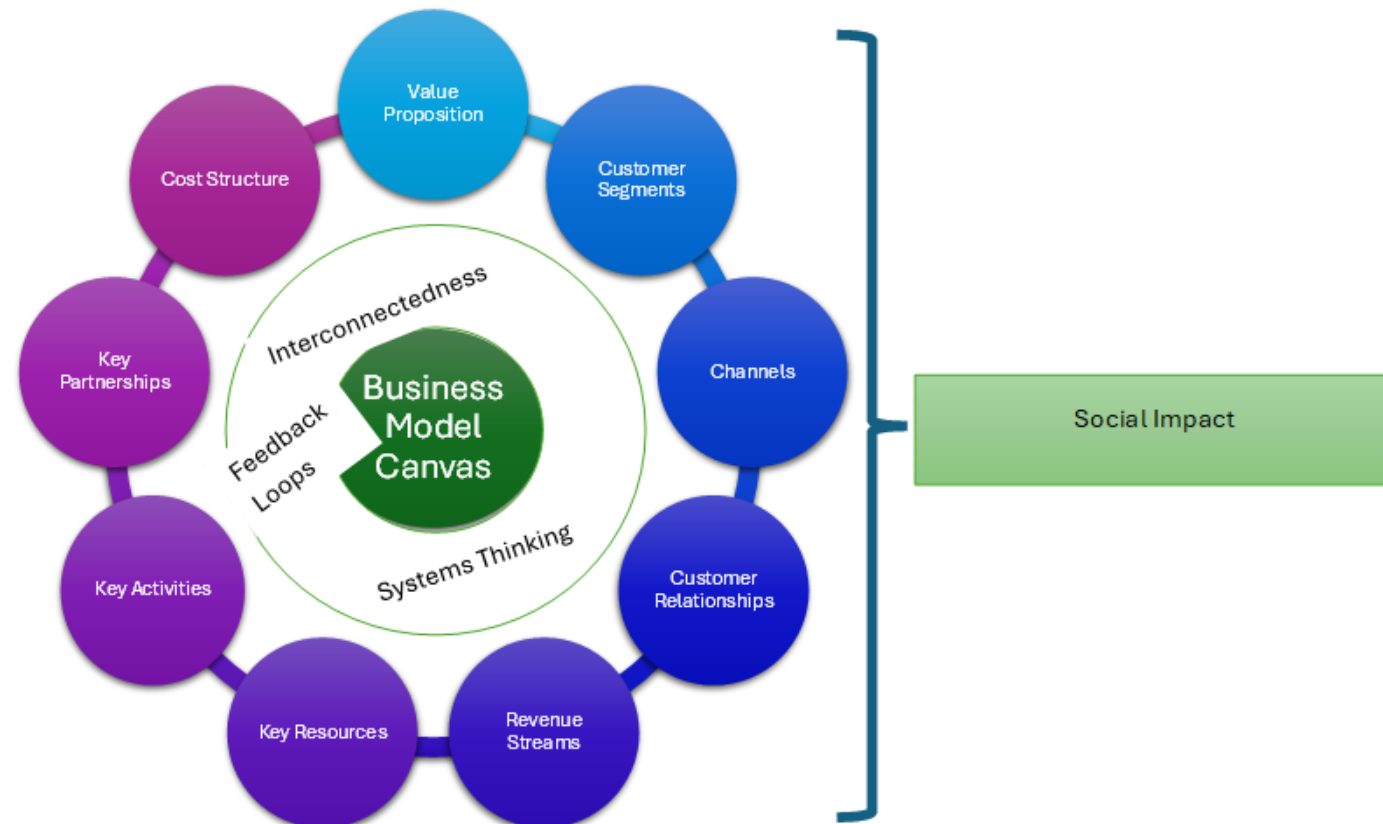


Figure 2: : Business Model Canvas adapted (Osterwalder & Pigneur, 2010) and Systems Thinking (Meadows, 2008) .

Systems Thinking in the Context of Digital Health Ventures

Understanding the connections and feedback loops, in the healthcare system through the lens of Systems Thinking offers a perspective. This viewpoint is crucial, for health initiatives as it emphasizes how different components are interrelated and how changes can influence results (Peter, 2015).

Identifying Interdependencies

An essential aspect of Systems Thinking is its capacity to acknowledge the connections, between policies, infrastructure, societal norms and economic factors, in the healthcare system (Atun, 2012). Having an understanding of this is essential, for creating strategies to tackle the underlying issues in healthcare. For instance enhancing healthcare facilities in regions goes beyond constructing clinics; it involves collaborative actions involving various fields such, as transportation, education and communication. To bring about lasting and significant improvements digital health innovations need to consider these interconnected relationships (Leslie et al., 2018).

Emphasizing Flexibility and Adaptability

The field of healthcare is always changing, facing challenges and opportunities, for growth. Systems Thinking highlights the importance of staying flexible and adaptable in healthcare solutions enabling health initiatives to address new trends and developments. This involves adjusting to advancements in technology changes, in regulations and evolving patient requirements. For example with the increasing popularity of telemedicine digital health projects need to update their platforms to meet regulations and integrate the latest technological innovations to stay current (Atun, 2012).

Promoting Comprehensive Analysis

By blending Systems Thinking, with the Business Model Canvas (BMC) a thorough examination of the details and larger scale elements of health entrepreneurship can be achieved. This integrated approach helps in grasping how components of a business model interact within the healthcare system

pinpointing areas ripe for enhancement and innovation. For instance delving into the connection between patient engagement efforts and health results offers insights, for improving service delivery. When patients actively engage with a health app their feedback can inform enhancements to its features subsequently leading to health outcomes and heightened patient satisfaction (Pereira et al., 2016).

Feedback Loops

In Systems Thinking feedback loops play a role in illustrating the recurring interactions, within a system Within the healthcare sector these loops can shed light on how modifications in one area impact components of the system. For example advancements, in managing a patient data task can result in improved patient outcomes. This progress fosters. vital elements of customer relationships. Thereby bolstering the overall value proposition. Understanding these loops empowers health initiatives to develop efficient and adaptable healthcare solutions (Arnold & Wade, 2015; Meadows, 2008).

Addressing Societal Influence

Systems Thinking also considers the implications of digital health technologies making sure that the digital health technologies have an impact, on public health outcomes. This includes looking at economic and cultural aspects that affect healthcare services and outcomes. For example educational initiatives that promote healthcare can result in communities and lower healthcare costs. By integrating these factors in digital health, projects can create solutions that are not just efficient but also aligned with cultural and social norms. (Leslie et al., 2018).

Application to Digital Health Ventures

Digital health ventures can make use of the Business Model Canvas (BMC) and Systems Thinking approach to shape and enhance their business strategies. By delving into each aspect of the BMC from a Systems Thinking perspective these

digital health ventures can craft enduring healthcare solutions that tackle the hurdles in primary healthcare, in South Africa.

For example a digital health venture could begin by pinpointing the healthcare requirements of communities (customer segments) and crafting a telemedicine platform (value proposition) to cater to those needs. Through collaborations with health authorities and non-governmental organizations (partnerships) the digital health venture can broaden its impact and tap into additional resources. Efficient channels like applications and community health initiatives ensure that the services reach the intended audience. Ongoing feedback, from users (customer relationships) aids in enhancing the services while sustainable revenue models (revenue streams) guarantee sustainability.

By embracing Systems Thinking the business can grasp the implications of its innovations within the healthcare sector. For instance it could examine how implementing telemedicine influences outcomes, medical costs and resource distribution. This thorough examination empowers the business to adjust its approaches, for outcomes and tackle any obstacles that may arise.

In summary combining the Business Model Canvas, with Systems Thinking offers a framework for evaluating and working with business model innovation. This method enables digital health businesses to create efficient and lasting business models that improve healthcare services and bring about social change. By using the findings from the research and implementing the framework, digital health ventures can navigate the challenges of the healthcare system, thereby contributing to enhancing health outcomes.

Restated Propositions

2.4.4 Proposition 1 - Barriers to Accessing Quality Healthcare in South African Primary Healthcare:

Access, to healthcare in South African primary healthcare facilities is hindered by systemic barriers and socio-economic factors leading to noticeable disparities in health outcomes, among the various population groups.

2.4.5 Proposition 2 - Digital Health Technologies (DHTs) used in Primary Healthcare

Digital health entrepreneurs, in South Africa's healthcare industry use mobile health (mHealth), telemedicine, and other advanced technologies to improve healthcare access, affordability and customization. These digital innovations cater to the needs of communities, promote cost efficiency and support long term healthcare strategies, in primary healthcare settings.

2.4.6 Proposition 3 - Innovations in Business Models by Digital Health Entrepreneurs

Digital health entrepreneurs, in the primary healthcare sector in South Africa are using creative business models that are changing the way healthcare services are provided. These fresh ideas are improving access to healthcare, raising the standard of healthcare while keeping costs reasonable and encouraging patients to be more involved. As a result there is an inclusive healthcare system in place, for primary healthcare.

CHAPTER 3. RESEARCH METHODOLOGY

3.1 Research approach

The research methodology chosen for this study is qualitative one, mainly because the research questions aim to delve into processes, experiences and perceptions rather than outcomes. Qualitative research is well suited for health sciences as it offers an understanding of the intricacies and dynamics, within a specific context or phenomenon being studied (Creswell & Poth, 2018). It presents a lens through which to explore the phenomenon.

Reasons for supporting the use of qualitative method of study include:

Contextual Understanding: The qualitative method allows for a detailed exploration of the digital health entrepreneurial landscape in South Africa. Given that innovation in business models in health and primary healthcare domains is heavily influenced by contextual factors it is important to employ an approach that considers this complexity (Khan et al., 2018).

In-depth Insights: The methodology is particularly valuable when aiming to understand motives, perspectives, motivations and obstacles. It sheds light on the issue at hand, aiding in the generation of ideas and propositions for the study (Scribbr, 2022).

Flexibility: Qualitative research offers flexibility, in both data collection and analysis processes. As the comprehension of the phenomenon grows and evolves the investigative path can be homed in to conduct a responsive study (Sutton & Austin, 2015).

Delving into Experiences: This enables an exploration of the experiences, viewpoints. and interpretations of digital health entrepreneurs enhancing the grasp of their perspectives (Creswell & Poth, 2018).

The foundational principles guiding this method are:

Reality is Constructed and Subjective: This research acknowledges that each digital health entrepreneur may offer a viewpoint on the challenges, opportunities and strategies pertaining to business models in primary healthcare. These diverse perspectives are valuable. And enrich our understanding of the phenomenon.

The researcher's Role is Integral: In research, data collection and analysis assume importance. The researcher serves as the tool for data gathering. This study facilitates an exploration of research inquiries, from various angles, which proves vital given the intricate nature of the subject.

Process-Oriented: This approach emphasizes comprehending the processes that culminate in outcomes.

In this research project it is crucial to explore how digital health entrepreneurs, in South Africa navigate through their environment to create and execute business models. The method of research allows for an examination of the insights and viewpoints of these entrepreneurs in the digital health sector providing, in depth and detailed data that quantitative methods may not have captured.

3.2 Research design

The research project focuses on the experiences of seven digital health entrepreneurs and therefore uses a multiple case study approach. This method allows for an analysis of each venture, in its context helping to compare and understand their innovative business models. It explores the strategies and challenges within the South African primary healthcare system. By using this approach the research can uncover patterns and insights that are more comprehensive and widely applicable compared to a single case study. This approach will enhance our knowledge on how various business models thrive in the landscape of digital health entrepreneurship in South Africa. The emphasis on business model innovation and its influence on healthcare outcomes makes this study a complex issue necessitating a case study approach (Quinn, 2015).

Reasons supporting the use of a case study design include:

Natural Contexts and Phenomena: Examining how digital health entrepreneurs go about executing on their business models requires meeting with them in their environments, justifying the use of multiple case studies, to compare and contrast the different approaches used in the innovation of business models.

Case Analysis: This method allows for an in-depth exploration of each scenario providing comprehensive insights, into the processes, methods, tactics and strategies involved in producing the final product or outcomes.

Cross Case Study Comparison: Comparing different case studies allows for an analysis to highlight similarities and differences, among entrepreneurs.

Advantages of using multi case study approach

Advantages of using case studies include gaining insights by examining real world scenarios, obtaining data for a deeper understanding of the subject, and having the flexibility to adapt research methods as needed.

Disadvantages of the case study approach

It is time consuming brought about by the collection and analysis of the data. This can prolong the research process. Additionally findings from case studies may not be easily generalized to other contexts due, to the nature of each individual case. Nevertheless one can anticipate the emergence of recurring themes and patterns that remain constant throughout the analysis phase. The credibility of the findings hinges on the management of researcher bias as the researcher's influence could impact the outcomes.

3.3 Data collection methods

During this study, data was collected through semi-structured interviews with each of the seven digital health entrepreneurs. The questions were open ended giving flexibility to the participants to be able to express themselves fully. Other data sources include content from peer review journals, business reports, news outlets and public health records.

The semi-structured interviews provided insights into the lived entrepreneurs experiences, opinions, emotions and expertise. This method allowed for an exploration of emerging topics with flexibility to delve deeper into issues.

The interviews took place between September – November 2023 online using Microsoft Teams as the messaging and collaboration platform. After obtaining permission from each digital health ventures Founder/Owner the discussions were transcribed into text using an open-source tool called Whisper by OpenAI. The interview transcripts of the seven digital health entrepreneurs have been included in the appendices to this document.

By combining the semi-structured interviews, with document analysis it was possible to lend credibility and validity of the findings. This mixed method approach facilitated an investigation of the research inquiries.

3.4 Population and sample

Given the time constraints and the inability to conduct additional interviews triangulation was used and achieved by using the following alternative data sources, for each of the digital health entrepreneurs under study. So the data sources were not only be limited to the semi-structured interviews but also the following data sources.

Existing Literature and Published Studies: Review of academic articles, from peer reviewed journals case studies, and reviews related to digital health ventures in South Africa or similar contexts. This will provide theoretical and contextual background, helping validate or contrast the findings from the semi structure- interviews conducted with the digital health entrepreneurs

Policy Documents and Government Reports: Analyzing relevant healthcare policies, digital innovation strategies, and regulatory guidelines can offer insights into the external factors impacting digital health ventures.

Company Websites and Public Reports: Information available on the digital health ventures' websites, including their mission statements, service

descriptions, and public reports, can provide additional perspectives on their business models and market approaches.

Online Reviews and User Feedback: Publicly available reviews and feedback from users of the digital health services can offer indirect insights into the effectiveness and reception of these services.

Media Articles and Industry Reports: News articles, industry blogs, and reports can provide information on the market trends, challenges, and successes of digital health ventures in South Africa.

Each of the above sources offers valuable data that complemented and triangulate the findings from the interviews, enhancing the validity and depth of the research within the given time constraints.

3.4.1 Population

There were thirty-five digital health ventures that were identified as taking an active role in digital health in South Africa. The list of digital health ventures was obtained by conducting web site search for digital health ventures operating in South Africa (HealthTech Alpha, 2023).

For this study, on "Innovating Business Models for Digital Health Entrepreneurship in Primary Healthcare in South Africa " the focus is on digital health entrepreneurs involved in projects across South Africa. These entrepreneurs play a key role in offering insights into the business models, strategies, challenges and impacts of their initiatives within the primary healthcare field.

Selecting this group is justified by the necessity to gain insights into the dynamics, strategic choices and innovation processes from those actively engaged in digital health entrepreneurship. Their firsthand experiences and viewpoints are vital for an understanding of how business model innovations are conceived and put into practice within the distinctive context of South Africa's healthcare system.

3.4.2 Sample

Introduction

In qualitative studies, and in particular a multi case study method, choosing the right sample size is essential to capture detailed and insightful data while keeping it manageable and focused. The decision to include seven health ventures in this research was guided by principles, existing studies and practical factors. This section presents the rationale for the selected sample size drawing on publications and pertinent research to support the methodology (Creswell & Poth, 2018; Yin, 2018).

Theoretical Justification

In past research regarding the sample size for a multi case study, it has been suggested that having six to eight cases is ideal for thorough exploration while keeping the study manageable and enable one to undertake an in-depth study on the subjects under study (J. Creswell & Cheryl, 2018). This range is seen as effective in capturing diverse aspects across the cases, helping researchers to identify, patten and themes and distinctions successfully. The decision to use seven cases aligns with this guideline, ensuring that the study covers a broad spectrum of digital health ventures without compromising the study.

Empirical Evidence

Some studies have shown that using a sample size within the range of four to ten cases can be adequate for developing theories through a case study method of research (Eisenhardt, 1989). There are other suggestions that contend selecting a smaller number of carefully chosen cases can provide deeper insights and enable a more comprehensive analysis compared to larger samples, which might scatter the focus (Yin, 2018).

Practical Considerations

Response Rate and Feasibility:

The study initially reached out to twenty digital health ventures. Out of these, only seven ventures responded positively and agreed to participate. This response rate reflects practical constraints such as availability, willingness to participate, and relevance to the research objectives. Despite the lower-than-expected participation, the sample size of seven still falls within the recommended range, ensuring the study's validity and reliability.

Diversity and Variation:

The study focuses on seven digital health ventures that offer various innovative solutions in primary healthcare. Their diverse approaches play a key role in examining business models and how they influence healthcare accessibility and quality. By gathering a broad spectrum of experiences and tactics, the study aims to offer a thorough insight into Primary Healthcare.

Relevance to Digital Health Entrepreneurship

Focused Insights:

Conducting in depth, semi structured interviews with seven digital health ventures enables a comprehensive exploration of their business models, obstacles and achievements. This level of detail is crucial for grasping the intricacies of digital health entrepreneurship within South Africa's Primary Healthcare industry.

Comparative Analysis:

The study includes seven cases, allowing for comparative analysis so as to pinpoint shared themes and distinct differences. This method of comparison is essential for deriving practical insights and suggestions aimed at digital health entrepreneurs and policymakers.

Support from Previous Research:

Several studies support the use of a small, focused sample size in qualitative research:

In qualitative research, it has been noted by some researchers that data saturation typically happens after about twelve interviews, with key themes becoming apparent after just six interviews (Guest et al., 2006). This suggests that a sample size of seven cases is sufficient to reach thematic saturation.

Other researchers highlight the significance of purposeful sampling in qualitative studies, emphasizing the selection of cases that offer valuable information and align with the research inquiry (Palinkas et al., 2015). The study focused on seven digital health startups involved in primary healthcare, chosen for their pioneering technology applications to ensure data relevance and in-depth analysis during the research.

The sample size of seven digital health ventures in this multi-case study is justified based on theoretical recommendations, empirical evidence, and practical considerations. By adhering to the proposed guidelines used in research enquiry and design (Creswell & Poth, 2018), and supported by other research work, the study ensures comprehensive coverage and in-depth study of the digital health ventures. The selected sample size enables detailed exploration and comparative analysis, providing valuable insights into business model innovation for digital health entrepreneurship in Primary Healthcare in South Africa.

3.5 The research instrument

For this study semi structured interviews were conducted using an interview schedule that aligns with the nature of the research.

The interview schedule included a set of questions that were open ended aiming to delve into the themes highlighted in the literature review and theoretical framework. These themes encompassed aspects such, as components of business models, challenges encountered, strategies implemented and the effects on healthcare accessibility and quality.

Each question was tailored to address elements of the research questions ensuring a grounded evaluation of the subject matter. The interview schedule will

be annexed in an Appendix alongside a letter detailing the research objectives, participant rights and data handling protocols.

Given that this tool was custom designed for the environment of digital health ventures in South Africa it provided room to explore context specific nuances.

3.6 Procedure for data collection

To collect data, for this study semi-structured interviews were conducted with the digital health entrepreneurs. The method was chosen due for its aptness in research, allowing for the exploration of the viewpoints and lived experiences of the participants and grasping the details around hindrances faced when working business model innovation on in healthcare.

Below is a brief description of the data collection procedure:

Selection of Participants: Digital health entrepreneurs were selected from a pool of thirty-five identified startups in South Africa specializing in primary healthcare. To ensure fair representation entrepreneurs who had previously implemented solutions in primary healthcare such as Telehealth, mHealth and Electronic Health Records included in the study while also considering different stages of business growth.

First Communication: The Researcher emailed prospective participants and informed them about the research, its objectives, privacy, optional involvement, and expected outcomes. A formal letter of invitation and a consent form was attached to the first communication.

Scheduling Interviews: For those who respond positively, a convenient time for the interview was scheduled. Interviews were conducted via Microsoft Teams and the interviews were recorded.

Conducting the Interviews: ; Each interview followed a predefined schedule to gather data points. The interviews were semi-structured allowing for flexibility to delve deeper into unexpected topics that often came up during the conversation.

Recording/Transcribing: With the participants approval the interviews were recorded to capture the truthfulness of the data. Subsequently the interviews were transcribed verbatim to enable analysis.

The choice of this data collection method is justified as it enables an exploration of the experiences and perspectives of digital health entrepreneurs within the South Africa primary health care context. Interviews provide a rich source of information, and the flexible nature of the semi-structured interviews allows for the emergence of unexpected themes and ideas. Additionally this approach allows for real time clarifications and follow up questions enhancing the accuracy and credibility of the gathered data.

3.7 Data analysis strategies and interpretation

The data gathered in this study was carefully analysed to delve into the research questions and provide descriptions of the information. Thematic analysis was chosen to offer a framework, for interpreting the data beneficial for exploring the perspectives and experiences of individuals involved in digital health innovations

To analyze the data a guide consisting of six phases outlined by (Maguire & Delahunt, 2017) was followed. These steps involve getting familiar with the data creating codes identifying patterns evaluating them defining themes and labeling them. This method of analysis provides an understanding of the data allowing for an exploration of aspects within South Africa's digital health entrepreneurship landscape

This approach is aligned to research principles focused on understanding the experiences, behaviors and viewpoints of the study participants. The decision to utilize this methodology is driven by the research questions and the nature of the collected data enabling an examination of phenomena, under investigation.

3.8 Quality Assurance

Quality assurance was a fundamental aspect of this study, ensuring the accuracy and reliability of the results. Throughout the planning, data collection, and analysis phases, stringent procedures were followed. These included organizing an interview schedule, sampling for diverse representation, and conducting unbiased data analysis using established qualitative techniques. To further validate the findings, cross-referencing with other data sources was employed. These measures were important in maintaining the trustworthiness and credibility of the research outcomes.

To ensure the credibility of the study, prolonged engagement with participants was prioritized to gather in-depth and meaningful data.

The dependability of the study was addressed by maintaining a comprehensive audit trail of all research activities, decisions, and changes made during the study. All the data collected was stored in a central location OneDrive. The transcribed material was stored in a third-party software which provided the flexibility of analysing the data when needed.

Confirmability was achieved through triangulation. Information was gathered from various sources, including existing literature, published studies, policy documents, government reports, company websites, online reviews, user feedback, media articles, and industry reports. By comparing and contrasting data from these diverse sources, the study ensured a thorough and unbiased understanding of the research topic.

The study's applicability allows readers to understand the specific context of the research and make informed judgments about the relevance of the findings to their own circumstances. Employing a rigorous approach in data gathering and analysis grounded the findings in solid evidence, thereby enhancing their applicability beyond the initial study setting. Although the objective of this research was not to generalize universally, it aimed to deepen the understanding

of digital health entrepreneurship in South Africa and contribute valuable insights to existing theory in this domain.

To validate and establish confidence in the research findings, various strategies were employed to enhance reliability. One key strategy involved collecting data through structured interviews with digital health entrepreneurs. During these interviews, the entrepreneurs' experiences, perspectives, and motivations were thoroughly explored. Another approach involved triangulation, which included gathering information from multiple sources such as existing literature, published studies, policy documents, government reports, company websites, online reviews, user feedback, media articles, and industry reports. By comparing and contrasting these sources of data, a comprehensive and trustworthy understanding of the topic being investigated was achieved

3.8.1 *Ethical considerations*

This research study adhered to stringent ethical guidelines to ensure the rights and well-being of all participants were respected. To uphold these ethical standards, several key procedures were implemented throughout the study.

Informed Consent

Before participating in the study, each individual received a thorough explanation of the study's objectives, methods, potential benefits, and any risks involved. The voluntary nature of their participation was emphasized. Participants were then provided with an informed consent form, which they reviewed and signed, confirming their understanding and agreement to participate. This process ensured that participants were fully aware of what the study entailed and their role within it.

Anonymity and Confidentiality

Maintaining the anonymity and confidentiality of participants was a top priority. All collected data was kept strictly confidential and securely stored. Personal information was managed in accordance with the Protection of Personal Information Act 4 of 2013. To protect participant confidentiality, any identifying

information was removed from the data. Pseudonyms were used when reporting the study's findings to further safeguard participant identities. Additionally, audio and video recordings, along with transcripts, were securely stored with access restricted to the research team only. Once the research concludes, these materials will be appropriately disposed of to maintain privacy.

Transparency

The research process was characterized by transparency and honesty at all stages. Participants were kept informed of any modifications made during the study, and their consent for continued participation was obtained before proceeding with data collection. This approach ensured that participants were aware of any changes and continued to agree to their involvement under the new conditions.

Compliance with Institutional Guidelines

Before commencing data collection, the study strictly followed the guidelines and standards set by Wits Business School. All necessary ethics forms were completed and submitted to the Ethics Committee for their review and approval. This compliance ensured that the study met all institutional requirements for ethical research.

By implementing these comprehensive ethical procedures, the study ensured the protection of participant rights and the integrity of the research process. These measures were crucial in maintaining the trustworthiness and credibility of the study's outcomes.

Prior to starting the data collection process compliance to follow the guidelines and standards set by Wits Business School was adhered to. Additionally the ethics committee forms were filled and submitted to Ethics Committee for their review and approval.

3.9 Rationale for Omitting Observations in the Case Study Approach

In utilizing the case study approach for this research, the decision to omit direct observations will need to be justified. While observations can provide valuable, firsthand insights into participant behaviors and interactions, several factors influenced the decision to exclude this method from the current study.

Firstly, the primary focus of this research is on digital health ventures, which often operate in diverse and geographically dispersed environments. Conducting in-person observations would have required extensive travel and logistical coordination, making it impractical given the scope and resources of the study. Furthermore, digital health activities often occur in virtual spaces, such as online platforms and telehealth services, where traditional observation methods are less applicable or feasible.

Secondly, the nature of digital health entrepreneurship involves interactions and processes that are frequently documented in digital formats. Detailed information can be effectively gathered through structured interviews, surveys, and analysis of digital records. These methods can capture the essential elements of business operations, user interactions, and service delivery without the need for direct observation. For instance, interviews with key stakeholders provide in-depth qualitative data on their experiences and perspectives, which can be more informative than superficial observational data.

Thirdly, ethical considerations and participant privacy played a crucial role in this decision. Observing participants in their professional environments could potentially intrude on their privacy and disrupt their normal activities. This is particularly relevant in healthcare settings, where patient confidentiality and the sensitive nature of medical interactions must be rigorously protected. By relying on interviews and document analysis, the study ensures a higher level of privacy and ethical compliance.

Lastly, the methodological alignment of the study supports the exclusion of observations. The research aims to explore the strategic and operational aspects of digital health ventures, which are best examined through narratives and documented evidence rather than real-time observation. Case studies thrive on detailed, context-rich data that can be thoroughly analysed and triangulated from multiple sources. This approach aligns well with the study's goals and provides a framework for understanding complex business models and their impacts.

CHAPTER 4. PRESENTATION OF FINDINGS

This chapter presents the findings resulting from the exploration of seven digital health ventures. The ventures have been anonymized as Case A through to Case G, within the broader context of digital health innovation's role in transforming Primary Healthcare (PHC) in South Africa. These ventures have been selected for their distinct approaches to leveraging digital health technologies (DHTs) that address challenges in healthcare accessibility, delivery, and quality. The objective of this chapter is dual: firstly, to describe the various strategies, operational models, and impacts these ventures have on primary healthcare, and secondly, to assess the collective insights and implications brought about by engaging with each of the seven digital health ventures.

4.1 Overview:

The importance of this analysis goes beyond looking at the stories of the digital health ventures. Its goal is to provide an understanding of the conversations on digital health innovation. By examining the achievements, obstacles and strategic choices made by these ventures this chapter aims to offer insights for policymakers, entrepreneurs and healthcare professionals involved in or considering health projects. This is especially relevant in middle income countries where digital health offers an opportunity to overcome traditional barriers in healthcare delivery.

4.2 Systems Thinking complementing the Business Model Canvas (BMC)

The social impact of Systems Thinking is maximized by integrating it with the Business Model Canvas. Each instance points to great contribution towards bettering healthcare access and quality. These undertakings change how health care is provided, and its outcomes as performed by digital health entrepreneurs; for example, they do this through making specialist advice accessible as demonstrated in Case A, while simplifying patient referrals in Case B and giving

patients control over their health records as shown in Case C. These digital health solutions tackle systemic challenges thus leading not only to desired health outcomes but also saving on costs involved while improving underserved populations' quality of life (Johnson et al., 2020).

Systems Thinking when combined with the Business Model Canvas creates an effective foundation upon which digital health enterprises can address intricate problems associated with healthcare delivery systems (Buchanan, 2019). This method ensures that all value propositions are relevant and impactful; customer segments are targeted appropriately; delivery channels used efficiently; customer relationships built and maintained effectively; revenue streams diversified adequately among others. (Arnold & Wade, 2015).

4.3 Findings pertaining to Case A

Introduction:

Case A, a digital health venture has made its mark in the healthcare sector, in South Africa since 2016. Its primary goal is to offer healthcare services, expert digital training and clinical assistance uniquely tailored to the various customer segments. Unlike other platforms, Case A focuses on providing medically relevant information that suits South Africa's distinct healthcare setting, resources, and financial frameworks(Founder/CEO Case A, 2023).

Mission and Vision

Case A's mission is centered on reducing disparities in healthcare accessibility and quality, through innovation. The objective Case A through its digital platform is to provide a support system for healthcare practitioners by having all relevant resources under one mobile application that is user-friendly. This consists of customised details regarding medications, clinical protocols, treatment guidelines and funding particulars. The digital health venture makes it possible for health care professionals to make informed choices that can eventually lead to better health outcomes. (Founder/CEO Case A, 2023).

Operational Tenure

Case A has been operational since 2016 building a dependable system that has gained massive popularity among medical practitioners. Case A has been able to continuously refine its offering over the years by incorporating user feedback and keeping abreast healthcare needs. (Founder/CEO Case A, 2023).

Primary Healthcare Focus

Case A mainly focuses on digital guideline tools and clinical decision support systems tailored for primary health care professionals in South Africa. For instance, it enables e-prescriptions on behalf of the National Department of Health among other decision-making aids. Case A significantly contributes towards streamlining the overall functioning efficiency of the country's health system (Founder/CEO Case A, 2023).

Strategic Approach

Case A collaborates with various stakeholders such as academic institutions, clinical partners, and health institutions among others so as to facilitate contributions towards content quality assurance. Local key opinion leaders including institutions are closely involved alongside the digital health venture, to ensure alignment between its protocols/guidelines with national standards/best practices. Such joint efforts enhance not only credibility but also encourage cooperation among medical practitioners (Founder/CEO Case A, 2023).

Local Tailored Solutions.

One important element of Case A's strategy is its focus on localizing its content. Unlike many global platforms that provide generic information, Case A's platform is designed to tackle the specific problems being experienced by healthcare practitioners in South Africa (Founder/CEO Case A, 2023). This involves considering local resources, funding guidelines as well as healthcare policies. By providing localized decision support information, Case A ensures that health care professionals have access to the most relevant and applicable data necessary

for making informed decisions in a limited resource environment. (Founder/CEO Case A, 2023).

Impact on Healthcare Delivery

Case A's impact on healthcare service delivery in South Africa has been monumental. The platform enables health care providers to easily get critical knowledge that helps them deliver high-quality services. In this case, the importance of Case A's services cannot be overstated because rural and underserved areas do not usually have opportunities for advice from specialists on current clinical guidelines. The platform addresses such concerns and thereby ensuring that health care practitioners are adequately supported irrespective of their location so that they can offer the best possible healthcare (Founder/CEO Case A, 2023).

The sections below will discuss how the business model of Case A addresses the identified challenges through the Business Model Canvas framework in contributing to the general improvement of Primary Healthcare in South Africa:

Business Model Canvas (BMC) Perspective:

1. *Value Proposition*

Case A's value proposition is anchored on the development and provision of a comprehensive user-friendly digital platform that significantly improves accessibility and quality of primary care services in South Africa. This platform aggregates essential clinical information thus making it readily available for clinicians who can therefore streamline their decision-making processes while improving patient outcomes and addressing the critical need for evidence-based information at the point of care (Founder/CEO Case A, 2023).

Contextual Relevance

Unlike global digital health platforms that give generic information, Case A's focus is on producing content which suits South African conditions. It encompasses adapting guidelines and protocols so that they reflect local healthcare policies,

available resources, as well as funding. This therefore implies that the information given is not only authentic but also applicable in the lived experiences of South African healthcare workers concerned about public health. Therefore, from a contextual perspective the information obtained from the platform resonates with the healthcare workers. (Founder/CEO Case A, 2023).

Convenience

This platform has been designed in such a way that even non-tech savvy users can navigate the application with minimal difficulties. The simplicity of use is crucial because it enables high adoption rates among healthcare providers who can easily integrate the application into their daily activities/processes without necessarily undergoing extensive training. The app's offline capabilities enable users to gain access even when there is limited or no connectivity (Founder/CEO Case A, 2023).

Access to Local Expertise

The platform provides access to clinical information and also connects healthcare professionals to local key thought leaders and academic partners. This feature allows users to benefit from the expertise of leading practitioners and institutions within South Africa (Founder/CEO Case A, 2023).

Enhanced Decision Support

The platform has clinical decision support tools that are meant to guide healthcare providers into making correct decisions promptly. These tools adopt evidence-based practices that are frequently revised as new research is being released or guidelines are updated. In addition, Case A ensures that the decision support provided is integrated with local treatment guidelines and protocols so as to result in effective patient care that meets the quality standards (Founder/CEO Case A, 2023).

Impact on Healthcare Quality and Accessibility

Case A's value proposition leads directly to better health services as well as improved accessibility. The company helps in improving healthcare by giving doctors/clinicians the necessary means of carrying out their duties more effectively. It also assists doctors/clinicians working in rural areas have access to clinical information, where there are fewer specialists available hence bringing in an important supportive role (Founder/CEO Case A, 2023).

2. Customer Segments

Case A caters to a variety of customer groups by ensuring that the digital health platform meets the requirements of various parties involved in delivering primary healthcare. The main customer categories, for Case A consist of doctors, pharmacists, nurses, medical schools, government bodies, pharmaceutical firms and hospitals. By concentrating on these stakeholders Case A aims to offer assistance that boosts healthcare services at various levels.

Doctors

Doctors, particularly those in primary healthcare settings form a significant customer group for Case A. These healthcare providers frequently encounter the task of making prompt and well-informed decisions amidst limitations in resources. Case A's platform offers doctors access to clinical recommendations, treatment strategies and tools for decision making support. This accessibility aids doctors in enhancing precision, choosing treatment and efficiently managing patient care. The incorporation of localized details guarantees that doctors can depend on useful advice customized to the healthcare landscape, in South Africa (Founder/CEO Case A, 2023).

Pharmacists

Pharmacists have a role, in the healthcare system in overseeing medication therapy and ensuring the safe and efficient dispensing and use of drugs. The Case A platform provides pharmacists with information on medications, such as interactions, dosage recommendations and contraindications. This data is crucial for preventing mistakes in medication and improving pharmacotherapy

outcomes. Moreover by keeping up to date on pharmaceuticals and protocols, pharmacists can offer improved patient guidance and assist other healthcare providers in making well informed decisions regarding medication that is to be dispensed to patients or patients requiring more information about the medication. (Founder/CEO Case A, 2023).

Nurses

Case A's platform is of immense benefit to nurses who are primary healthcare patients' first contact. The platform offers the nurses clinical decision support tools and educational resources that help to enhance their patient care management. This is very crucial especially in remote areas with inadequate medical resources where nurses have to deal with many illnesses. By getting such information as latest industry standards, nurses become more empowered and, therefore, can provide better care and contribute to the overall health of patients (Founder/CEO Case A, 2023).

Medical Academic Institutions

Universities and training hospitals form a second major Case A customer group. These are the institutions that train the next generation of medical professionals. Some of the academic institutions integrate Case A's platform into their teaching programmes to enable learners at all levels access up-to-date clinical guidelines, research information, and decision-aid tools. This means that, when students graduate from medical school or complete their training, they are adequately prepared for clinical practice thereby improving the quality of medical education and training. (Founder/CEO Case A, 2023).

National Government Entities

Case A's platform is also an important customer for national government especially in the dealing with healthcare policy and regulation. The digitized national standard treatment guidelines from the platform of Case A, aligns with government efforts to enhance quality and access in health care. When government entities support and advocate the use of this platform, all medical

practitioners in the country are provided with standardized clinical information on an evidence-based approach. (Founder/CEO Case A, 2023).

Pharmaceutical Companies

Regarding sponsorship and partnership opportunities, pharmaceutical companies are an important clientele segment for Case A. By using this platform these firms are able to launch new products, enlighten health practitioners on their services, and additionally support continuing medical education by means of sponsored webinars or training programs. (Founder/CEO Case A, 2023) .

Hospitals

Case A's platform is used by hospitals, both public and private. Clinical decision making is the backbone of a hospital which needs an efficient and effective management of systems. By obtaining licenses for some components of the software, hospitals are able to leverage the technology for their requirements. (Founder/CEO Case A, 2023).

Identifying Unmet Healthcare Needs

Stakeholder engagement and collaboration revealed unmet healthcare needs in these client segments. Case A gained valuable insights into the challenges and requirements of each group by closely collaborating with healthcare professionals, academic institutions, governmental organizations, as well as pharmaceutical companies. The development of this collaborative approach enabled Case A to design its platform so that it could address specific pain points and gaps in the healthcare system as well as ensure it provides solutions that are highly effective and useful. (Founder/CEO Case A, 2023).

3. Channels

Case A utilizes various methods to connect with its intended audience, such, as word of mouth, social media, academic and pharmaceutical networks, conferences and events. These approaches have been quite successful allowing Case A to engage with 70% of doctors and pharmacists nationwide with a user

base exceeding 65,000 and 12,000 active users daily. By leveraging these communication channels healthcare professionals from various backgrounds and regions can easily access the platform and stay informed. The effectiveness of these outreach efforts is evident in the platforms reach and engaged user community demonstrating its impact in improving access, to healthcare resources. (Founder/CEO Case A, 2023).

4. Customer Relationships

Case A has been able to maintain healthy relationships with its customers by creating an online community, giving updates regularly, and providing technical support. Constant engagement with medical professionals ensures that they can be aware of the latest developments and functionalities of the digital platform. This is important for Case A, to ensure the continued use of its platform as it cultivates a strong community and offers ongoing support services that raise user loyalty hence ensuring Case A's long-term success (Founder/CEO Case A, 2023).

5. Revenue Streams

Case A has various income streams among them sponsored educational listings, online webinars, and pharmaceutical product information as well as software licensing. This diversified revenue model keeps health professionals in the know while making sure that it is financially viable. The multiple streams of revenues help in the risk mitigation and maintaining cash flow necessary for platform growth and survival. This approach corresponds to the view found in literature that stresses on financial sustainability as one of the ingredients for success in digital health ventures over time. (Founder/CEO Case A, 2023).

6. Key Resources

The essential resources of the platform are made up of a skilled team of software development and product management professionals, commercial team responsible for securing sponsorship revenue and licensed clinical data. They are important in improving and enhancing its reliability, keeping it up-to-date, and

to cater for varying needs among healthcare experts. Investing in high quality resources ensures that Case A is able to continuously improve its services and provide quality health services. (Founder/CEO Case A, 2023).

7. Key Activities

The main activities in Case A are maintenance of technical infrastructure, user engagement, sponsorship acquisition and provision of continuing professional development programs. These activities are vital for the functioning and expansion of the platform. Ongoing engagement with users as well as professional development initiatives are meant to ensure that users keep up-to-date and adept at using it, thus making it more effective and impactful (Founder/CEO Case A, 2023) .

8. Key Partnerships

The success of the platform is largely determined by its collaboration with the National Department of Health and pharmaceutical companies. The digitization of national treatment guidelines happens through these collaborations, which also facilitate training programs that are accredited by the National Department of Health. They make Case A more credible and far-reaching hence it can be able to provide patients with detailed and authoritative clinical information. The adoption of such partnerships is vital in driving the platform's impact since they conform to arguments in literature about how strategic alliances improve efficiency and spread of digital health programmes (Founder/CEO Case A, 2023)

9. Cost Structure

The key costs for Case A include human resources, software licensing as well as data licenses. The objective is to manage these costs to ensure the continued operation of the platform without affecting the quality and accessibility of its services. Effective cost control is critical in keeping a balance between financial health and high-quality healthcare delivery. The platform's capacity to effectively control costs, therefore, secures its long-term viability and access, this being

consistent with the emphasis on cost management in digital health ventures sustainability in the literature (Founder/CEO Case A, 2023)

10. Social Impact

The digital platform is very influential as evidenced by the twelve thousand people using it daily. This level of interaction means that the platform plays a great part in supporting medical personnel and improving patient treatment. By widening access to trustworthy clinical information, Case A enhances health outcomes contributing to overall healthcare system improvement. The widespread use of this system shows how important it is towards the healthcare ecosystem aligning with literature suggesting how digital health innovations impact on delivery of health care services and patients' outcome (Founder/CEO Case A, 2023).

Conclusion:

The Business Model Innovation Canvas, for Case A showcases how the company is meeting the demand for localized clinical information, within South Africa's primary healthcare . Through the use of digital the digital platform and collaboration through partnerships, Case A has developed an approach that enhances primary healthcare service quality and generates income from sponsored content and licensing fees.

Case A provides insight into how digital health solutions are able to improve on the quality of primary healthcare. Case A provides important lessons brought about by the use of technology and how the technology is bridging knowledge gaps, clinical decision-making, and patient care. As the Case A progresses in growing its market and services more customers, its experiences will provide insights for other digital health entrepreneurs, and policymakers.

The success of Case A signifies the immense potential of digital health in addressing the systemic challenges found in the current healthcare delivery, especially in resource-constrained environments as noted in Case A. By empowering healthcare professionals with information that is readily accessible and contextually relevant, such innovations contribute to improving on the quality

of healthcare coupled with providing services to those in underserved or remote areas.

4.4 Findings Pertaining to Case B

Introduction:

Case B, a digital venture that is committed to revolutionizing the provision of primary healthcare, in South Africa using creative technological innovations. Having been in existence since 2014, Case B has become an important player in the healthcare industry; particularly when it comes to the support of marginalized rural and remote areas. The main objective of their platform is to improve communication between health care providers and medical specialists ultimately increasing the accessibility and quality of medical services provided for communities struggling with limited access to health care resources. (CEO/Founder Case B, 2023).

Mission and Operational Tenure

The main objective of Case B is to ensure that experts' advice is available for people working in healthcare sector. Through their software doctors can exchange information with specialists faster thus enabling them to make informed decisions on time while treating patients. Since 2014 when it was founded, the company has consistently improved its platform so as to meet the needs of different user needs within the sector thereby ensuring its continued usefulness towards supporting practitioners involved in delivering healthcare. (CEO/Founder Case B, 2023).

Primary Healthcare Focus

Case B has mainly targeted the public healthcare sector catering to a segment of South Africa's populace that lives in rural and underserved regions. This specific focus holds importance for the venture, as it caters to the requirements of communities that frequently face challenges, in accessing healthcare services due to financial limitations. By concentrating in these areas, Case B is able to

offer healthcare solutions that have the potential to improve health outcomes for marginalized populace (CEO/Founder Case B, 2023).

Strategic Approach

Case B takes an approach of combining cutting edge technology with a deep understanding of the healthcare environment, in South Africa. The platform links healthcare professionals with medical specialists. The platform also utilizes data analytics to improve healthcare services. This approach improves the success rate of Case B's solutions being innovative and being embraced by the intended users of the services. (CEO/Founder Case B, 2023).

Commitment to Continuous Improvement

A key aspect of Case B's approach in conducting its business is its commitment, to continual enhancement of services. The digital health ventures does regularly enhance its platform based on feedback from users enabling it to keep abreast of the technology innovation. This commitment to excellence is evident in how the platform adjust to changes by seamlessly integrating into existing healthcare processes. (CEO/Founder Case B, 2023) .

Focus on Underserved Populations

Case B's emphasis on supporting underserved communities demonstrates its commitment to making an impact. The company acknowledges the obstacles that rural and remote areas face in terms of lack of access to healthcare facilities and specialists. By offering resources that empower healthcare professionals in these regions Case B plays an important role in enhancing healthcare accessibility and quality for the vulnerable populations, in South Africa (CEO/Founder Case B, 2023).

The following sections will explore how Case B's business model, viewed through the lens of the Business Model Canvas, addresses these challenges and contributes to the overall improvement of the healthcare system

Business Model Canvas (BMC) Perspective:

1. Value Proposition

Case B value proposition strives to improve access, to medical guidance, in addition it simplifies referral processes by utilizing data analysis for informed decision making. This aspect improves the overall healthcare systems by empowering healthcare professionals and cutting down on unnecessary healthcare costs. When analysed critically, each aspect of the value proposition works on addressing some of the systemic issues that are found in South Africa's primary healthcare system particularly in rural and underserved areas. (CEO/Founder Case B, 2023).

Enhanced Access to Specialist Medical Advice

A major highlight of Case B's value proposition is its capacity to significantly enhance access to healthcare for frontline workers particularly those serving in remote rural locations. By linking healthcare professionals with specialists through its digital platform, Case B does away with the need for patients to undertake long journeys for specialist consultations. This improved accessibility is vital, in areas where specialized services are limited. With a solution such as that provided by Case B, patients are able receive the required medical advice promptly.(CEO/Founder Case B, 2023)

Efficient and Timely Referral Process

Case B's system simplifies the process of referring patients, thereby making it more efficient and quicker. The traditional referral method often involves lengthy wait times and other bureaucratic obstacles when trying to get medical attention. By enabling communication, between primary care providers and specialists Case B reduces the time healthcare workers need to receive feedback and make decisions. This efficiency is very important for enhancing patient outcomes in health care scenarios, where there is the urgent need to obtain medical assistance (CEO/Founder Case B, 2023).

Data-Driven Healthcare Improvement

Using data analytics is one of the capabilities of Case B's value proposition. The platform analyses data from referrals and consultations providing insights into trends and healthcare delivery (CEO/Founder Case B, 2023). This data driven approach enables planning and resource allocation within the healthcare system. By understanding these trends healthcare administrators can make informed decisions that improve the efficiency and effectiveness of healthcare services. This utilization of data analytics not only enhances patient care but also contributes to the broader quality aspect in healthcare delivery (CEO/Founder Case B, 2023).

Empowerment of Healthcare Workers

Case B supports healthcare professionals through its platform. Through the platform the healthcare workers are able to obtain necessary knowledge that will assist them then in making effective decisions. In primary care environments healthcare workers frequently come across situations that require specialized guidance. By facilitating access to opinions and storing knowledge, Case B boosts the confidence and proficiency of healthcare workers. This empowerment results in enhanced patient outcomes as healthcare professionals become better prepared to handle varying scenarios by making informed choices (CEO/Founder Case B, 2023).

Reduction in Unnecessary Healthcare Expenditure

Another key aspect of Case B's value proposition is its contribution in reducing healthcare costs. By guiding healthcare workers on how to handle and manage a case that requires referral to a specialist, the platform helps minimize patient transfers and hospital visits. This aspect goes a long way in controlling healthcare costs. Decreasing costs enables healthcare facilities to allocate their resources efficiently thereby enhancing the overall quality of care provided. (CEO/Founder Case B, 2023).

Case Study Illustration

This illustration demonstrates the benefits of Case B's value proposition: There was a healthcare center facing challenges, with frequent patient transfers. Prior to integrating the Case B solution, the facility often had to transfer patients to city hospitals for consultations resulting in transportation costs and extended wait times for patients. With the introduction of Case B's platform healthcare staff were able to consult with specialists leading to a decrease, in unnecessary transfers. This not only reduced costs but ensured that patients received prompt care locally resulting in improved satisfaction and health outcomes. (CEO/Founder Case B, 2023).

2. Customer Segments

Primary Patient Populations

South Africa's rural, remote and underserved populations have specific health care needs that Case B's customer segments strategically target. The selection of these segments is based on the merging of demographics, disparities in health care access, as well as the overall goal to bridge the gap between primary care providers and medical specialist services. (CEO/Founder Case B, 2023).

Identification of Unmet Healthcare Needs

Case B's founder recognized the healthcare gaps in these communities from experience gained during an encounter in one of the health incidents that had occurred back then. During this period the founder witnessed a patient struggling with an eye condition that couldn't be addressed locally due to a lack of guidance, highlighting the disconnect between primary and specialist care. This incident underscored the necessity for a solution that would enable healthcare professionals to have instant access to online consultations, with specialists. (CEO/Founder Case B, 2023).

Understanding Socioeconomic and Geographic Disparities

In South Africa people living in remote areas often face challenges, like poverty, lack of education and limited healthcare access. These issues lead to undesirable

health outcomes. Case B's platform aims to help healthcare workers in these areas by giving them the support and tools to provide top notch care. (CEO/Founder Case B, 2023).

Focus on Uninsured and Public Sector Patients

Case B mainly focuses on individuals, without insurance who rely on public healthcare services. These individuals usually cannot afford healthcare options. They depend on the public health system, which is frequently strained and lacking resources. By concentrating on this group, Case B uses its platform to cater for those who might otherwise struggle to access the needed medical guidance (CEO/Founder Case B, 2023).

Tailoring Solutions to Meet Specific Needs

Understanding the unique challenges faced by vulnerable populations allows Case B to tailor its solutions to meet their specific needs effectively. For instance, the platform's ability to connect healthcare workers with specialists remotely is particularly valuable in rural areas where travel to urban centers for specialist care is impractical. By providing a decision support tool that is easily accessible via mobile devices, Case B ensures that its platform is user-friendly and can be integrated seamlessly into the daily workflows of healthcare workers in primary healthcare settings (CEO/Founder Case B, 2023).

Impact on Healthcare Workers

While the primary recipients of the services offered by Case B are the patients, the users of the platform consist of healthcare professionals such, as nurses, midwives, doctors and other primary care providers working in underserved areas (CEO/Founder Case B, 2023). By equipping the healthcare workers with specialist guidance and ongoing educational materials Case B effectively improves the level of care. The emphasis on healthcare workers as a customer group plays a vital role, in ensuring the platform's efficacy and long-term viability. (CEO/Founder Case B, 2023).

3. Channels

Case B indirectly reaches its target population by collaborating with healthcare professionals who cater to these communities. The platform has supported the treatment of, around 1.4 million patients through 33,000 healthcare workers, all of whom volunteer to use the application. The natural growth of the platform and the significant adoption rate among healthcare workers demonstrate its effectiveness in enhancing healthcare accessibility. By reducing the need for travel, saving time for healthcare providers, and ensuring that only patients needing medical assistance make use of the platform. the platform's reach is widespread and actively used, thereby improving the quality of healthcare. (CEO/Founder Case B, 2023)

4. Customer Relationships

Case B nurtures connections, with healthcare professionals such as nurses, midwives, physicians and specialists. These relationships play a vital role in enabling meaningful communication between primary care providers and specialists. Through building relationships, with healthcare providers, policymakers and patients, Case B enables the embedding of its services into the healthcare ecosystem ultimately improving both accessibility and quality of care. (CEO/Founder Case B, 2023).

5. Revenue Streams

Initially Case B's funding came from innovation, competitions, and grants. Its revenue model has since expanded to include advertising and contracts, with various health systems. Recently contracts related to data have become a source of income. For instance the Global Fund engages Case B to analyze data for HIV and TB cases offering insights for healthcare planning and resource distribution. This diverse revenue structure ensures the sustainability of the venture enabling it to deliver quality services while maintaining accessibility. With multiple revenue streams, in place Case B can cover its costs, and invest further in the platform's growth and expansion. (CEO/Founder Case B, 2023).

6. Key Resources, Activities, and Partnerships

Case B relies on its infrastructure, workforce and extensive data and knowledge base, as core assets. The technology setup includes the app, web data analytics systems, that are crucial for enabling communication between healthcare professionals and experts. The team comprises software developers, data analysts, customer service representatives and medical specialists who offer expert guidance through the platform. Data gathered from referrals and consultations combined with insights embedded in the system play a key role in enhancing service quality and providing valuable information for healthcare planning (CEO/Founder Case B, 2023).

Key operational tasks involve improvements to the mobile and web apps, user assistance and training initiatives as well data analytics and research. These activities ensure that the platform remains user friendly updated regularly to meet the changing needs of healthcare practitioners. Collaborations with organizations like Novartis, the Global Fund and the Johnson & Johnson Foundation have been pivotal in expanding the projects reach and amplifying its impact. Such partnerships bring backing, technical know-how, and access to a wider network of healthcare professionals. This contributes significantly to fulfilling the ventures objectives sustainably. (CEO/Founder Case B, 2023).

7. Cost Structure

The primary cost components, for Case B comprise technology development and upkeep, data management and analytics, human resources, marketing and outreach as well as operational expenses. Investments in technology development are crucial in maintaining the current platform while focusing on data management enhances the platforms capability to offer insights for healthcare enhancement. Human resource expenditures are essential for retaining the workforce, and expenses related to marketing. Outreach plays a crucial role in expanding the apps user community. By providing services to healthcare professionals, Case B ensures broad accessibility while ensuring sustainability through effective revenue generation strategies. (CEO/Founder Case B, 2023).

8. Social Impact

Case B has made notable impact in primary healthcare by increasing access to specialized care, streamlining patient referrals, empowering healthcare professionals, reducing healthcare costs, and supporting the continuous professional growth of healthcare workers. The platforms metrics including the number of patients assisted, referral response times and user feedback served as proof of its efficacy and alignment with its goal of improving healthcare accessibility and quality. By facilitating precise diagnosis and treatment in remote and underserved areas Case B contributes to improved health outcomes and a more efficient healthcare system. (CEO/Founder Case B, 2023).

Conclusion:

Case B is an example of how innovations, in healthcare can help address key challenges in South Africa's primary healthcare system. Their focus on connecting healthcare professionals for referrals with specialist consultations directly tackles issues related to disparities and limited access to specialized medical services in remote regions.

At the core of Case B's business strategy is a telemedicine platform that bridges the gap between rural healthcare providers and urban specialists. This not only enhances the quality of healthcare services in rural/remote areas but also maximizes the utilization of scarce specialist resources. Through facilitating consultations and efficient referrals Case B minimizes the necessity for patients to travel, saving both time and costs while ensuring access, to expert medical guidance.

4.5 Findings pertaining to Case C

Introduction:

In 2021, a digital health venture, Case C, was created with the goal of transforming healthcare accessibility and delivery in South Africa especially among marginalized communities. The health venture seeks to implement

advanced digital health technologies in the primary care system via its flagship digital platform. This all-inclusive solution for digital healthcare consists of a safe medical record systems driven by artificial intelligence (AI) tools as well as wellness tracking functions which aims at empowering both community health workers and patients while ensuring that even remote areas, access quality care.(CEO Founder Case C, 2023).

The primary healthcare setting in South Africa is characterized by numerous challenges particularly for people living in rural settings or those who are underserved regions. Such communities face various barriers including the lack of health facilities and having to travel long distances before reaching any clinic. Poverty limits their ability to pay for medical services The described problems lead to inequalities when it comes to healthcare thereby leaving a large number of people without access to needed healthcare. (CEO Founder Case C, 2023).

What sets Case C apart from other players is its approach to the solution that it offers to its users. The solution encompasses multiple features within one system offering a complete healthcare package. One example is the secure sign-on system integrated into the platform that ensures patient data privacy while complying with regulations such the Protection of Personal Information (POPI) Act which safeguards personal information against unauthorized access or disclosure. (CEO Founder Case C, 2023).

One of the remarkable innovations brought about by Case C has been patient empowerment through control over the patient medical records. Traditionally, health facilities have always kept patient records which often leads to fragmented care and little involvement from patients themselves. However with this new development patients are now placed at the centre stage of managing their own healthcare journeys. This is made possible by allowing individuals or families keep all relevant documents including lab results, prescriptions etc so that they can easily share them with whom they choose to share their records with (CEO Founder Case C, 2023).

Lastly community-based health workers (CHWs) who play pivotal roles in delivering primary care services across remote parts of the country are also included on the digital platform. The CHW are provided with digital tools alongside AI resources so as to boost capacity for quality service provisioning of services (CEO Founder Case C, 2023).

The initiatives of Case C are in line with the national healthcare goals of South Africa which are centered on enhancing accessibility, efficiency and equity in healthcare. The ventures attempt to make health care accessible to all is connected to a wider public health objective thereby contributing towards better health outcomes for the country (CEO Founder Case C, 2023).

Through strategic collaboration with local NGOs, universities and healthcare providers; Case C has widened its coverage as well as influence thus ensuring that their digital health solutions become part of communities (CEO Founder Case C, 2023).

The following section explores how Case C's business model, viewed through the lens of the Business Model Canvas, addresses the identified challenges in Primary Healthcare and how Case C's solutions contributes to the overall improvement of the healthcare system.

1. Value Proposition

The digital health innovation in Case C has a value proposition that is unique to primary healthcare in South Africa; it does this by focusing on patient-centered care especially for underserved communities. With this platform, patients are able to possess as well as control their medical records thereby increasing personal involvement and continuity of care. In contrast with conventional models where establishments hold onto patient information, the digital framework ensures that it remains stored with the individual making it possible for smooth entry across various health service providers while also allowing for the sharing of medical records (CEO Founder Case C, 2023). The digital platform also consists of a secure sign-on system; voice-video and data-engines; an AI driven interface among others which enable efficient health care delivery through remote

consultations and monitoring of health. Equipping community health workers with digital tools alongside artificial intelligence raises the level of care provided within remote areas. Moreover, wellness tracking capabilities covering exercise, diet, medication and mood enable patients to play an active role in looking after their own health. (CEO Founder Case C, 2023).

2. Patient Population – Customer Segments

Case C mainly concentrates on poor people in South Africa. These are individuals living within LSM (Living Standards Measure) 1-5, which means that they belong to the lower bracket of the socio-economic hierarchy. Often such groups live in less privileged communities where they do not have adequate access to health care services. To identify these communities' unmet healthcare needs, required working together with universities and non-governmental organizations (NGOs). The collaboration helped them understand better what each community goes through like spending long hours at clinics waiting or failing to get consistent medical attention because one is always on the move due to work or lack of finances for meeting medical costs (CEO Founder Case C, 2023).

Digital health innovation from Case C has been positioned strategically towards serving those who are considered the most vulnerable among underserved populations. The venture achieves this when it responds directly to unique requirements presented by various marginalized groups thereby not only widening but also heightening accessibility levels for quality healthcare provision too (CEO Founder Case C, 2023).

According to CEO and founder of Case C: "Our aim is simple; we want everyone irrespective of their location or social background to receive timely and appropriate medical attention whenever they require it most." This statement implies that by focusing on such areas like the ones described, there will be a bridging of the gap between rich and poor which would otherwise have never happened had all efforts been concentrated in regions where people are well off and can easily access health facilities.(CEO/Founder Case E, 2023; Gordon et al., 2020)

3. Channels

Case C primarily involves working with non-governmental organizations (NGOs) and participating in programs such as E-Village to reach the desired patients. The setup enables Case C to embed their digital health solutions into communities' settings (CEO Founder Case C, 2023).

NGO Partnerships: Through partnerships, Case C leverages existing trust and infrastructure within marginalized areas. Non-profit organizations typically have established connections and networks that are essential when dealing with hard-to-reach populations (CEO Founder Case C, 2023).. It is therefore important for the digital health venture to directly involve itself in these communities so that they can be able to benefit from digital healthcare services provided by them. Another benefit of involving Non-Governmental Organizations is that they help collect feedback from the communities which can be used to improve upon or change some aspects about the offerings (CEO Founder Case C, 2023).

Community Projects like E-Village: Joining initiatives like E-village enhances visibility throughout all corners where Case C operates adding a variety of community development projects that will use this digital health venture's internet health platform. One such initiative is known as smart village which looks at making towns digital; among its components being healthcare system provided by Case C. Therefore during the roll out of the smart villages, it becomes necessary to also address peoples' medical requirements via Case C's solutions. (CEO Founder Case C, 2023).

Corporate Social Responsibility (CSR): Case C also collaborates with corporate social responsibility partners to increase its impact. These usually comprise corporate funding or supporting the implementation of the digital health platform as part of their CSR initiatives. Apart from providing financial aid, this move enhances visibility and adoption among wider business community and consumers alike.(CEO Founder Case C, 2023).

Government Collaboration: While acknowledging limited involvement with the Government currently, Case C views working together with such institutions as

crucial for realizing large scale change hence aligning itself with the need to work together with Government. The realization of Case C's strategic plans may be hindered by bureaucracy when dealing with public offices; however there will be need to seek government support as envisaged under long-term strategies meant to ensuring wider reach and sustainability.(CEO Founder Case C, 2023) .

Impact on Healthcare Accessibility: The approach followed by Case C, is clearly effective at improving healthcare access as Case C has expanded the coverage area greatly which means that many people can be reached within their localities. This could be demonstrated by the way in which Case C has been working with Non-Governmental Organizations (NGOs) has allowed for specific interventions to be made where they are most needed; this is true because different visits made during project implementation by partnering organizations such as E-village, showed Case C what communities lacked and required, thereby integrating wider digital infrastructure in the communities so as enable user adoption.(CEO Founder Case C, 2023) .

4. Customer Relationships

Establishing meaningful relationships with clients is a fundamental part of the company's business model. This in turn ensures that its digital health solutions are effectual, sustainable and widely adopted. Healthcare providers, policy makers and patients are among the most important stakeholders for Case C. Each group has unique contributions to make towards the achievement of set goals (CEO Founder Case C, 2023).

Healthcare Providers

Involving healthcare providers in the service delivery improvement process based on feedback is one method used by case C. The providers have a significant role to play during the implementation stage of case C's digital platform. The collaborative approach enhances service delivery because clinicians are able to suggest new ways addressing issues that are based on patient needs. This approach ensures that the implemented system remains

responsive and relevant to the patient healthcare needs (CEO Founder Case C, 2023).

Policy-makers

There is limited interaction between Case C and policy makers mainly due to difficulties faced when attempting to align traditional healthcare policies with innovative approaches (CEO Founder Case C, 2023). In other words although some contacts were made with representatives from different institutions like Stellenbosch University or University Of Cape Town, there was not much support coming directly through government channels (CEO Founder Case C, 2023). It should be noted that such reservedness towards engaging policymakers reflects challenges commonly encountered by digital health startups while navigating bureaucratic environments around regulation(CEO Founder Case C, 2023)

Patients

Patient involvement in Case C's value chain is an integral part of what makes Case C unique among digital health ventures working in similar settings. This is more so where records ownership is given back to patients. This evidently creates an environment where individuals feel empowered about their health care journey as they have full control over everything happening around them including medical records storage locations (CEO Founder Case C, 2023). Therefore, this type of a business model ensures that healthcare becomes democratic and accessible to all regardless of one's needs or geographical location since patients can always carry their medical records with them and present them when needed. What such empowerment does therefore is helping people make informed decisions about various aspects relating to their personal health which eventually leads to improved outcomes for both individuals and communities (CEO Founder Case C, 2023).

5. Revenue Streams

Case C ensures the sustainability and growth of its digital health solutions by using a variety of methods in generating revenue. The main revenue generation

avenue is through a referral-based model. Under this model, Case C charges fees for referring patients to healthcare providers. This method is consistent with the mission of the venture which is to increase accessibility to healthcare while also generating revenue based on the value delivered both to patients and healthcare providers (CEO Founder Case C, 2023).

In addition to this, data mining and advertising are among the other ways explored by Case C as sources of secondary income (CEO Founder Case C, 2023). The platform collects extensive patient data which is used to produce insights useful for different stakeholders such as government agencies; pharmaceutical companies; and other health related organizations (CEO Founder Case C, 2023).

6. Key Resources, Activities, and Partnerships

Key Resources

To ensure that value is delivered, Case C requires several important resources. The digital platform sits at the core of its operations. This platform combines different technologies that facilitate safe data management and seamless communication. Some of the notable features are a secure single sign-on system, an all-inclusive voice, video, and data engine as well as AI-powered tools for medical diagnosis and wellness monitoring. There cannot be compromise when it comes to protecting information; this is why patient privacy measures such as those stipulated by POPI Act have been put in place (CEO Founder Case C, 2023).

Human resources The company has experienced IT staff who develop and maintain the digital platform on an ongoing basis (CEO Founder Case C, 2023). The founder also acknowledges community health worker trainers as a critical part of their team; they ensure that local healthcare providers know how to use the digital tools provided by Case C. Moreover, customer support is critical for guiding patients through the system and resolving any problems they may encounter (CEO Founder Case C, 2023).

Finally, data security systems are a key resource. These systems ensure that patient data remains private and secure, which is vital for building and maintaining trust among users and complying with local data protection laws (CEO Founder Case C, 2023).

Key Activities

The main activities of Case C are centered on improving and maintaining the platform. Systems and software development are an ongoing process with regular updates being made to increase its efficiency and make it more user friendly. Among these are integration of new AI modules, enhancement of voice, video and data engines as well as adding extra security measures (CEO Founder Case C, 2023).

Training and support: also take priority. The company provides digital tools and AI-driven systems that help community healthcare workers in their work. This training equips them with skills needed to offer quality services whether they're working from a hospital or remote community setting (CEO Founder Case C, 2023) .

Data management and analysis: serve as critical components too. Patient information is received and analysed by Case C so as to enhance health care delivery while supporting decision making processes . Such understanding enables the discovery of healthcare trends hence enabling Case C to adapt and refine its service packages based on target population needs(CEO Founder Case C, 2023).

7. Cost Structure

Main Cost Elements:

Several main cost elements play a crucial role in Case C's business model. The most important one is the massive investment in the digital platform's technological infrastructure. It takes substantial financial resources to continuously develop and maintain the digital platform. These comprise

integrating new features, improving security protocols and making sure that the platform remains user-friendly as well as efficient for delivering health care services (CEO Founder Case C, 2023).

Personnel costs also take up a significant portion of Case C's expenditure. For instance, developers, healthcare professionals, and support staff are employed by Case C who are key in maintaining and enhancing the platform while still providing health care services. Salaries paid to employees on an ongoing basis constitute a significant financial outlay (CEO Founder Case C, 2023).

Operational expense: further contribute towards the costs structure such as those connected with data storage, safety and general business operations. Patient data must be stored securely due to sensitivity of healthcare information coupled with regulatory requirements on privacy of personal records which makes necessary operational costs related to security measures around them (CEO Founder Case C, 2023).

8. Social Impact

Improving Healthcare Accessibility:

Case C has done a lot to improve health care accessibility among the less privileged communities in South Africa. The digital health venture has given patients power over their own medical records through Case C's digital platform (CEO Founder Case C, 2023). This method focuses on the patient and thus ensures consistent care since people can reach their health information from any place & share with healthcare providers when necessary – an aspect that is particularly helpful for mobile populations within South Africa where there is need for continuous access as they keep moving from one region to another (CEO Founder Case C, 2023).

Community Health Workers (CHWs) working in remote or underserved areas have been equipped with digital tools plus AI-driven technologies so as to enable them provide quality healthcare services even when far away from urban centers (CEO Founder Case C, 2023).. CHWs are able to detect heart murmurs using

onsite digital stethoscopes connected through AI platforms which eliminates the need for patients traveling long distances get to a health center just for basic diagnosis. This approach has helped cut down on waiting times while at the same time improving service delivery efficiency thereby ensuring that many more patients get treated in good time (CEO Founder Case C, 2023).

Enhancing Patient Engagement and Health Management

The empowerment of patients through data ownership and wellness tracking has led to improved patient engagement in health management. The digital platform includes features that allow patients to track their exercise, diet, medication adherence, and mood, fostering a more proactive approach to personal health (CEO Founder Case C, 2023). This holistic approach not only enhances individual health outcomes but also contributes to the broader goal of preventative healthcare by encouraging healthier lifestyles and early detection of potential health issues (CEO Founder Case C, 2023).

Measuring Impact

Case C measures its social impact through a combination of quantitative and qualitative metrics. These include patient access metrics, healthcare quality indicators, and user satisfaction feedback (CEO Founder Case C, 2023). By tracking the number of patients accessing services, reductions in wait times, and overall patient satisfaction, Case C ensures that its services are meeting the needs of the community effectively (CEO Founder Case C, 2023). Additionally, feedback from CHWs and patients provides valuable insights into the efficiency and impact of the healthcare delivery model, allowing for continuous improvement and adaptation of services to better meet community needs (CEO Founder Case C, 2023).

Alignment with Mission

The social impact generated by Case C aligns closely with its mission to democratize healthcare access and improve the quality of primary healthcare services, particularly in underserved areas. By focusing on patient empowerment,

efficient healthcare delivery, and the use of advanced digital tools, Case C is addressing the systemic barriers to healthcare access and quality in South Africa. This alignment ensures that the venture's activities and outcomes are consistently oriented towards creating positive social change and improving public health (CEO Founder Case C, 2023).

Conclusion

Case C's primary focus is, on empowering patients to take control of their records, which is a groundbreaking idea in an environment where health data has traditionally been controlled by health institutions. This patient centered strategy not only boosts involvement in healthcare but also supports ongoing care, which is particularly important in a country, with a population that is highly mobile.

The utilization of AI powered tools, by the venture to support community healthcare workers stands out. Providing these frontline health workers with solutions allows Case C to connect high level medical expertise with local healthcare services effectively. This strategy could greatly enhance healthcare quality in underprivileged regions tackling the challenge of unequal access to healthcare, in South Africa.

4.6 Findings pertaining to Case D

Introduction

Case D was founded in 2005 and re-registered in 2015, Case D represents itself as the first organization to exploit technology in solving health problems experienced mainly in rural and underserved areas. Its main objective is to bridge the gap between urban and rural healthcare provision which is characterized by most parts of the country (CEO/Founder Case D, 2023).

The South African healthcare system has encountered several difficulties such as high non-communicable diseases (NCDs) prevalence rates, shortage of medical personnel and poor infrastructure especially in remote locations (CEO/Founder Case D, 2023). These circumstances result in different levels of

health outcomes among various populations living in different regions. To solve these problems, telemedicine along with mobile health applications are used by Case D in addressing the challenges (CEO/Founder Case D, 2023).

This introduction sets the stage for a detailed exploration of Case D's business model through the lens of the of the Business Model Canvas.

Business Model Canvas (BMC) Perspective:

1. Value Proposition

The value proposition of Case D revolves around the utilization of digital health technologies as a means of narrowing down the healthcare divide between urban and rural areas in South Africa. Quality medical services can be accessed by any person from the remote communities or those underserved by taking advantage of telemedicine and mobile health (mHealth) applications which are all about the approach adopted by Case D.

Accessibility:

Improving access to healthcare for populations in rural and underserved areas is one of the key elements of the value proposition of Case D. In South Africa, a large percentage of people live in remote locations where they have little or no contact with hospitals (CEO/Founder Case D, 2023). Case D provides telemedicine services which enable patients to interact with doctors through video calls, phone calls or online chats (CEO/Founder Case D, 2023). The method eliminates the need for long journeys, cutting down on waiting times and ensures that patients get attended to by medical professionals within a reasonable time frame, hence improving general healthcare (CEO/Founder Case D, 2023).

A notable example is Case D's telemedicine program, which has been implemented in several rural communities. This initiative has enabled patients to access specialist consultations without leaving their local areas, significantly reducing travel costs and the time associated with seeking medical care. As a result, more patients are receiving the care they need, when they need it, which

is particularly crucial for managing chronic conditions and preventing complications (CEO/Founder Case D, 2023).

Efficiency:

Case D enables efficiency by integrating advanced digital tools into its services. These tools include electronic health records and data analytics (CEO/Founder Case D, 2023). Among healthcare providers, electronic health records facilitate the smooth sharing of patient information which ensures continuity of care while reducing administrative burden. This allows management to be more efficient because healthcare professionals can access and update records quickly thereby leading to better coordinated care as well as less duplication of tests and procedures (CEO/Founder Case D, 2023).

In addition, through the use of data analytics; health trends are identified, patient outcomes are monitored, and resources are optimized in Case D. For example, places with higher occurrences of certain diseases can be located through data analytics thus allowing interventions that target those areas thereby making use of healthcare resources more efficiently. Such an approach driven by information not only better patient care but also enables system wide efficiency in healthcare as a whole (CEO/Founder Case D, 2023).

Empowerment:

Case D's value proposition is that of patient education and involvement which are considered keys to empowerment. They provide many educational resources like articles, videos, and interactive tools etc (CEO/Founder Case D, 2023). When patients are empowered with the necessary knowledge about their health, they become capable of managing their own health and actively work towards long term improvements in their health (CEO/Founder Case D, 2023).

Additionally, Case D fosters a sense of community and support among its users. Through online fora, support groups, and community health events, patients can connect with others who share similar health challenges. This sense of

community helps reduce feelings of isolation and provides emotional support, which is essential for overall well-being of patients (CEO/Founder Case D, 2023).

2. Patient Population – Customer Segments

Case D has a wide range of customers, each with different healthcare needs and difficulties. By adapting its digital health solutions to cater for these diverse needs, the digital health venture makes sure that the services it provides are within reach and relevant. The major customer segments comprise rural and remote communities; underserved and economically disadvantaged groups; people living with chronic diseases; and communities lacking digital literacy (CEO/Founder Case D, 2023).

3. Channels

Case D uses different means to take health care closer to the people. These methods are telemedicine platforms, mobile health applications, community health workers, local clinics, online portals, websites, SMS and messaging services as well as training workshops and educational programs. The organization ensures that its services reach many patients by combining both traditional and digital strategies so that even those without adequate internet connectivity or those with low levels of digital literacy can access them easily. This is because such channels have been successful in cutting down on physical journeys made by patients seeking treatment convenience; they also help in getting medical attention for people living far away from towns or cities where hospitals are located thereby extending their reach into rural areas while at the same time promoting community participation (CEO/Founder Case D, 2023).

4. Customer Relationships

Case D collaborates with policy-makers, healthcare providers, and patients. The organization needs these partnerships to blend digital health solutions into the system already in place for delivering health care, support digital health policies through advocacy efforts as well as guaranteed patient involvement. Involving the people who provide healthcare ensures that there are workable solutions while

working with those who make policies creates an atmosphere where innovation in health technology can thrive. By directly involving individuals receiving treatment, the environment fosters a more patient-centred approach thereby leading patients to take an active role in their own health (CEO/Founder Case D, 2023).

5. Revenue Streams

Case D generates revenue through different avenues such as charging subscription fees, partnerships with other organizations, grants and donations from various sources, and also service fees for specialized services. This model of revenue diversification is useful because it helps them to be financially stable in the long run while at the same time ensuring that there are always means for improving their digital health service delivery. A steady income can be expected through this type of business where funds are continuously ploughed back into the business making the business sustainable. (CEO/Founder Case D, 2023).

6. Key Resources, Activities, and Partnerships

The technological infrastructure, human capital, strategic partnerships, financial resources, community networks, patient engagement mechanisms and data analytics capabilities are the key resources that are necessary for delivering Case D's value proposition. Developing and implementing digital health solutions; training, and capacity building; patient education and community outreach; fostering partnership and collaboration; research and innovation; quality assurance and compliance; data management and analytics as well as infrastructure management are the main activities the Case D performs in its operations. (CEO/Founder Case D, 2023).

7. Cost Structure

Technology development and maintenance, compliance and regulatory costs, partnership and collaboration costs, training and capacity building, marketing and outreach expenses as well as operational and administrative expenses are among the principal cost components of Case D's business model. Providing

reliable services requires huge outlay of money to be spent on technology while healthcare delivery is improved through spending on training. Operational costs need to be controlled if there is to be any hope for the future sustainability of the venture; thus it becomes necessary that marketing efforts should be directed towards creating brand awareness. (CEO/Founder Case D, 2023).

8. Social Impact

The impact that Case D is making in primary healthcare can be demonstrated by the outcomes that Case D is enabling. These are: making healthcare services more accessible; improving the quality of healthcare; empowering people through health education and digital literacy; supporting health workers; and promoting public health programs. The company's digital health platforms increase access to care in remote or underserved areas while also improving patient data management with electronic health records (EHRs). Patient and community education about digital tools for managing one's own health leads to active self-care, whereas training alongside these aids among medical personnel heightens their ability to deliver required treatment. (CEO/Founder Case D, 2023).

Conclusion:

Case D serves as an example on how innovation, in healthcare can help bridge the gap between rural and urban healthcare services in South Africa. Through a combination of telemedicine, mobile health apps and programs to improve literacy this initiative presents an approach to addressing long standing accessibility issues.

At the heart the business model of Case D, the digital venture focuses on overcoming economic disparities in healthcare access. By utilizing telemedicine platforms the digital health venture facilitates consultations between patients in rural/remote areas and healthcare professionals in urban settings. This not only enhances access to quality healthcare, but also alleviates the challenges of travel, for patients saving them time and costs.

4.7 Findings pertaining to Case E

Introduction

Case E is regarded as a paradigm shift in the management of non-communicable diseases (NCDs) like hypertension, heart disease and diabetes mellitus within the South African primary health care system. The digital health venture was started in 2018 with the idea of incorporating advanced digital health technologies into primary healthcare. Case E concentrates on remote patient monitoring (RPM) which connects patients from rural and underserved areas who have limited access to continuous medical care with healthcare providers (CEO/Founder Case E, 2023).

The global burden of NCDs cannot be undermined given their huge contribution towards morbidity and mortality worldwide. In South Africa this problem is worsened by unhealthy behaviors; poverty levels coupled with inequality among different groups within society as well as lack or inadequate facilities especially those needed for prevention measures like screening programs.(CEO/Founder Case E, 2023).

This introduction sets the stage for a detailed exploration of Case E's business model through the lens of the BMC.

Business Model Canvas (BMC) Perspective:

1. Value Proposition

Case E's core offering centers around revolutionizing the management and treatment of communicable diseases (NCDs) by leveraging cutting edge remote patient monitoring (RPM) technologies. The primary goal is to deliver quality healthcare services to individuals coping with conditions such, as hypertension, heart disease and diabetes among others. This approach addresses the gaps in healthcare systems particularly in rural areas of South Africa where access, to regular medical care is limited.(CEO/Founder Case E, 2023).

2. Customer Segment

In Case E, there are customer segments, with health care needs and challenges. Understanding these segments is essential for offering tailored services that address primary healthcare needs effectively. The main customer categories include individuals, with non-communicable illnesses, high risk job sectors underserved rural areas and healthcare professionals themselves. (CEO/Founder Case E, 2023).

Individuals with Chronic Non-Communicable Diseases (NCDs):

Case E's primary customer base consists of individuals grappling with health issues such, as hypertension, heart ailments, diabetes and persistent respiratory infection (CEO/Founder Case E, 2023). These patients require monitoring in addition to routine check-ups to effectively manage their health conditions. Traditional healthcare systems often struggle to provide care due to limitations, in resources and accessibility (CEO/Founder Case E, 2023). For these individuals Case E's remote patient monitoring (RPM) technology offers a convenient way of overseeing health from the location of choice. Tailored care plans coupled with real time health tracking and prompt medical guidance play a key role in enhancing the health of this group (CEO/Founder Case E, 2023).

High-Risk Occupational Groups

Another important demographic consists of truckers, miners, and factory workers. They have a greater risk for chronic diseases because of the nature of their jobs that may require them to work long hours with little physical activity and in dangerous environments. Such factors result in higher rates of high blood pressure, heart disease, and lung problems. For these people, Case E offers continuous monitoring and targeted assistance based on job-related hazards which is highly beneficial. The capacity to keep track of health indicators from afar guarantees effective self-care among this population while they are at work thus enhancing wellness as well as productivity (CEO/Founder Case E, 2023).

Rural and Underserved Communities:

The priority of Case E is to concentrate on reaching the rural and underserved areas. These areas are characterized by poor health care access due to distance and few health care providers. Such places usually present their dwellers with great difficulty in getting regular medical checkups thereby making it hard for them to detect or treat chronic diseases early enough (CEO/Founder Case E, 2023). The way this gap is filled is through its telemedicine platform provided by Case E coupled with RPM services which take healthcare right into such localities (CEO/Founder Case E, 2023). Digital health technologies ensure that even the most remote parts benefit from continuous monitoring of their health status, timely intervention as well as personalized care plans based on individual needs. (CEO/Founder Case E, 2023). This method does not only lead to better outcomes in terms of individual health but also overall community wellness since it makes healthcare services more reachable and fairer (CEO/Founder Case E, 2023).

3. Delivery Channels

Employing a multifaceted approach in providing telemedicine services is what characterizes Case E. To effectively cater for its diverse customer base, the organization utilizes various means that are applicable in different scenarios. In other words, this digital health venture has many ways of reaching all its customers with constant personalized attention irrespective of where they live or how much money they have (CEO/Founder Case E, 2023). These delivery channels act as important gateways through which users can access continuous personalized care provided by any value proposition regardless of their location and financial background among others (CEO/Founder Case E, 2023). Digital platforms – such as websites; mobile apps like Android Market Place or Apple Store – are just some examples of primary delivery channels used (CEO/Founder Case E, 2023). Case E also uses community outreach programs designed specifically for those who may not afford expensive health facilities (CEO/Founder Case E, 2023).

Digital Platforms and Mobile Applications:

Case E's delivery model is anchored on its cutting-edge platform and mobile app. These tools support patient monitoring (RPM), giving users instant access, to their health information tailored care plans and virtual healthcare consultations (CEO/Founder Case E, 2023). The user-friendly mobile app lets patients effortlessly check their health data, schedule medication reminders, and explore educational material. (CEO/Founder Case E, 2023). With the digital platform patients can conveniently monitor their health from any location proving valuable for individuals in rural or underserved regions with restricted access, to traditional healthcare (CEO/Founder Case E, 2023).

Telehealth Services:

Telehealth services play an important role, in Case E's delivery methods. Patients can use the app and online platform to book, attend virtual appointments with healthcare professionals. These remote sessions offer guidance lessening the reliance for face-to-face meetings and allowing for timely interventions. The convenience of telehealth is particularly beneficial for individuals, with mobility challenges or those residing in remote locations. This avenue not only improves access, but also enables ongoing supervision and check-ups essential for managing chronic illnesses effectively (CEO/Founder Case E, 2023).

Community Outreach Programs:

Case E's outreach, to the community is carried out by engaging with communities through organizing health workshops, educational seminars, and public health campaigns to raise awareness about the advantages of patient monitoring (RPM) and telehealth services. These programs focus on educating individuals, about managing illnesses emphasizing the importance of health check-ups and ensuring proper use of Case E's electronic devices, among others (CEO/Founder Case E, 2023).

Educational Institutions and Policy Advocacy:

Case E utilizes partnerships, with institutions and advocacy groups as means of distribution. By engaging in research and clinical trials in collaboration with

universities and other research centers it can demonstrate the effectiveness of its platform. These partnerships also enable the development of features based on discoveries and the enhancement of existing ones. Advocacy for policies ensures that digital health innovations like those from Case E are recognized within healthcare regulations thereby providing an enabling environment for implementation. (CEO/Founder Case E, 2023)

4. Customer Relationships:

Case E's business model is based on relationships with customers. This means that the company aims to attract, retain and support users throughout their life cycle. They do this through continuous engagement, personalized care and community involvement. All these aspects work together in order to drive long term loyalty from the customer by enhancing their experience with the product or service offered by case E. Personalized care is one aspect of a relationship between a consumer and provider; but it should not end there because people need continuous support as well as patient education besides community building plus feedback mechanisms (CEO/Founder Case E, 2023).

5. Revenue Streams

Case E adopts an innovative approach, to generating revenue aiming to maintain stability while delivering quality healthcare services to its clientele. The strategy revolves around sources of income, enabling Case E to secure funds, invest in technological advancements and expand its reach to individuals lacking adequate healthcare access. Revenue avenues such as subscription packages, fees for consultations collaborations, with healthcare providers, sales of health monitoring devices, corporate health initiatives and supplementary services all contribute to sustaining Case E's health. (CEO/Founder Case E, 2023).

6. Key Resources, Activities, and Partnerships

Key Resources, Activities, and Partnerships

In order to successfully offer cutting edge healthcare solutions Case E depends on resources, tasks and important collaborations. These elements play a role in the success of its business model by ensuring that the digital health venture delivers quality remote patient monitoring (RPM) and telehealth services efficiently while also having the ability to expand its services.

Key Resources:

Case E relies on a number of resources, such, as cutting-edge technology infrastructure, health monitoring devices, a talented workforce, strong data management systems and effective marketing and outreach tools. (CEO/Founder Case E, 2023).

Advanced Technology Infrastructure:

The advanced digital platform and mobile application are the basis of Case E's service delivery. The system enables them to monitor patients' health metrics in real-time, have telehealth consultations, analyze data among other things that help in user interaction. They invest continuously on technology so that it remains safe, easy to use as well as capable of handling information necessary for scaling up the services to a wider audience (CEO/Founder Case E, 2023).

Specialized Health Monitoring Devices:

Tracking one's health consistently is achievable, with devices such as sensors, blood pressure monitors, glucose monitors and others utilized by Case E, a specialist, in patient monitoring (RPM). These instruments facilitate data gathering round the clock. Hence it is critical that these devices are dependable and seamlessly integrated into the platform to deliver healthcare services. (CEO/Founder Case E, 2023).

Skilled Workforce:

Different categories of employees including but not limited to medical practitioners such as nurses or doctors; IT specialists like software engineers or programmers who develop computer programs; statistical experts dealing with

numbers which are later analysed statistically (data analysts) form part of their highly skilled staff required by any company operating under this model. Doctors give professional advice based on consultation findings (CEO/Founder Case E, 2023).

Patient and Provider Education:

It's crucial to educate patients and healthcare providers on patient monitoring (RPM) and telemedicine. This includes training doctors on integrating health technologies into their work and equipping patients with resources, for self-management. Educational programs also aim to boost the utilization of services provided by Case E. (CEO/Founder Case E, 2023).

Social Impact

Case E has an impact, on healthcare by offering a wide range of services and solutions that enhance the control of chronic diseases, empower patients, and increase access to healthcare services. The effectiveness of these efforts is assessed through health outcome indicators, patient feedback, satisfaction surveys, data analysis and collaboration with partners. The primary goal is to support the management of non-communicable diseases (NCDs) through the use of digital health technologies as articulated by its mission. Case E plays a role in improving health outcomes for individuals, in remote or underserved areas by enabling continuous monitoring and timely interventions. Empowering and educating patients helps create patient centered care that encourages health habits on looking after one's health. (CEO/Founder Case E, 2023).

Conclusion

Case E serves as an example of how advancements, in health can have a significant impact on the management of non-communicable diseases (NCDs) within South Africa's primary healthcare system. The digital health venture's focus on monitoring patients with conditions like hypertension, heart disease and diabetes addresses a pressing health challenge facing the nation.

At the heart of Case E's business model lies in the blending of selling devices and offering subscription-based monitoring services. This not only equips patients with tools to track their health status, but also ensures continuous support and analysis of data. Through facilitating monitoring of health indicators Case E enables early detection of health issues and prompt interventions potentially reducing the necessity, for emergency medical care and hospital stays.

4.8 Findings pertaining to Case F

Introduction

Case F assists in smoking cessation through innovative technological solutions. The establishment which was founded in 2021 in response to the smoking problem that contributes to a variety of Non-Communicable Diseases. (CEO/Founder Case F, 2023). Smoking is very much related to public health within South Africa since it comes along with diseases like cardiovascular diseases, cancer and other respiratory infections which are very common hence overburdening the current healthcare system.(CEO/Founder Case F, 2023; Reddy et al., 2015).

The goal of the digital health venture is not about aiding individuals in giving up smoking but about transforming the approach to quitting smoking in general. This includes integrating technology with science, telehealth, habit monitoring and behavioral economics into a mobile application to ensure convenient accessibility, for anyone in need regardless of their location. (CEO/Founder Case F, 2023). It is these kinds of goals that fall under general public interest when it comes down to individual-focused support for stopping smoking where there usually lies more emphasis on broader anti-smoking campaigns. (CEO/Founder Case F, 2023). This is, in line with public health goals, as it fills a significant void in personalized smoking cessation assistance, an area that is frequently neglected in comparison, to more general anti-smoking initiatives. (CEO/Founder Case F, 2023).

The following section will examine the specific elements of Case F's business model components.

Business Model Canvas Perspective:

1. Value Proposition

Case F's value proposition integrates cutting edge technology with insights, from science to address the public health issue of smoking cessation. This digital healthcare venture utilizes an approach that merges telemedicine, behavioral economics and habit monitoring via an application to offer enhanced assistance for individuals looking to quit smoking particularly in regions with limited access, to medical services. (CEO/Founder Case F, 2023).

Unique Value of Case F's Innovation: Case F's unique selling point revolves around its ability to provide a technology driven solution, for helping individuals quit smoking. By incorporating services principles of behavioral economics and real time habit monitoring it addresses both the psychological and physical aspects of smoking addiction simultaneously. This innovative approach not only aids those looking to kick the habit, but it also enhances the accessibility and quality of cessation programs, for individuals seeking to quit smoking cigarettes. (CEO/Founder Case F, 2023).

Telehealth Consultations: Case F links up people who want to stop smoking with medical practitioners by use of telehealth consultations; this fills the missing connection. Users can now get customized advice and assistance from professionals trained in helping people quit smoking without going for appointments, a move that is very useful in places lacking doctors. What makes it even better is that constant help is guaranteed, thanks to convenience brought about by these types of consultations thereby making them more effective in aiding one give up on tobacco addiction. (CEO/Founder Case F, 2023; Peterson et al., 2015).

Behavioral Economics: To support its value proposition, Case F's program applies behavioral economics. Behavioral economics is useful in comprehending irrational behaviors related to smoking addiction and creating interventions which can effectively change people's decision to quit smoking. They use methods like nudging, commitment devices, financial incentives among others to motivate individuals thus ensuring that they remain focused on quitting cigarettes (CEO/Founder Case F, 2023; Matjasko et al., 2016; Siegel et al., 2021). This strategy tackles the behavioral obstacles that hinder individuals from quitting smoking and enhances their ability to quit. (CEO/Founder Case F, 2023).

Habit Tracking: The habit monitoring function, on the app offers users feedback on their progress to keep them motivated and focused. Users can monitor their smoking habits set goals and receive reminders or rewards upon achieving milestones. Additionally this feature enables healthcare providers to track individuals progress over time to identify signs of improvement or the need, for assistance (CEO/Founder Case F, 2023).

2. Customer Segments:

The main customers of Case F are smokers in South Africa. This group is selected because smoking is very common and tobacco consumption causes many serious diseases such as heart attack, cancer or lung infection. The audience targeted, covers people from different age brackets, income levels and physical conditions; nevertheless they mainly concentrate on communities with heavier smoker presence as well as individuals prone to smoking induced health problems due to their higher susceptibility rates (CEO/Founder Case F, 2023).

Identifying Unmet Healthcare Needs:

In order to meet the needs of this particular customer group, Case F analysed the tobacco use environment in South Africa holistically. The global adult tobacco survey was used as a basis for this research because it showed how much people smoke in a given area. They noticed that there is not enough assistance for those who want to stop smoking and it does not consider their individual needs over

time unlike general measures against smoking. Case F realized that there are few healthcare workers skilled in working with those who need to quitting smoking. Case F recognized that people need help throughout the process, so they decided on a long-term digital health solution (CEO/Founder Case F, 2023).

Target Demographics:

Case F's main audience consists of people, who are interested, in giving up smoking. This group comprises young adults, and older adults each dealing with specific obstacles and health risks linked to smoking. Young adults aim to avoid health problems while older adults focus on handling health issues worsened by smoking. The digital health solution offered by Case F is crafted to be flexible and adjustable to cater to the varying requirements of these age groups. (CEO/Founder Case F, 2023).

Furthermore Case F is geared to reach out to people, from diverse socio-economic backgrounds. This is important as the prevalence of smoking is often linked to one's socio status with lower socio-economic groups exhibiting higher rates of smoking. Through offering cost effective health options Case F endeavours to connect with individuals who may lack the financial resources or access, to conventional smoking cessation initiatives. (CEO/Founder Case F, 2023).

3. Delivery Channels

Digital Platforms:

Primarily a mobile app serves as the method to connect with the intended audience, (CEO/Founder Case F, 2023). The app forms the core of Case F's strategy offering access to resources for quitting smoking, virtual healthcare consultations and tools for monitoring habits. The app was designed to cater to users of varying skills. In South Africa using the app proves effective as even in rural areas where services are limited due to infrastructure challenges and poverty smartphone usage is widespread. With accessibility many individuals

stand to benefit from this program if they seek support, for quitting smoking. (CEO/Founder Case F, 2023).

Among the functions of the mobile app are individualized strategies for stopping smoking, tracking habits in real-time, and the ability to have telehealth consultations with healthcare providers (CEO/Founder Case F, 2023). Case F gives full support for anyone who wants to quit smoking. This app acts as a one-stop platform for all those with the desire to quit smoking. This approach makes health care services more accessible and convenient which increases chances of user involvement with their plan on quitting smoking (CEO/Founder Case F, 2023).

Social Media and SEO:

Case F, in addition to the mobile app, uses social media platforms and search engine optimization (SEO) strategies to increase visibility and attract users (CEO/Founder Case F, 2023). Facebook, X formerly Twitter, and Instagram are some of the social media platforms used by Case F. They use these platforms for sharing success stories disseminating information as well as interacting with prospective clients. Younger populations are targeted through these sites because most of them spend much time online chatting with friends or playing games among others. In order for case F to get involved with people who are using its services at any given moment on top of responding to their queries it must keep up an active presence on different social media outlets where it can also offer support and motivation (CEO/Founder Case F, 2023).

Challenges and Limitations:

Despite its many strengths, there are also problems and limitations with the digital delivery channels used by Case F. The biggest difficulty is relying on digital literacy and internet access. While smartphones are widely available, not all individuals have equal levels of digital skills nor reliable internet connectivity (CEO/Founder Case F, 2023). This creates a “digital divide” which limits how far Case F can reach; especially among elderly people or those living in remote

areas with very little internet. To meet these challenges head on, Case F has been continuously working on ways to make their app more user-friendly and accessible even for users who may have limited digital abilities. They also look into partnering with telecommunication companies so that they can provide data subsidies or free access to their app in order to ensure that cost or connectivity does not become a barrier for anyone wanting to use their services (CEO/Founder Case F, 2023).

4. Customer Relationships

Collaborative Relationships with Healthcare Providers

The CEO and founder of Case F mentioned that the company has established partnerships, with healthcare professionals like doctors and nurses. These collaborations play a role in enhancing the credibility and usage of their app. By collaborating with experts Case F ensures that their smoking cessation programs are grounded in evidence-based practices and in line, with clinical standards. This partnership not only validates the apps approach, but also builds trust among users as healthcare providers often recommend it to their patients. (CEO/Founder Case F, 2023).

5. Revenue Streams

Freemium Model:

Case F operates on a freemium model for its main source of income. What this means is that the company offers basic smoking cessation services without charge while providing premium features and personalized support at a price (CEO/Founder Case F, 2023). The freemium approach works best when it comes to attracting as many users as possible because it makes it easier for those who want to quit smoking but are unwilling or unable to pay for help to get started with the program. In other words, through making tools and resources necessary for success available at no cost, more people can use them, which ultimately leads towards widespread adoption of the app. Basic functionalities include educational content about quitting smoking habits; tracking progress made against addiction-

forming routines as well general advice given by professionals in the field among others (CEO/Founder Case F, 2023).

The advanced behavioral interventions, customized care plans and telehealth meetings with medical staff are among the premium features that generate revenues. These functions provide more help and support, making them highly personalized and effective as well. Premium service is what is offered for users who need intense assistance since it contributes to the financial sustainability of Case F too. The services at a higher cost are for people ready to spend on their health (CEO/Founder Case F, 2023).

5. Key Resources, Activities, and Partnerships

Key Resources:

Digital Platform:

The primary area of focus for Case F revolves around their application. This digital tool serves as the hub, for delivering smoking cessation services, including programs, habit monitoring, virtual healthcare consultations and educational resources. (CEO/Founder Case F, 2023).

Content and Program Material:

Case F uses content and program materials of high quality to provide effective assistance to quit smoking. This includes evidence-based behavioral science frameworks; protocols for telehealth consultations; methodologies for tracking habits. The content has been developed with input from healthcare professionals as well as experts in behavioral economics so that it is grounded on evidence and responsive to people's needs. There are regular updates made to the library of contents which make them current and more interesting (CEO/Founder Case F, 2023).

Human Resources:

The Case F Team includes a group of professionals including healthcare practitioners, like doctors, nurses and behavioral economics specialists along with experts, marketing personnel and customer support representatives. Each member plays a role in providing quality services. The healthcare professionals offer expert guidance and support to patients while the technical team focuses on maintaining the apps functionality. Marketing staff interact, with users to build engagement and customer support ensures satisfaction levels to retain users. (CEO/Founder Case F, 2023).

Technical Infrastructure:

The technical infrastructure for the smooth functioning of the mobile application. encompasses servers, software, cybersecurity protocols and upkeep procedures. It is vital to ensure that the technical framework is safe, adaptable and dependable so as to safeguard user information and accommodate an expanding user community. Routine upgrades and security checks are carried out regularly to guarantee the reliability and efficiency of the IT services. (CEO/Founder Case F, 2023).

Marketing and Outreach Resources:

Effective marketing and outreach are vital for attracting and retaining users. Case F utilizes a variety of tools and platforms for search engine optimization (SEO), social media marketing, content creation, and user engagement. These resources help increase visibility, drive traffic to the app, and build a loyal user base. Strategic marketing campaigns and partnerships with influencers and community organizations further enhance the reach and impact of Case F's services (CEO/Founder Case F, 2023).

Key Activities:

Development and Maintenance of the Mobile App

One of the key activity, at Case F involves enhancing and keeping their mobile application current. This entails performing updates to enhance functionality, improving the user interface, fixing of bugs and adding features based on user

input and technological advancements. Keeping the app current and easy to use and efficient are some of the key activities performed by Case F. (CEO/Founder Case F, 2023).

Content Creation and Program Development:

Crafting and maintaining content and software are activities for Case F. This includes designing approaches to help people quit smoking creating educational resources and implementing behavioral support methods. The material should be interesting backed by evidence and customized to suit the requirements of users. Keeping the content up to date ensures its relevance and compliance with research findings, and effective strategies for quitting smoking (CEO/Founder Case F, 2023).

User Engagement and Support:

Ensuring user involvement and delivering top notch assistance are tasks. Case F accomplishes by monitoring progress through tailored alerts, interactive functionalities and responsive client service. Engaging with users assists in boosting retention levels and guaranteeing they get the needed assistance to quit smoking. Offering efficient client support resolves any problems users might face and enriches their journey in quitting smoking. (CEO/Founder Case F, 2023).

Marketing and Outreach:

Expanding Case Fs user base and boosting visibility heavily rely on marketing and outreach initiatives. This encompasses campaigns engaging with social media platforms, content marketing and partnering, with influencers and community groups. Implementing marketing tactics is key, to drawing in users while also keeping current ones engaged ultimately securing the longevity and viability of Case Fs offerings. (CEO/Founder Case F, 2023).

Partnership Building:

Establishing and nurturing partnerships is crucial for Case F. This involves working with healthcare professionals, policymakers, technology collaborators

and various other parties. These alliances not only boost the reputation and impact of Case Fs offerings, but also open doors for shared development, financial support, and collaborative marketing initiatives. By engaging with partners in this way it helps fortify the organizations' purpose and ensures long term viability of its business model. (CEO/Founder Case F, 2023).

Key Partnerships

Healthcare Collaborations:

Establishing relationships, with healthcare professionals and other health institutions plays an important role in the success of Case F. These partnerships validate and improve the services offered, by ensuring that they are based on clinical excellence. Healthcare providers provide insights that contribute to creating content and making suggestions on improvement to the app thereby boosting its usage and trustworthiness. Moreover these collaborations help in incorporating Case Fs services into healthcare programs and public health campaigns (CEO/Founder Case F, 2023).

Technical Partners:

Working with partners plays a key role, in advancing, supporting and expanding the mobile application. The partners contribute their knowledge and resources to maintain the apps modernity and dependability. The list of partners includes software developers, cybersecurity specialists, and IT infrastructure providers. By working together with the partners Case F harnesses cutting edge technologies and industry standards to elevate the apps performance and security protection (CEO/Founder Case F, 2023).

Government and Policy-Makers:

Interacting with government agencies and policymakers is crucial, for meeting requirements and supporting Case F's health efforts. The collaborations assist Case F in navigating challenges, garnering backing for their initiatives to help

people quit smoking. Working with policymakers also opens doors to shaping public health policies and promoting the use of healthcare solutions. (CEO/Founder Case F, 2023).

Pivotal Partnerships:

In Case F, significant collaboration that stands out involves teaming up with healthcare providers and insurers. These partnerships play a role, in validating Case F's strategy boosting its credibility and growing its user community. For instance working with insurers includes integrating the app into wellness initiatives for policyholders thereby creating advantages for both sides. By partnering with healthcare providers and insurers the app's reach get to a wider audience and instils trust among users of the app.(CEO/Founder Case F, 2023).

6. Cost Structure:

Technology Development and Maintenance:

The production and maintenance of Case F's app incurs costs. This encompasses tasks, like programming and validating the app to guarantee user satisfaction and functionality. Continuous upkeep involves updates, bug fixes and the integration of features based on user feedback or technological advancements. Ensuring the applications security, usability and relevance across all versions is crucial, for retaining user engagement. (CEO/Founder Case F, 2023).

Content Creation:

Another significant cost for Case F is the creation and continuous updating of content. This includes developing educational materials, personalized smoking cessation programs, and behavioral interventions. The content must be engaging, evidence-based, and tailored to the diverse needs of the user base. Developing high-quality content requires collaboration with healthcare professionals, researchers, and behavioral scientists, which incurs costs related to expert consultations, research, and content production (CEO/Founder Case F, 2023).

Social Impact

Focusing on delivering a technology driven approach to help individuals quit smoking, Case F plays a vital role in shaping primary healthcare in South Africa, as discussed below:

Public Health Improvement:

Case F specifically tackles a public health concern, in South Africa, which is the use of tobacco. Through providing a platform to help people quit smoking this digital health venture plays a role in lowering the rate of smoking, a contributor to various health problems. This proactive effort towards promoting health is in line, with the core principles of healthcare focusing on preventing diseases and educating the public on effective health habits that help prevent diseases brought about by smoking (Kim, 2021) .

Accessibility of Specialized Care

Case Fs digital platform is making it easier to get help with quitting smoking, which is usually seen as a service. This is especially significant, in a place where access to healthcare services can be hard to come by especially in rural or underserved areas.(Harris et al., 2011; Maphumulo & Bhengu, 2019). By offering support for quitting smoking through an app Case F is opening up access to this health service, for more people.

The social influence of Case F, on healthcare is diverse going beyond improving individual health to also encompass wider public health, economic and social advantages. Through the use of technology to tackle a health concern Case F demonstrates how digital health innovation can support the objectives of primary healthcare, in South Africa by enhancing health outcomes preventing illnesses and potentially lessening healthcare disparities.

Conclusion:

Case F highlights the potential of digital health to go beyond traditional healthcare delivery models but instead to implement solutions that directly work on engaging individuals in managing their own health. Case F was able to provide the tools that enable smoking cessation through the users' smartphones. Such innovations can contribute to the prevention of diseases due to smoking.

Case F's approach showcases the importance of taking into consideration the broader public health goals in the development of digital health solutions. By addressing a major risk factor for a number of health conditions, the venture not only improves outcomes for individual users who may be struggling with smoking, but also contributes to the overall reduction of the long-term burden on the healthcare system as a result of smoking. Case F's approach is in alignment with the public health objectives on disease prevention efforts in South Africa.

4.9 Findings pertaining to Case G

Introduction

Case G is a digital health venture whose goal is the promotion of patient safety and risk management in South African healthcare. Starting operations in 2010, the digital health venture has been using innovation to fill the noted gaps in primary healthcare provision especially in remote areas with scarce resources. Its objective involves improving healthcare ethics, wellness advocacy, as well as ensuring patients' safety through adoption of appropriate technology-based systems (Founder/CEO Case G, 2023).

The healthcare system, in South Africa is encountering difficulties, such as resource disparities in access to healthcare. These issues have had an effect on the provision of quality healthcare services in areas where hospitals are scarce or non-existent (Maphumulo & Bhengu, 2019). Case G has developed a framework to tackle the healthcare issues by introducing measures that enhance communication among healthcare stakeholders performing quality assurance on patient safety in health institutions and offering support to healthcare workers

thereby empowering them to deliver quality services.(Founder/CEO Case G, 2023).

Generally Case G's mission and operational approaches are intricately linked to the goal of transforming healthcare in South Africa. Through addressing issues and leveraging innovations Case G aims to create a healthcare system that is easily accessible, time and resource efficient, and patient centered (Founder/CEO Case G, 2023). The following sections will delve into the nine elements of Case G's business model .

Business Model Canvas (BMC) Perspective:

1. Value Proposition

The value proposition of case G is built around integrating digital health innovations that enhance patient safety and risk management within South Africa's primary healthcare sector. What makes it unique is the strategic use of mobile communication platforms, especially WhatsApp for bettering communication between healthcare providers and patients (Founder/CEO Case G, 2023). In remote or underserved areas where traditional healthcare resources are scarce this solves the problem of accessible healthcare communication which has been found necessary by many people (Mbunge et al., 2022). Through capitalizing on ubiquity of mobile phones, it enables patients to receive timely medical advice; manage chronic conditions as well as get needed information about health care services. In addition to that, data driven decision making sets apart Case G from other organizations in the same sector. This implies that they can always monitor patient's real time health data, identify risks quickly and come up with treatment plans that work best for them through their approach. (Founder/CEO Case G, 2023) Patient empowerment represents a significant component within case G's value proposition too. Therefore by informing individuals comprehensively about their health options through timeous reporting ensures that patients and health institutions remain knowledgeable before involving themselves directly into any decision concerning health (Moretta Tartaglione et al., 2018).

2. Patient Population (Customer Segment)

The customers primarily targeted by the Case G are health insurers, hospital groups, and medical practitioners' groupings. These institutions are consumers of Case G's services. While the business model for case G does not target individual patients directly, their services are eventually provided to patients through these health care institutions. By improving the operational efficiency and clinical standards at these institutions, Case G indirectly affects a wide variety of patients mainly those who get primary health care from hospitals and clinics(Founder/CEO Case G, 2023).

Case G uses its wealth of experience, in healthcare services in overseeing trauma and emergency departments to pinpoint the requirements of their customer groups. Through these hands-on experiences they gain an understanding of the challenges that need attention and get a glimpse, into how institutions function. Case G places an emphasis on ensuring risk management and patient safety within the healthcare sector. (Founder/CEO Case G, 2023).

3. Delivery Channels

Case G employs methods to connect with its intended audiences with an emphasis, on Business to Business, (B2B) communications and online platforms. Key channels used include tools like WhatsApp, professional networks, collaboration opportunities as well participation in industry events and leadership discussions. These channels are chosen thoughtfully to engage with clients such, as hospital and doctor groups ensuring that Case G's services are easily accessible and make a meaningful impact. (Founder/CEO Case G, 2023).

Digital Communication Platforms: WhatsApp is used by Case G as one of its most important channels. WhatsApp is commonly used all over South Africa even in remote areas where there is lack of essential services making it a perfect communication tool for patients and doctors (Labuschagne, 2024) . The platform enables direct and quick communication thereby allowing medical practitioners to give relevant advice when it is required most, track chronic diseases and react swiftly during emergencies. In as much as digital illiteracy or absence of internet

connection may be a barrier to accessing services offered by Case G, the services are still accessible since the app can be easily reached through simple steps on any phone which has access to airtime or data bundles (Mbunge et al., 2022).

Professional Networks and Collaborations: Case G uses its wide professional network and collaboration with healthcare facilities to get in touch with its network partners. The network consist of doctors, hospitals, and health insures (Founder/CEO Case G, 2023).

Conferences and Thought Leadership: Furthermore conferences and thought leadership play a role, for Case G. These platforms enable the health venture to reach out to potential customers and partners in the healthcare industry while also fostering the exchange of innovative ideas and best practices (Founder/CEO Case G, 2023). By presenting at conferences and publishing thought leadership articles, Case G can influence healthcare policies promoting the adoption of solutions in healthcare and enhancing primary care services (Sibuyi et al., 2022). This strategy also facilitates networking with industry leaders allowing for discussions and knowledge sharing on trends, in digital health, a field that is continuously evolving.(Johnson & Johnson, 2022).

Effectiveness of Delivery Channels: Improving access, to healthcare through the selected channels is a complex process. By utilizing platforms like WhatsApp Case G can effectively connect with an audience, particularly in regions where mobile phone usage is high (Founder/CEO Case G, 2023). This approach ensures that health information and services are accessible to individuals in underserved areas bridging the gap between rural healthcare facilities and urban ones. The use of WhatsApp enables real time communication fostering engagement, between patients and healthcare providers and ultimately leading to desired health outcomes (Mbunge et al., 2022).

Professional Networks and Collaborations: Working alongside healthcare institutions as a middleman allows Case G to indirectly influence the way patient care is delivered. By enhancing operations, risk management, and safety

practices, within these institutions, Case G contributes to improving healthcare outcomes for patients. Additionally these partnerships enable Case G to implement its solutions on a scale benefiting patients through their innovations (Founder/CEO Case G, 2023). The collaborations, among healthcare providers foster a cycle of improvement and adaptation of solutions driven by experiences and challenges encountered in real world scenarios. (Founder/CEO Case G, 2023).

Influence through Thought Leadership: When Case G engages in thought leadership and speaks at conferences, it ensures that new ideas and best practices in healthcare are widely disseminated. Consequently, this channel contributes input into healthcare policies development (Founder/CEO Case G, 2023).

4. Customer Relationships:

Case G nurtures consultative partnerships with a variety of stakeholders, in the healthcare field such as healthcare professionals, policymakers and with patients. These connections play a role in Case G's framework facilitating the successful implementation and continual enhancement of their digital health solutions. By offering expertise in areas like risk management, safety and healthcare ethics, Case G supports healthcare providers in delivering quality healthcare. Their advisory role with policymakers contributes to shaping healthcare policies and practices especially those concerning health, patient safety and ethical standards, within the healthcare industry. (Founder/CEO Case G, 2023).

Collaborative Relationships with Healthcare Providers: Case G engages in collaborative relationships with healthcare providers that are key to their operations. These relationships are based on trust and mutual benefit, where Case G provides valuable skills and support, and on the other hand healthcare providers provide feedback which helps in the improvement of the services offered by Case G. For example, by partnering with hospital groups and physician groups, Case G can customize its risk management and patient safety solutions

to address specific requirements and issues prevailing in these entities (Founder/CEO Case G, 2023). This teamwork ensures pragmatism, relevance, and the utility of the solutions, resulting in better patient outcomes alongside operational efficiency (Johnson & Johnson, 2022).

Consultative Role with Policymakers: Policy engagement gives Case G the power to influence healthcare policies and practices especially in the areas of digital health, patient safety and ethics. The roles that Case G plays makes them an important provider of evidence-based recommendations as well as insights needed for shaping policies that support adoption and integration of digital health technologies. It is a consultative role that ensures that healthcare policies are not only aligned with current innovations but also the best practices, thereby enhancing better environment for digital health ventures. Additionally, policy modification can lead to enhancements in the quality and accessibility of services within the healthcare system as a whole (Founder/CEO Case G, 2023).

5. Revenue Streams

Case G has created a revenue model to support and expand its health services. The primary revenue sources include fees, for consulting, subscription-based services and project related income. By leveraging these revenue streams the company can establish stability to enhance and develop its offerings further (Founder/CEO Case G, 2023).

6. Key Resources, Activities, and Partnerships

Case G's business model relies on resources, core activities and important partnerships that play a crucial role, in attaining its achievements and bringing about impact within the digital health industry. These elements are essential, for providing valuable services and ensuring the sustainability and growth of the venture.

Key Resources

Expertise in Healthcare Consulting: The healthcare consulting skills it possesses are an asset, for Case G in areas such, as risk management, patient safety and healthcare ethics. These capabilities have been developed over years of overseeing trauma and emergency departments, and actively collaborating with healthcare professionals to address their challenges. (Founder/CEO Case G, 2023).

Digital Technology Platforms: Case G leverages tools, like WhatsApp for communication and different data analysis software to enhance their service delivery as highlighted by the Founder/CEO. These platforms play a key role in enabling communication between healthcare professionals and patients enhancing data organization and analysis and aiding in the creation of personalized solutions. The incorporation of these capabilities is vital, in fulfilling Case G's goal of enhancing safety and risk management (Founder/CEO Case G, 2023).

Primary Activities

Providing Consulting Services: Case G's primary function involves offering services to healthcare organizations with a focus, on managing risks and ensuring safety and upholding ethical standards in healthcare. These services encompass evaluations, tailored solution development and training initiatives, for healthcare personnel. The consultancy projects are crafted to tackle the requirements and obstacles faced by each institution guaranteeing that the solutions provided are feasible, pertinent and impactful. (Founder/CEO Case G, 2023).

Developing and Implementing Digital Solutions: Some of the key activities Case G is involved with include working on health solutions, which includes developing tools, like clinical audit systems, digital communication platforms, and data analytics systems designed specifically for healthcare providers. The process of putting these solutions into action includes customizing, implementing, and providing support to ensure integration into the current workflows of healthcare facilities. (Founder/CEO Case G, 2023).

Academic Institutions: Collaborating with universities is essential, for the research and development activities of Case G. These partnerships enable access to research, foster collaborative projects and aid in sharing discoveries (Founder/CEO Case G, 2023). Through these collaborations Case G can keep abreast of trends and advancements in digital healthcare guaranteeing that its solutions are based on up, to date scientific knowledge and industry standards. (Founder/CEO Case G, 2023; Johnson & Johnson, 2022).

7. Cost Structure

The costs involved in running Case G cover wide range of aspects, for providing quality digital healthcare services and securing the long-term success of the business. These cost components consist of employee wages, technology upkeep and advancement research efforts, marketing strategies for attracting clients and day to day operational costs (Founder/CEO Case G, 2023). It is vital to handle these costs to ensure stability and fulfil the venture's goal of enhancing patient safety and risk management within South Africa's healthcare industry. (Founder/CEO Case G, 2023).

8. Social Impact

The social impact of Case G is an aspect of its strategy, with a focus on enhancing patient safety improving healthcare standards strengthening healthcare facilities and shaping healthcare policies. These initiatives lead to transformations in the healthcare industry especially within primary healthcare environments, in South Africa. (Founder/CEO Case G, 2023).

Improving Patient Safety: One significant social impact of Case G is the enhancement of safety. Through the development and implementation of risk management and patient safety initiatives, Case G aids healthcare providers in minimizing errors and adverse occurrences (Founder/CEO Case G, 2023).. These initiatives encompass the utilization of audit tools, real time data analysis and ongoing training, for healthcare personnel. The focus on patient safety contributes to improved outcomes and elevates the overall standard of care (Founder/CEO Case G, 2023). As an illustration the efforts by Case G have led

to decreases, in hospital acquired infections and the reduction medication errors directly benefiting patients. (Founder/CEO Case G, 2023).

Enhancing Healthcare Quality: Case G's commitment, to enhancing healthcare quality is evident in its dedication to creating and implementing health solutions that streamline healthcare services and elevate standards. By leveraging communication platforms data analytics tools and tailored risk management systems healthcare providers are empowered to deliver quality care (Founder/CEO Case G, 2023). These activities promote enhanced care coordination, prompt decision making and adherence to standard practices. Consequently patients benefit from health outcomes increased satisfaction levels and heightened trust, in the healthcare system. (Founder/CEO Case G, 2023).

Building Capacity in Healthcare Institutions: One major social impact of Case G involves strengthening healthcare institutions. Through consulting services, training initiatives, and digital health solutions, Case G enables healthcare providers to improve their efficiency and clinical skills (Founder/CEO Case G, 2023). This capacity enhancement benefits all healthcare personnel ranging from frontline staff to employees, resulting in an enhancement of healthcare services (Founder/CEO Case G, 2023). The improved capabilities of healthcare institutions lead to effective resource management, decreased operational costs and enhanced patient care (Founder/CEO Case G, 2023).

Influencing Healthcare Policy: Case G's interactions, with decision makers and involvement in leading discussions allow it to impact healthcare policies and procedures. Through offering recommendations grounded in evidence and sharing insights gained from its background Case G plays a key role in shaping policies that facilitate the adoption and incorporation of health technologies. These policies influence and fosters an environment that encourages innovation and innovation in the healthcare industry. For example Case G's advocacy initiatives have played a part in shaping policies that endorse the utilization of mobile communication platforms for delivering healthcare services thus improving access to care, in underserved regions. (Founder/CEO Case G, 2023).

Conclusion:

Case G showcases how digital health solutions are able to address critical, often overlooked aspects of healthcare delivery namely patient safety and risk management. Case G model provides important insights how technology and expertise can be used to healthcare quality. Case G's experiences will provide key lessons for other digital health entrepreneurs, policymakers, and healthcare leaders that are looking at working on the safety and quality of healthcare services.

The success of Case G points to the potential of digital health to go beyond traditional areas of focus like telemedicine or health information systems, and to address the basics such the safety and quality of healthcare. By placing the power into the hands of the healthcare institutions with key capabilities such as data-analytics and expert guidance, such capabilities enable the elevation of quality standards in South African primary healthcare.

4.10 Systems Thinking complementing the Business Model Canvas

The use of Systems Thinking has greatly enhanced the Business Model Innovation Canvas for digital health venture CEOs'/founders, in cases A – G, it offers a fluid view of their business models and how they have impacted South Africa's Primary Healthcare system. By combining Systems Thinking, with the Business Model Canvas (BMC) these business owners have been able to navigate the healthcare environment effectively leading to the development of sustainable solutions.

Value Proposition and Systemic Impact: Each case presents a unique value proposition that addresses challenges in primary healthcare. Case A offers

clinical decision support tools, Case B focuses on a healthcare worker connectivity platform, Case C emphasizes patient empowerment, Case D works on bridging the urban and rural healthcare divide, Case E provides remote patient monitoring, Case F introduces a smoking cessation app, and Case G prioritizes patient safety. Together these cases contribute to enhancing aspects of primary healthcare delivery. When viewed through the lens of Systems Thinking, it becomes apparent how these individual value propositions interact to establish a healthcare ecosystem (Peters, 2014). For instance the improved decision making from Case A's digital platform could complement the effectiveness of Case B's system while the patient empowerment approach of Case C could bolster the impact of Case E's monitoring solutions.

Customer Segments and Interconnectedness: The cases target various customer segments, from healthcare professionals (Cases A, B, G) to patients (Cases C, D, E, F) and healthcare institutions (Case G). Systems Thinking reveals how these segments are interconnected. Improvements in one segment (e.g., better-informed healthcare professionals through Case A) can positively impact others (e.g., improved patient care in Case C). This interconnectedness underscores the importance of considering multiple stakeholders in digital health innovations (Arnold & Wade, 2015).

Channels and Feedback Loops: The digital health venture's digital platforms, mobile apps, and community partnerships used as channels across the cases create feedback loops within the primary healthcare system (Jackson, 2019). A case in point is Case B's telemedicine platform, which not only connects healthcare workers but also generates data on referral patterns, which can be used to inform healthcare resource allocation decisions. In this instance, Systems Thinking helps identify feedback loops, which allows the digital health entrepreneurs to leverage them for continuous improvement and scalability (Jackson, 2019).

Revenue Streams and System Sustainability: The varied revenue models (subscriptions, licensing, referral fees, device sales) demonstrate the complexity of creating sustainable digital health ventures. From a Systems Thinking

perspective, this helps in the understanding on how the revenue streams contribute to the overall business sustainability of the primary healthcare system (Arnold & Wade, 2015). For example, Case F's freemium model for smoking cessation could lead to reduced healthcare costs in the long term, creating value beyond the immediate revenue generated.

Key Resources and System Resilience: The technological infrastructure, medical expertise, and partnerships are highlighted as key resources across the cases, contributing to the resilience of the primary healthcare system. Systems Thinking helps identify how these resources can be leveraged across different digital health ventures. For instance, the AI capabilities developed in Case C could potentially enhance the risk management tools in Case G (Atun, 2012).

Key Activities and Systemic Efficiency: The core activities of software development, data analytics, and stakeholder engagement across the cases contribute to overall system effectiveness. Systems Thinking reveals how the described activities in one venture can benefit others (Arnold & Wade, 2015). For example, the data analytics capability developed by Case E for remote monitoring, could inform public health strategies addressed by Case F's smoking cessation efforts.

Partnerships and Ecosystem Development: Partnerships and building connections, with healthcare providers, academic institutions and government entities are crucial for establishing a health network. Viewing these collaborations through a Systems Thinking lens emphasizes their ability to generate network effects thereby amplifying the influence on new ideas and fostering a conducive environment, for digital health entrepreneurship (Buchanan, 2019).

Cost Structure and Resource Allocation: The costs associated with aspects such, as technology innovation, advertising and adherence to regulations, in all the cases mirrors the financial commitments required to revolutionize the primary healthcare sector. By applying Systems Thinking one can grasp how the costs can be streamlined throughout the primary healthcare ecosystem ultimately

resulting in more efficient and effective distribution of resources during the implementation of digital health initiatives and operations.

The analysis using Systems Thinking and the Business Model Canvas shows how the digital health ventures (Cases A - G) are interconnected within the South African Primary Healthcare ecosystem. Together they have the potential to revolutionize healthcare by addressing challenges simultaneously such as improving clinical decisions, engaging patients effectively, and optimizing resource management. Moreover the analysis emphasizes the importance of adaptability and continuous learning within Primary Healthcare ecosystem. The digital health ventures must remain flexible to adapt to changes in healthcare practices, regulations, and technological innovations. The success of the health solutions relies not on the individual business strategies but also, on their ability to add value to the broader Primary Healthcare ecosystem.

4.11 Thematic Analysis

The thematic analysis was done manually using the Miro Mind map software. The analysis summarizes the findings on the seven digital health ventures with the common themes clearly articulated. Refer to the thematic analysis diagram 3 for the details below:

Thematic Analysis – Cases A - G

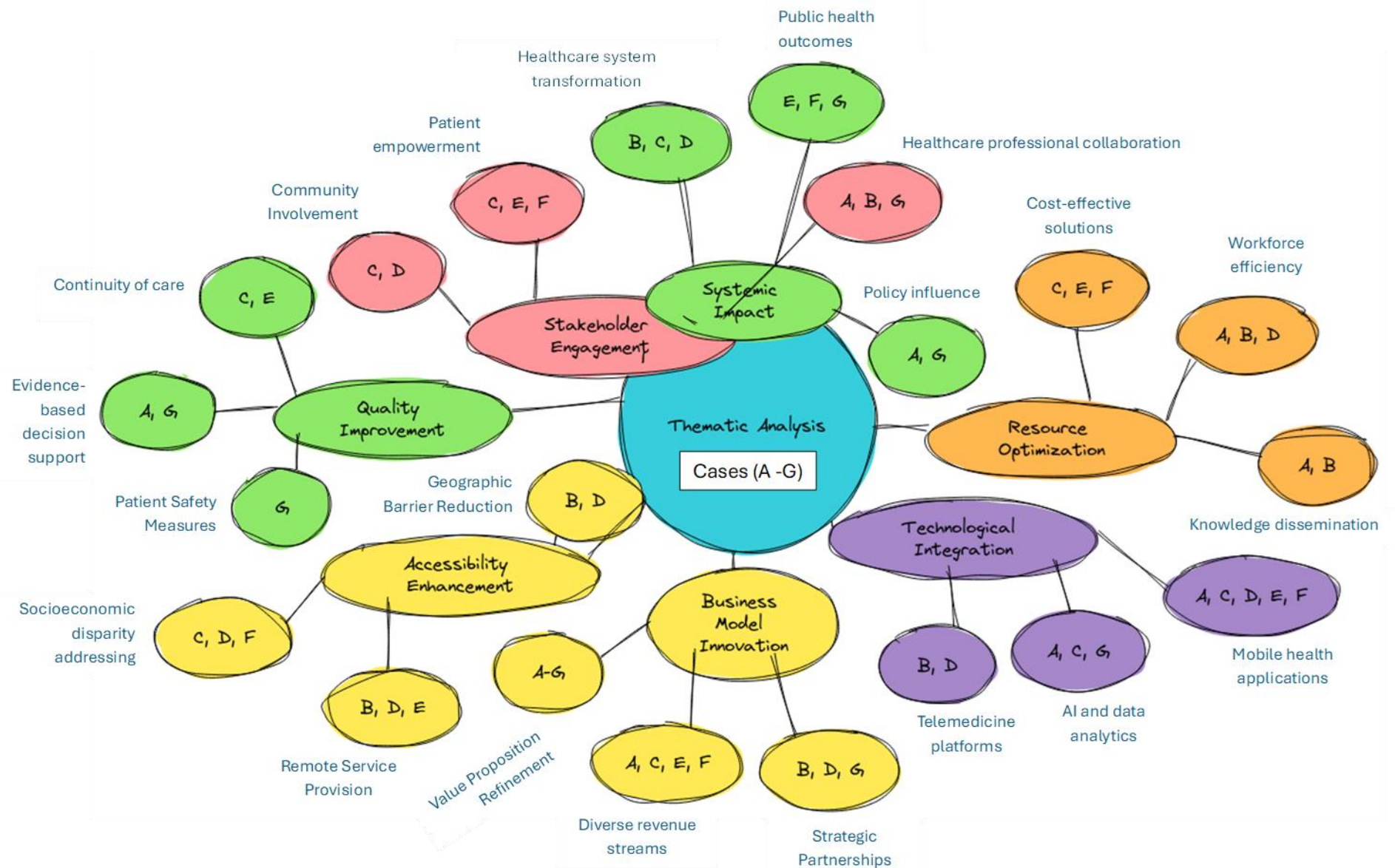


Figure 3: Thematic Analysis overview: Source Miro Mindmap

4.12 Summary of Findings

The combined findings build upon the strategies outlined in the case studies, as experienced by the digital health ventures. By testing the findings as described above against the propositions, a cohesive narrative that describes the impact the digital health entrepreneurs bring to healthcare is made apparent. These entrepreneurs also face systemic challenges, which they are able to navigate in their quest to attain set goals and objectives. The identified themes in the findings section have been streamlined to five broad areas that are discussed below:

Access to High Quality Healthcare: The case studies demonstrate how digital health ventures can notably reduce systemic and structural challenges in healthcare which are well documented by (Coovadia et al., 2009) and (Maphumulo & Bhengu, 2019). By addressing the barriers through digital health solutions, the populace is able to access quality healthcare.

Incorporation of Digital Health Technologies (DHTs): The challenges in integrating DHTs as described in the findings section are reflected in the case study examples. Digital health ventures address these challenges by creating user context specific digital solutions that resonate with the realities of the South African primary healthcare environment.

Innovative Business Models: The entrepreneurial innovations showcased in the case studies, respond directly to the value proposition's call for business model innovation. These digital health ventures demonstrate how digital platforms can offer solutions to healthcare issues, underscoring the significance of sustainability and adaptability in their business models.

Entrepreneurial Hurdles: Regulatory barriers, insufficient funding and infrastructure challenges are just some of the hurdles that digital health entrepreneurs have to contend with as highlighted in both the proposition and case studies. Collaboration and strategic partnerships are considered essential in being able to overcome the entrepreneurial hurdles.

Impact of Business Models on Healthcare: The experiences of these digital health ventures highlight the need for policies, investment and infrastructure development to enable quality primary healthcare. The positive impact of business models discussed in the case studies validate the claim that such models can greatly improve healthcare access, quality and patient involvement. By utilizing technologies with sound and responsive business models the digital health ventures are making progress in reshaping the healthcare landscape in South Africa.

This consolidated summary articulates the role of digital health ventures in addressing healthcare challenges, in South African primary healthcare and illustrates the importance of innovative solutions that are tailor made to the local environment.

CHAPTER 5. DISCUSSION OF THE RESULTS OR FINDINGS

This chapter combines the research findings from the seven digital health ventures, under study in this research project. Insight gleaned from the literature review will pretty much be the subject of discussion in this chapter. The objective is to validate the findings from lived experiences of the digital health entrepreneurs to existing knowledge in the literature. Attention will focus on the connections to scholarly discourse and real-world studies as exemplified by the digital health ventures. By aligning findings with the literature, this chapter places the landscape of healthcare in South Africa into context and contributes to discussions on its potential impact in transforming primary healthcare systems in in South Africa and other emerging economies.

The chapter is structured methodically to ensure a storyline. It revisits themes identified in Chapter 2 "Literature Review and Theoretical Framework " including obstacles to accessing quality healthcare, integration of health technologies, innovations in business strategies, challenges encountered by digital health entrepreneurs and the influence of innovative business models on healthcare. Each theme is then explored in detail intertwining findings from Chapter 4 "Presentation of Findings" within the context of existing literature. Special attention is given to referencing studies, theories and models that complement, inform or contrast, with research discoveries.

5.1 Introduction

Structure of the Chapter

Chapter Structure

1. **Review of Literature:** This section provides an overview of the foundations and empirical evidence, in existing literature setting the stage for the analysis.

2. **Healthcare Access Challenges:** This section combines research findings on barriers to healthcare access, the impact of socioeconomic factors on health, and the role of Digital Health Technologies in overcoming these obstacles.
3. **Integration of Digital Health Technologies:** Exploring the Alignment of DHT Integration Strategies with Healthcare Transformation Literature
4. **Innovations in Business Models;** An examination of business models adopted by digital health ventures and comparing them to the literature on business model innovation within the health sector is made.
5. **Hurdles Faced by Digital Health Entrepreneurs;** Digital health entrepreneurs face a range of challenges, including financial, regulatory, and market obstacles. These differ from the hurdles encountered by entrepreneurs in emerging technologies and innovative healthcare ecosystems as outlined in existing literature on entrepreneurship.
6. **Impact of Innovative Business Models on Healthcare;** Discusses potential impacts alongside relevant research on digital health outcomes, patient engagement levels, and enhancements in healthcare system efficiency.
7. **Conclusion:** Summarizing insights derived from this chapter's research contributions to literature while proposing avenues, for future research exploration.

5.2 Profile of respondents

In today's South African changing healthcare landscape digital health ventures are leading the way in driving innovation to tackle healthcare grand challenges. Seven such ventures showcase approaches to improving healthcare through technology and creative business models. Some the technologies these ventures utilize but not limited to are telemedicine, mobile health apps, information sharing platforms, and other emerging technologies to transform how healthcare

professionals interact with patients and manage their health. Each venture focuses on filling gaps in the healthcare system by enhancing access to healthcare and improving the management of diseases or providing solutions for smoking cessation support. Their localised solutions demonstrate an understanding of their target market's needs. These ventures highlight how technology can significantly improve healthcare delivery. By prioritizing patient centered healthcare, the digital health ventures not only enhance the quality and efficiency of healthcare services. but their innovations also promote inclusivity and accessibility in primary healthcare. The overview in Tables 1 and 2 below delves into each digital health venture's focus areas, innovations, target audience and the positive outcomes that aimed to be achieved.

Digital Health Venture	Focus Area	Technology Services	Target Market	Business Model	Impact
A	Medical Education Enhancement	Digital platform for clinical information aggregation	Healthcare Professionals	Sponsored content, software licensing	Improved healthcare delivery through better-informed professionals, leading to more accurate diagnoses and treatment plans.
B	Healthcare accessibility in rural areas	Digital health technologies integration	Rural and underserved communities	Innovative business models, technology integration	Enhanced healthcare delivery and system efficiency in rural settings, bridging the gap in access to medical services
C	Primary healthcare accessibility	Secure medical records, AI-driven analytics	Underserved communities	Focus on patient-centric care	Scalable primary healthcare solutions reducing accessibility gaps, enabling more individuals to receive timely and effective care.
D	Enhancing primary healthcare services	Telemedicine platforms, mobile health applications	Underserved communities	Diversified revenue streams (subscriptions, partnerships)	Accessibility and quality of healthcare services significantly improved, especially in remote areas, through the use of telemedicine and digital health tools.

Table 1 – Digital Health Venture Focus Area

Digital Health Venture	Focus Area	Technology Services	Target Market	Business Model	Impact
E	Addressing non-communicable diseases	Remote patient monitoring, telehealth services	Patients with or at risk of chronic conditions	Device sales, subscriptions, partnerships	Greater healthcare access and better patient care for chronic conditions, leading to improved management of these diseases and better patient outcomes.
F	Smoking cessation	Mobile app with telehealth, behavioral economics	Rural and underserved communities	Freemium model	Public health improvement by reducing smoking rates, supporting individuals through their cessation journey with technology and behavioral support
G	Patient safety and risk management	Digital platforms (e.g., WhatsApp for communication)	Broad healthcare sector	Broad healthcare sector	Scalable primary healthcare solutions reducing accessibility gaps, enabling more individuals to receive timely and effective care.
D	Enhancing primary healthcare services	Telemedicine platforms, mobile health applications	Underserved communities	Diversified revenue streams (subscriptions, partnerships)	Accessibility and quality of healthcare services significantly improved, especially in remote areas, through the use of telemedicine and digital health tools.

Table 2 – Digital Health Venture Focus Area

5.3 Literature Review: Theoretical Foundations and Empirical Evidence in Digital Health Ventures

The review of the existing literature plays a key role, in understanding the landscape of digital health entrepreneurship in South Africa's Primary Healthcare (PHC) sector. The literature review demonstrates how innovative business models can transform healthcare services. The current exploration sets the stage for an in-depth analysis of seven digital health ventures that combine real world experiences based on solutions deployed in the field. The application of theory will be pertinent to the pragmatic approach that digital health entrepreneurs perform on a daily basis.

1. Framework

Existing literature articulates the influence of business model innovation (BMI) on healthcare, highlighting the contributions from scholars such as (Osterwalder & Pigneur, 2010) and (Chesbrough, 2010). The two scholars view BMI as a critical in reshaping healthcare delivery landscapes. This shift is particularly important, in resource constrained settings, where innovation can bridge gaps in accessibility and quality. The convergence of technology and healthcare referred to as 'digital health entrepreneurship' offers opportunities for digital health entrepreneurs to tackle healthcare challenges by utilizing mainstream technology while leveraging emerging technologies underpinned by a sound business model capable of enabling desired business outcomes.

2. Empirical Studies:

The empirical research discussed in the literature review focuses on the challenges faced by South Africa's healthcare system, such, as infrastructure, shortage of healthcare workers and social and cultural obstacles (Chowdhury & Ravi, 2022). These studies highlight the importance of developing solutions to address the challenges in healthcare service delivery. The review examines how health technologies are being integrated into healthcare settings and evaluates

their adaptability, performance and potential to bring about enhancements to healthcare services.

3. Comparative Analysis:

Within this framework the comparative analysis of Cases A. - G will delve into the various aspects including:

- 1. Challenges in Accessing and Ensuring Quality Primary Healthcare:**

This analysis will draw insights from existing literature to understand how each digital health venture addresses the barriers to accessing quality healthcare within primary healthcare. It will explore how these ventures tackle gaps, workforce issues and socio-cultural factors.

- 2. Integration of Digital Health Technologies;** The examination will focus on how the digital health ventures incorporate digital health technologies into healthcare setting, this will be based on research findings and technology's impact on healthcare delivery. Further evaluation includes assessing the feasibility of these technologies within South Africa's healthcare system and their effectiveness, in enhancing service accessibility and quality.

- 3. Innovative Business Models:** This aspect will involve comparing the business strategies utilized by the digital health ventures, with existing literature. The analysis seeks to elucidate how the digital health ventures contribute to addressing challenges in the public health sector. Their alignment with and impact on the primary healthcare will also be assessed.

Strategies of Entrepreneurs in the Digital Health Field:

The approaches taken by digital health ventures in dealing with financial, regulatory and market related challenges will be explored and contrasted with the hurdles faced by the digital health entrepreneurs. The examination will delve into the methods employed to overcome these challenges.

Impact of Innovative Business Practices, on Healthcare:

By examining how digital healthcare ventures influence healthcare systems through real world examples of healthcare outcomes, a critical assessment of claims made regarding improved healthcare access and quality will be conducted, so as to test the veracity of the claims.

5.4 Discussion pertaining to Proposition 1

The proposition focuses on exploring how each of the seven digital health ventures (Cases A - G) identify, navigate, and work in overcoming the barriers that have traditionally hindered access to quality healthcare services. Proposition 1 aligns with the themes in the literature reviewed in Chapter 2, which discuss the systemic challenges that prevent healthcare access. These range from geography, socio-economic, and infrastructural challenges (Chowdhury & Ravi, 2022; Coovadia et al., 2009; Gordon et al., 2020; Harris et al., 2011).

Similarities Between Findings in Chapter 4 and Literature in Chapter 2

Geographical Disparities: Both the findings and the literature acknowledge the important role that digital health ventures play in addressing the geographical gaps (Leon et al., 2012). Ventures like Case B, which facilitates connections between healthcare workers and specialists, directly address the accessibility barrier by using technology to overcome distance and improve healthcare access in rural and underserved regions (CEO/Founder Case B, 2023). This supports the literature findings on the potential of telehealth and mHealth solutions in extending healthcare's reach (Chakraborty et al., 2023).

Socio-Economic Barriers: The literature and findings from cases such as Case C, which focuses on enhancing access for poor communities through secure medical records and AI-driven analytics, demonstrates how the venture's strategy is supported by literature in tackling socio-economic barriers. Both emphasize digital health's role in democratizing access to healthcare by providing affordable and scalable solutions (Lee et al., 2017). Proposition 1 suggests making changes, to policies enhancing infrastructure, supporting and training healthcare workers better, and launching community programs. On the hand studies by (Lee

et al., 2017) highlight how mobile technology can contribute to addressing these issues. Specifically mobile health initiatives can help address resource limitations through the delivery of training and support via mobile platforms and provide targeted interventions to bridge gaps in healthcare access between geographical areas. Proposition 1 and the work by (Lee et al., 2017) focus on aspects of healthcare access and delivery incorporating mHealth solutions, this aligns with the broader strategies outlined in Proposition 1 that advocate for enhancing healthcare accessibility and quality, in South Africa.

Differences Between Findings in Chapter 4 and Literature in Chapter 2

Innovative Solutions to Traditional Barriers: While the literature discusses digital health's potential in overcoming access barriers, the findings in Chapter 4 discuss specific, innovative approaches adopted by individual ventures. For instance, Case A's use of a digital platform to aggregate and provide critical clinical information showcases a unique solution to information accessibility, going beyond the general solutions discussed in the literature.

Customization and Localization: The findings reveal an understanding of the barriers to healthcare access, with ventures like Case C emphasizing patient-centric care that is tailored to local contexts. This level of customization and localization by digital health ventures is not extensively covered in the literature, which tends to focus more on general digital health applications rather than the tailored, context-specific interventions that are carried out by the digital health ventures

Integration of Literature and Findings

The analysis compares real world findings with existing literature and shows how digital health ventures are putting ideas into action in addressing healthcare challenges. While the literature discusses the obstacles to healthcare access Chapter 4's findings demonstrate practical and creative approaches being used to overcome these barriers on the ground.

Furthermore the analysis gives practical examples of where the digital health venture went beyond what is discussed in the literature. These digital health ventures not only support what the literature says about health's transformative potential but also go further by implementing solutions tailored to their target population's specific needs.

To sum up the discussion Proposition 1 and its findings, the discussion highlights a relationship between theory and practice in health. It uncovers the alignment or divergence between real world data obtained from the case studies and existing literature. This in turn leads to an insight into the complexities of using health innovations in improving healthcare accessibility and quality in Primary Healthcare.

5.5 Discussion pertaining to Proposition 2

Similarities Between Chapter 4 Findings and Chapter 2 Literature

Integration of Digital Health Technologies (DHT)s: Both the literature and findings emphasize on the importance of integrating digital health technologies into healthcare system. These are crucial for enhancing healthcare delivery. For instance, ventures like Case A, which offers a platform for clinical support and education, aligns with the literature emphasizing the on need for DHTs to support healthcare professionals' decision-making processes and improve information accessibility (Agarwal et al., 2018).

Effectiveness of Digital Health Technologies: The literature review in Chapter 2 discusses the effectiveness of DHTs in enhancing service quality and accessibility (Chib et al., 2015), a theme echoed in the empirical findings. Case B's software that connects healthcare workers to specialists for advice demonstrates the practical application of DHTs to streamline healthcare services, demonstrating the potential benefits of DHTs discussed in the literature .

Differences Between Chapter 4 Findings and Chapter 2 Literature

Innovative Models for DHT Integration: The findings from Chapter 4 reveal innovative models for integrating DHTs into healthcare systems that are not extensively covered in the literature in Chapter 2. For example, Case C's use of AI-driven analytics for patient-centric care presents a novel approach to leveraging technology for healthcare service delivery, going beyond the generic integration strategies presented in the literature.

Localized Applications of DHTs: The empirical findings highlight the importance of localizing DHT applications to meet specific community needs, a detail that is less emphasized in the broader discussions of DHT integration in the Chapter 2 literature. Cases like Case D, focusing on telemedicine solutions for remote patient monitoring, illustrate the tailored application of DHTs in addressing local healthcare challenges, demonstrating an understanding of technology integration in specific contexts.

Integration of Literature and Findings

The discussion reveals a nuanced understanding on how digital health ventures implement digital health technologies within healthcare systems, aligning with and expanding upon the theoretical insights discussed in the literature. While the literature provides a foundational framework for understanding the potential of DHTs (Pillay & Motsoaledi, 2018) ; (Mbunge et al., 2022) the empirical findings from Chapter 4 illustrate the varied, innovative ways in which these technologies are being applied to improve healthcare delivery.

This analysis suggests that while there is a strong alignment between the literature and the empirical findings on the importance and potential effectiveness of DHTs, the ventures' specific applications and integration models provide new insights into the practical challenges and opportunities for implementing digital health solutions. These ventures not only confirm the transformative potential of DHTs highlighted in the literature but also contribute new perspectives on how to effectively integrate technologies in diverse healthcare contexts. This has been demonstrated by all the 7 digital health ventures where each one of them has deployed digital health innovations based on creative business models.

5.6 Discussion pertaining to Proposition 3

Similarities Between Chapter 4 Findings and Chapter 2 Literature

Business Model Innovation: Both the literature and the findings underscore the importance of innovative business models in the success of digital health ventures. The literature in Chapter 2 discusses the critical role of adaptability, customer-centric approaches, and revenue diversification for digital health startups (Nkwanyana, 2022) ; (Lukhele & Soumonni, 2021) ; (Kapri, 2023), themes reflected in the case studies. For instance, Case A's platform, aggregates clinical information for healthcare professionals, demonstrating a service-oriented business model aimed at enhancing information accessibility and decision-making in healthcare.

Sustainability and Scalability: The findings from Chapter 4 align with the literature insights on the need for digital health ventures to develop sustainable and scalable business models. Ventures like Case B, which facilitates connections between healthcare workers and specialists, demonstrates innovative approaches to creating value while addressing systemic healthcare challenges. This supports the literature on the importance of scalability in health tech entrepreneurship (Gao et al., 2022)

Differences Between Chapter 4 Findings and Chapter 2 Literature

Customized Revenue Models: The empirical findings reveal more nuanced and customized revenue models than those broadly discussed in the literature. For example, Case E's approach to managing non-communicable diseases through digital solutions employs a unique combination of subscription fees, device sales, and partnership revenues, demonstrating a level of customization in revenue generation strategies this goes beyond the generic models highlighted in the Chapter 2 literature (Chowdhury & Ravi, 2022).

Partnerships and Collaborations: While the literature emphasizes the value of strategic partnerships, (Talib et al., 2015) the findings from Chapter 4 provide specific examples on how digital health ventures navigate and leverage

partnerships. Case F's smoking cessation app, for instance, illustrates strategic collaboration with healthcare providers or public health organizations, offering insights into the practicalities of partnership models which is not extensively covered in the literature.

Integration of Literature and Findings

The comparative analysis highlights the relationship between theoretical discussions in the literature and practical applications observed by the digital health ventures. While the literature provides a conceptual framework for understanding business model innovations in the digital health sector, the findings from Chapter 4 enrich this framework by detailing specific, innovative business strategies employed by digital health entrepreneurs, e.g. Case A's value proposition brings together and aggregates clinical information" while Case B has revolutionized rural healthcare by providing access to specialist advice for healthcare workers.

This discussion suggests that while there is significant alignment between theoretical insights and practical innovations in digital health business models, the ventures contribute novel perspectives and strategies that expand upon the discussions from the literature. These innovations not only underscore the critical role of business model adaptability in the digital health ecosystem but also highlight the ventures' contributions in advancing the literature on pragmatic application of digital solutions underpinned by the theory discussed in the literature.

The value of seminal work by business model innovation scholars:

The seminal works by (Osterwalder & Pigneur, 2010) on the Business Model Canvas and (Chesbrough, 2010) on Open Innovation provide frameworks that can be applied to innovate the business model of digital health ventures in the healthcare sector. Osterwalder & Pigneur's Business Model Canvas as a strategic management tool allows digital health ventures to describe, design, challenge, invent, and pivot their business model. Based on the nine key building blocks. Complementing the business model canvas, (Chesbrough, 2010)'s

concept of Open Innovation suggests that companies can and should use external ideas as well as internal ideas and internal and external paths to market as they look to advance their technology. For digital health ventures working on business model innovation this means, them incorporating external innovations. Most of the digital health ventures in the multi-case study are continually engaging in partnerships with tech startups, universities, and research institutions to co-develop new features or services (CEO/Founders – Semi Structured Interviews October – December 2024). Some of them are involved in crowdsourcing by inviting suggestions and ideas from users and healthcare professionals to identify needs and opportunities for innovation (CEO/Founders – Semi Structure Interviews October – December 2024). By applying these frameworks cases A - G have been able to systematically innovate and refine their business models to better serve their target markets and respond to the healthcare industry's challenges. This holistic approach ensures not only the alignment of cases A - G internal capabilities and market needs but also fosters an environment of continuous innovation and adaptation.

5.7 Conclusion

Summary of the Discussion Across the Propositions

Barriers to Accessing Quality Healthcare: The findings presented in this chapter articulate how digital health ventures are adept at addressing barriers to healthcare access, through sound business practice. The digital health ventures not only reflect the real-world implementations drawing from concepts found in academic discussions and literature but have also demonstrated how they are able to introduce customized solutions tailored to specific contexts, thus eliminating obstacles to healthcare access.

Integration of Digital Health Technologies: The digital health ventures integration of DHTs into the healthcare system. This demonstrates the promise of the technologies and stood out very clearly in the literature. Particularly interesting were the variations on how integration strategies were approached

and the focus, on using DHTs in applications offering tangible instances that enhance the theoretical literature.

Innovations in Business Models: Digital health entrepreneurs have been identified as trailblazers, given their pragmatic approach to problem solving. They develop business approaches that align with and expand upon existing research. Their focus, on sustainability, scalability and value generation brings perspectives to the dimensions of digital health innovation projects.

Conclusion

The comparative analysis brings to light the role that digital health ventures, in South Africa play in improving healthcare services through the utilization of technologies and implementation of business strategies. These digital health ventures expound on existing research and provide insights and real-world examples on the potential of digital health. By combining the results from Chapter 4 with the existing literature in Chapter 2 a deeper understanding of the complexities, challenges and opportunities in the digital health is achieved.

In summary Chapter 4 highlighted how digital health ventures contribute significantly to primary healthcare innovation by enhancing accessibility, efficiency and quality. Through applying business models in practice these digital health ventures offer lessons and guidance for future research and implementation, in digital health.

CHAPTER 6. CONCLUSIONS & RECOMMENDATIONS

6.1 Introduction

The chapter's structure aims to connect the research questions outlined in Chapter 1 with the findings, from Chapter 4:

Introduction Recap: This section briefly revisits the research questions introduced in Chapter 1 setting the stage for their exploration using insights from chapter 4.

Integration Framework: Here a framework is presented to merge the findings from the propositions with the research questions outlining a methodology to link data and theoretical insights to achieve research objectives.

Discussion of Propositions and Research Questions:

Each proposition is discussed in relation to how it informs and relates to the research questions addressing each question based on the propositions.

Emphasis is placed on identifying similarities and differences, between the findings and the initial expectations set by the research questions.

Synthesis of Findings: This stage involves consolidating insights gained from propositions within the context of research questions offering a narrative that connects evidence with the theoretical framework.

Conclusion and Implications: Summarizing how integrated findings address the research questions.

6.2 Conclusions regarding primary research question

In order to address the research inquiry this study's combined findings, from the propositions demonstrates how digital health ventures in South Africa are pioneering new ways of enhancing healthcare services. The key focus was on how digital health ventures could effectively address the identified systemic

healthcare challenges that have a direct bearing healthcare access, quality and efficiency.

Key Findings

Digital health ventures play a vital role in breaking down barriers to healthcare access by utilizing technology to reach a wider audience and promote inclusivity.

The innovative business models introduced by these digital health ventures offer solutions that enhance the quality and efficiency of healthcare services.

The digital health ventures have been able to tailor and localize health their solutions based on specific community needs that were previously unaddressed.

Addressing Shortcomings in Literature: This study bridged existing gaps in literature by presenting evidence on how digital health venturers are impacting systemic healthcare challenges. It also shed light on integration strategies and business models that have not been fully explored based on the literature reviewed

This summary serves as a prelude to delving into the discussions around the sub primary questions thereby providing nuanced insights into specific facets of digital health innovations for a comprehensive understanding of the study's contributions, to digital health research.

6.3 Conclusions regarding sub primary research question 1

After analyzing the introduction literature review, proposition statements and the findings related to Sub Primary Research Question 1 it is evident that digital health ventures have had a positive impact, on healthcare, by enabling accessibility and quality to healthcare services in South African Primary Healthcare. The digital health innovations introduced by the digital health ventures have effectively addressed barriers identified in the literature such as constraints, financial limitations and inadequate healthcare infrastructure.

The study's results indicate a departure from research particularly in terms of the efficiency and scalability of specific digital health models. In contrast to studies that often highlighted infrastructural obstacles without offering viable solutions, (Rensberg, 2021) this research presents real life examples of successful business model innovations that overcome these challenges.

By filling the gaps in existing literature—such as undervaluing context in technology adoption and lacking evidence on business model efficacy—this study offers fresh insights into how digital health entrepreneurship can enhance healthcare delivery. It illustrates that customized business models tailored to contexts along with digital technologies can effectively narrow the healthcare access divide. The findings provide lessons, for policymakers and practitioners across the South African Primary Healthcare setting.

6.4 Conclusions regarding sub primary research question 2

The examination of existing literature, in Chapter 2 and the research findings presented in Chapter 4 indicate that various digital health technologies (DHTs) are currently being used in healthcare facilities across South Africa. These technologies encompass electronic health records (EHRs), telemedicine, mobile health (mHealth) applications and Artificial Intelligence (AI) applications (Chakraborty et al., 2021) . Their primary objective is to enhance accessibility and quality by addressing barriers, improving data management, and facilitating consultations and enhancing precision.

The results suggest that although these technologies hold promise for enhancing healthcare services their integration is met with challenges such as system fragmentation, accessibility issues and compliance hurdles related to quality standards. Despite these challenges, the adoption of DHTs has been instrumental in ensuring healthcare provisioning during times of the COVID 19, underscoring their importance in modernizing healthcare access and delivery.

Discrepancies from the research highlight the pace at which technology adoption is advancing in healthcare and the distinctive features of South Africa's

healthcare system. Previous studies may not have fully acknowledged the potential of utilizing DHTs in resource constrained settings or the specific obstacles impeding their implementation.

By addressing the identified limitations from existing literature reviews this study presents insights into integrating DHTs into healthcare settings, within South Africa.

The text underscores the significance of implementing changes such, as enhancing infrastructure. adjusting policies and supporting healthcare workers and digital health innovators to fully leverage the benefits of Digital Health Technologies (DHTs) in improving healthcare accessibility and quality. By utilizing a method that merges Osterwalder's Business Model Canvas with Systems Thinking this research overcomes constraints. Offers practical guidance on effectively incorporating digital health technologies into primary healthcare settings.

In essence digital health technologies are enhancing healthcare in South Africa; however their complete potential is impeded by obstacles. Addressing these challenges through business models and strategic partnerships is crucial, for unlocking their advantages.

6.5 Conclusion regarding sub primary research question 3

After examining the provided documents, which encompass the introduction, literature review, presentation of findings and proposition statements the response, to Sub Primary Research Question 3 (SPRQ3); " What business model innovations are digital health entrepreneurs using to overcome barriers in South Africa's primary healthcare" is discussed below:

Findings and Conclusions:

The research indicates that digital health entrepreneurs in South Africa are spearheading innovative business models that tackle the various challenges in primary healthcare (Wulfovich & Meyers, 2020) . These innovations primarily

aim to improve healthcare accessibility, quality and efficiency through digital platforms. Key strategies involve creating health apps, offering telemedicine services, managing health records and utilizing digital tools for patient engagement. These models prioritize patients' needs by using technology to deliver care efficiently .

Moreover digital health entrepreneurs are prioritizing sustainability and scalability by adopting models that are advanced technologically and economically feasible (Engwall et al., 2021). This includes subscription-based models, partnerships with existing healthcare providers, and integrating health solutions into the healthcare system for a seamless patient journey.

Differences from Previously Published Research:

In contrast to research findings this study emphasizes an integrated approach, to innovating business models within the realm of digital health (Gao et al., 2022).

In the past, many studies have focused on innovations, in healthcare. However this research highlights the significance of business strategies that tackle systemic issues like healthcare accessibility and quality using digital solutions (Gao et al., 2022).

A key discovery is the promotion of partnership models (Engwall et al., 2021), which differs from the approaches seen in earlier research. This cooperative strategy aims to connect healthcare providers and stakeholders for an organized and effective healthcare delivery system.

Addressing Shortcomings in Literature:

This study highlights the gaps outlined in literature reviews especially regarding how digital health innovations can be integrated into current healthcare systems to enhance accessibility and quality. By showcasing examples of business models this study provides insights into overcoming operational, financial and regulatory obstacles that have impeded the adoption of digital health technologies.

Additionally this research adds value to existing literature by presenting a framework for evaluating the impact of business model innovations on healthcare outcomes. This goes beyond considerations that encompass economic feasibility, scalability and long-term viability.

In summary digital entrepreneurs in South Africa's health sector are leading the way, in revolutionizing healthcare with inventive business models.

These models use technology to address access and quality challenges, in healthcare while also focusing on sustainability and integration within the healthcare system. This study emphasizes how these advancements can greatly enhance healthcare services in South Africa providing guidance, for policy makers healthcare professionals and business owners in the health industry.

6.6 Recommendations

The evaluation of existing research, on healthcare in South Africa along with the interactions with health entrepreneurs in the case study has highlighted the intricate dynamics of primary healthcare. Challenges embedded within the sector create barriers, for individuals seeking quality healthcare through primary health care services.

The challenges faced in primary healthcare in terms of accessibility and quality is what has led digital health entrepreneurs tackle the challenge through innovative digital solutions. The innovative business models, as shown in the case study have enabled access to quality primary healthcare. The complexity in primary healthcare delivery necessitates the bringing together of efforts across various stakeholder groups with the goal of a shared objective - the advancement of healthcare accessibility and quality via digital innovation augmented by innovative business models.

As the recommendations for digital health entrepreneurs, healthcare providers, policymakers, and communities are made, the importance of collaboration, innovation, and strategic technology utilization is underscored. The following recommendations serve as a roadmap not only for individual entities but also a

collective call to action, whose aim is to bridge the primary healthcare provision gaps and bring to fore the transformative potential of digital health solutions. The journey ahead will require concerted efforts, adaptive strategies, and a shared dedication to the improvement of primary healthcare outcomes amidst the myriad challenges that are ever so present in the delivery of healthcare. The recommendations talk to the following stakeholder groups as described below:

Stakeholders:

Digital Health Entrepreneurs:

Innovate Continuously: The digital health entrepreneurs are advised to focus on developing scalable and sustainable business models that address specific healthcare accessibility and quality barriers, as has been demonstrated in the case study. Leveraging emerging technologies will only bolster their innovation potential as they continue to craft local tailored digital solutions

Collaborate and Partner: Building an ecosystem of partnerships is highly recommended given the complex nature of primary healthcare.

User-Centric Design: Following a customer centric design of solutions is required. This will involve prioritizing the needs and preferences of end-users in the design and development of digital health solutions that ensure higher adoption rates and satisfaction.

Healthcare Providers

Adopt Digital Solutions: Healthcare providers should be willing to incorporate health technologies into healthcare systems to enhance efficiency, patient care and accessibility. It is essential for the new systems to be compatible, with existing ones to prevent fragmentation and promote collaboration.

Capacity Building: Investing in training for healthcare professionals on using health tools is crucial to ensure they can effectively utilize these resources in their practice.

Patient Engagement: Prioritizing customer centric approaches involves engaging with patients. Utilizing platforms to improve communication provides access to health information and offer remote consultation options is highly recommended.

Policymakers

Foster a Supportive Regulatory Environment: Developing and implementing policies that encourage health innovation while safeguarding data privacy and ethical considerations is vital.

Incentivize Innovation: Offering incentives such, as tax breaks, grants and funding opportunities can motivate both startups. Established companies to invest in health solutions.

Infrastructure Development: Invest in building the infrastructure, like broadband internet and digital literacy programs to make sure that everyone can access health solutions.

Communities

Digital Literacy: Get involved in programs that help improve literacy so that people can effectively use health services.

Feedback and Participation: The community should get involved, with health entrepreneurs and providers to feedback and take part in community health initiatives.

Health Education: .The community should engage with health entrepreneurs and providers to provide input, on healthcare services and get involved in health projects. Use platforms, for educating people about health and promoting awareness to help individuals make choices about their health.

These recommendations center on utilizing the business strategies of digital health innovators in addressing the systemic issues of primary healthcare of availability and quality, in South Africa. By promoting cooperation, among the

various stakeholder groups great strides can be made in improving primary healthcare services.

6.7 Possible Limitations and Challenges of the Study

Limitations of the Study

Sample Size and Diversity: One limitation of this study is the focus on a limited sample of digital health ventures. While this allows for an in-depth analysis, it may not fully capture the diverse landscape of digital health entrepreneurship in South Africa. The variety of business models, technologies, and operational contexts means that findings from this sample may not represent the broader industry.

Subjectivity in Qualitative Analysis: Qualitative research, by its nature, involves a significant degree of interpretation by the researcher. In thematic analysis, the identification and coding of themes can introduce bias, as the researcher's perspectives and preconceptions may influence the analysis. This subjectivity can affect the reliability and validity of the findings.

Generalizability: The study's findings are specific to the South African context. Factors such as local healthcare infrastructure, regulatory environment, and socio-economic conditions play a crucial role in shaping the outcomes. Therefore, the results may not be universally applicable to other regions or countries with different contexts.

Reliance on Self-reported Data: The research relies heavily on self-reported data from participants. This dependence on respondents' honesty and self-awareness can pose a risk to the study's validity. Participants may provide inaccurate or incomplete information due to recall bias, social desirability bias, or misunderstanding of the questions.

Data Collection Method: Interviews are a primary data collection method in this study. While they can provide rich, detailed insights, they also have limitations. Participants may interpret questions differently, and the interviewer's tone or wording can influence responses. Additionally, the dynamic nature of interviews

means that data quality can vary based on the interaction between the interviewer and interviewee.

6.8 Suggestions for further research

The research areas needing further investigation were conceived out of the constraints that were noted in this research project coupled with the evolving landscape of business model innovation and digital health. Curiosity also arose from the fact that the digital health entrepreneurs, that were the focus of the study had come up with novel innovations that are making a positive impact in healthcare. It is therefore compelling to contribute to the body of knowledge in digital health in terms of further research. The suggested research areas are described below:

- 1. Impact of Digital Health on Rural vs. Urban Populations:** Further research on how digital health innovations impact rural and urban communities differently is an areas worth pursuing. Considering the digital divide between the two groups, the research could provide interesting findings that could inform key decisions on navigating resource constrained settings with pragmatic solutions.
- 2. Longitudinal Studies on Digital Health Adoption:** An, in depth research study could be carried out by conducting studies over a period of time to evaluate how digital health innovations impact primary healthcare results in the long run. These studies could offer an understanding on the sustainability of the business models being studied.
- 3. Comparative Analysis of Regulatory Frameworks:** Studying on how regulations, impact healthcare innovations could provide useful knowledge that will inform policy for the key stakeholders. The analysis might also suggest ways to create policy that promotes innovation while safeguarding the interest patient's well-being including health workers.
- 4. Technological Advancements and Their Integration:** Other research could explore how mainstream digital health technologies could be

optimised while leveraging of emerging technologies. The findings could inform how strategy is crafted to maximise the returns on the deployed solutions

5. **Patient and Provider Perspectives on Digital Health:** Further investigation is recommended to delve into the viewpoints of patients and healthcare professionals regarding the utilization of health tools. Understanding the attitudes, anticipations and encounters of these parties would guide the creation and execution of user focused health innovations.
6. **Economic Analysis of Digital Health Innovations:** Further research on the aspects of health innovations is essential to assess their cost effectiveness and influence, on healthcare costs. This type of study plays a key role in guiding policymakers and investors when determining how to allocate resources, for health projects.

The suggested areas for further research provide an opportunity to add to the body of knowledge and bolster knowledge on Digital Health Entrepreneurship.

TABLES

RQ #		State Research Question	Prop #	State Proposition	Data collection detail	Data analysis method
1		What are the key challenges hindering access to and the quality of primary healthcare in South Africa?	1	Barriers to Accessing Quality Healthcare	Semi-Structured Interviews (Interview Guide)	Thematic Analysis
2		Which digital health technologies are currently being used in South Africa's primary healthcare to enhance accessibility and quality?	2	Integration of Digital Health Technologies (DHTs) in Primary Healthcare	Semi-Structured Interviews – (Interview Guide)	Thematic analysis
3		In what innovative ways are digital health entrepreneurs redesigning their business models to navigate and address the unique obstacles present in primary	3	Innovations in Business Models by Digital Health Entrepreneurs	Semi-Structured Interviews – (Interview Guide)	Thematic analysis

RQ #		State Research Question	Prop #	State Proposition	Data collection detail	Data analysis method
		healthcare in South Africa?"				

Table 3: Consistency table: research questions, propositions, data collection and data analysis:

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APPENDIX A – Participant Information Sheet

Dear Madam /Sir

My name is Dalitso Chindongo. I am a Master of Management in Digital Business student at the University of the Witwatersrand, Johannesburg. My supervisor is Dr Michael Sony. I am conducting a research study about Business Model Innovation in Digital Health. The study title is “**Business Model Innovation for digital health entrepreneurship in Primary Healthcare in South Africa.**”

I am inviting you to take part in a semi structured interview through the collaboration platform, namely Microsoft Teams. If you decide to take part, your participation in this research study will last about an hour. The interview/research activity will take place online at a time and date that is convenient to you.

With your permission, I would like to audio record the interview. This data will be stored in a secure, password protected storage for three years and deleted after that. Only the researcher will have access to the data.

During the research activity, the questions will solicit

- Your first-hand experience on the benefits of digital health
- Your insight on the challenges in South African Primary Healthcare
- Your insight on the critical success factors that enable effective business model innovation in Primary HealthCare settings.
- The specific strategies that digital health entrepreneurs employ in their business model innovation to develop low-cost, high-value solutions that effectively address the unique challenges faced in South African primary healthcare.
- Your first-hand experience on the digital health technologies that are being used in South African primary healthcare.

By studying phenomena in real-world contexts, the research gains practical relevance and applicability. This is the advantage of having a real-world perspective in the research process. By participating in this research you will be able to provide invaluable insight on the research topic.

The semi-structured will be confidential and anonymous. When I share the results of the research study, I will not include your name or anything else that could identify you. With your permission, other researchers may use the data collected from this research study, but your name and any personal information will not be used or passed on.

If you decide to take part in the research study, it should be because you want to volunteer. You do not have to take part. You can stop being in the study at any time. You do not have to answer any questions if you do not want to. You will not lose any services, benefits or rights you would normally have, if you decided not to join. Taking part in the research study will not cost you anything.

This research study will be written up as a research report. The report will be available on the university library website. If you would like to receive a summary of this report, I will be happy to send it to you.

If you have any questions during or afterwards about this research study, feel free to contact me or my supervisor on the details listed below. If you have any concerns or complaints about the ethical procedures of this research study, you are welcome to contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408, email hrecnon-medical@wits.ac.za.

Yours sincerely,

Dalitso Chindongo

Researcher:

Daliso Chindongo, Wits email, 2633703@students.wits.ac.za, Phone number:0845612050

Supervisor:

Dr Michael Sony, Wits email, michael.sony@wits.ac.za , Wits phone number: 0117173817

APPENDIX B – Participant Agreement



Consent Form

Title of project: Business Model Innovation for digital health entrepreneurship in Primary Healthcare in South Africa.

Name of researcher: *Dalitso Chindongo*

I, [Click or tap here to enter text.](#) agree to participate in this research project.

I agree to the following:

(Please click the relevant checkbox below)

- | | | |
|---|------------------------------|-----------------------------|
| 1. The research study was explained to me. I understand what this study is about. | YES ☐ | NO ☐ |
| 2. I understand that I can volunteer to take part in the study | YES ☐ | NO ☐ |
| 3. I agree that the interview/focus group/other activity may be audio recorded. | YES ☐ | NO ☐ |
| 4. I agree that direct quotations from my interview may be used by the researcher in their research report/manuscript/book chapter. | YES ☐ | NO ☐ |
| 5. I agree that my participation will remain anonymous (my name or other identifying data will not be used by the researcher in their research report/manuscript/book chapter) | YES ☐ | NO ☐ |
| 6. I agree that other researchers may use the information I provide in my interview activity (depending on their own ethics clearance being obtained) but my name and any personal information will not be used or passed on. | YES ☐ | NO ☐ |



(Name of participant): Click or tap here to enter text.

(Signature): Click or tap here to enter text.

(Date): Click or tap to enter a date.

(Name of researcher/person seeking consent): Click or tap here to enter text.

(Signature): Click or tap here to enter text.

(Date): Click or tap to enter a date.

APPENDIX C – Interview Guide

1. Introduction

Briefly describe your digital health venture's mission, operational tenure, and your primary healthcare focus.

2. Value Proposition

1. How would you articulate the unique value your digital health innovation brings to primary healthcare in South Africa?
2. Can you discuss a specific instance where your value proposition improved the availability or quality of primary healthcare services

3. Patient Population – Customer Segments

1. Who are the primary patient populations that your venture targets?
2. How did you identify the unmet healthcare needs within these populations?

4. Channels

1. What delivery channels do you use to reach your target patient populations?
2. Can you talk about the effectiveness of these channels in enhancing accessibility to primary healthcare?

5. Customer Relationships (Stakeholders)

1. What types of relationships do you maintain with healthcare providers, policy-makers, and most importantly, patients?
2. How do these relationships contribute to the quality of healthcare services provided?
3. How do you believe these relationships influences accessibility to quality in primary healthcare?

6. Revenue Streams

1. How does your venture generate revenue?
2. Has your revenue model shown any influence on the sustainability of your digital health services in primary healthcare? If so, how?

7. Key Resources, Activities, and Partnerships

1. Can you enumerate the key resources crucial for delivering your value proposition?
2. What are the primary activities your venture engages in?
3. Do you have key partnerships? How do they contribute to your mission and business model sustainability?
4. Could you discuss any partnerships that have been pivotal in your venture's success?

8. Cost Structure

1. What are the main cost elements in executing your business model?
2. How do these costs affect the sustainability and quality of primary healthcare services you offer?
3. How do these costs affect the pricing and thereby, the accessibility of your services?

9. Social Impact

1. Could you elaborate on the social impact your venture has generated in primary healthcare?
2. How do you measure this impact, and how does it align with your venture's mission?

10. Additional Questions

1. Can you cite instances where your business model innovations have tangibly improved accessibility or quality in primary healthcare?
2. What challenges or limitations have you faced in implementing your innovative business model?
3. Are there specific key performance indicators that you track to measure improvements in accessibility and quality in Primary Healthcare in South Africa? If so what are the Key Performance Indicators?
4. How do your innovative business models address the barriers to both accessibility and quality in South Africa's primary healthcare sector?

11. Closing

1. Is there any other information you think would be valuable for this research?
2. Is there any other CEO/Founder of a digital health venture that you think would be interested in participating in this research?

APPENDIX D – Details of Semi-Structured Interviews

In October and November 2023, semi-structured interviews were conducted with the following CEOs/Founders of digital health ventures who preferred to remain anonymous.

1. CEO/Founder of Case A (Interview conducted on 31st October 2023)
2. CEO/Founder of Base B (Interview conducted on 1st November 2023)
3. CEO/Founder of Base C (Interview conducted on 13th October 2023)
4. CEO/Founder of Base D (Interview conducted on 3rd October 2023)
5. CEO/Founder of Base E (Interview conducted on 3rd October 2023)
6. CEO/Founder of Base F (Interview conducted on 4th October 2023)
7. CEO/Founder of Base G (Interview conducted on 30th October 2023)

These interviews were conducted via Microsoft Teams, and each lasted approximately 60 minutes. The focus was on exploring business model innovations and their impact on primary healthcare in South Africa. The data collected from these interviews were analysed to identify common themes and insights relevant to the research objectives.

APPENDIX E – Ethics Approval

Graduate School of Business Administration
University of the Witwatersrand, Johannesburg



Wits Business School Ethics Committee

Constituted under the University Human Research Ethics Committee (Non-Medical)

Ethics Clearance Certificate

Ethics protocol number: WBS/DB2633703/845

This certificate is only valid with a legitimate ethics protocol number and signed by the Researcher (below).

Project title	Business model innovation for digital health entrepreneurship in primary healthcare in South Africa
Investigator / Researcher	Mr Dalitso Chindongo
Nature of Project	MM (Digital Business)
Decision of the Committee	Approved, provided stakeholders and participants are guaranteed confidentiality.
Issue Date of Certificate	9/11/2023
Expiry date	Date of submission of the project / research report
Chairperson	Dr Pius Oba  ☎ +27 11 717 3976 📠 +27 82 733 6587 ✉ pius.oba@wits.ac.za

Declaration by Researcher

One copy must be signed by the Researcher and returned to the Chairperson of the Wits Business School Ethics Committee.

I fully understand the conditions under which I am authorized to carry out the abovementioned research and I guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I undertake to resubmit the protocol to the Committee.



Signature

13/11/23

Date: