INVESTIGATING BUSINESS MODELS OF DIGITAL HEALTH STARTUPS IN THE NETHERLANDS

Master Thesis Project (MOT2910)

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INVESTIGATING BUSINESS MODELS OF DIGITAL HEALTH STARTUPS IN THE NETHERLANDS

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Project Duration:	March, 2024 - September, 2024
Faculty:	Technology, Policy & Management, Delft
Number of credits:	30 ECTS

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Acknowledgement

Since the day I landed in The Netherlands, each day has brought new excitement and a wealth of learning. These last two years have taken me a step closer to becoming the person I've always aspired to be. Pushing the boundaries of my comfort zone, going from "I have no clue how to proceed" to "there is definitely a solution to this", it has been a journey both incredibly adorable and daunting. I have deeply cherished every part of this academic experience and it feels almost surreal that it is now coming to an end.

It has been an absolute pleasure to be guided and inspired by my graduation committee especially because it was led by three remarkable women! I would like to thank Dr. Saba Hinrichs-Krapels for chairing my committee, providing insightful feedback, and offering unwavering support and kindness. I am also deeply grateful to my supervisors, Asli Boru and Dr.Hanieh Khodaei for their invaluable guidance, encouragement, and support throughout my research. Their mentorship not only helped shape the direction of my thesis but also encouraged me to tackle tasks with a deeper analytical perspective. I would like to express my gratitude to the Honours Programme of TU Delft for offering me the opportunity to challenge myself with the Honours course and for selecting me to serve on the board for a year, where I had the privilege of working alongside some of the most inspiring individuals. My sincere thanks also go to the TPM Faculty for giving me the chance to contribute to the Board of Studies, where I could offer constructive feedback on the Management of Technology Programme. Additionally, learnings from my role as a teaching assistant for the Business Model Innovation MOOC at TU Delft's Extension School played a significant role in shaping this thesis. Each of these experiences has enriched me both professionally and personally, for which I am truly grateful.

I am deeply grateful to my family in India, who have always believed in me and encouraged me to pursue my dreams. My mother, in particular, has been a continuous source of inspiration, exemplifying strength and independence throughout my life. Along with all the members of my family, I am deeply thankful to my grandmother for playing a significant role in shaping me. Her diagnosis of dementia last year, inspired me to delve into the healthcare field for my thesis, driving my desire to contribute towards improving the lives of those affected by a wide range of diseases.

Just as importantly, I want to extend a big thanks to all my amazing friends, both back home and here, who have always had my back and helped me to keep going when things went awry. I can't emphasize enough how much these wonderful people have been there throughout this entire process. My heart is full of gratitude for the incredible people and experiences that I have been blessed with throughout! ...And finally, a special shoutout to YouTube Music and Spotify, my constant companions and entertainers during this journey. On that note, reaching the end of my thesis felt like a walk in the park—except, well, the park was Jurassic Park. XD

Mrunmayee Londhe
Delft, September 2024

Executive Summary

In recent years, public health deterioration is a growing concern worldwide driven by factors such as lifestyle changes, environmental degradation, and unequal access to healthcare. Increasing rates of chronic diseases, mental health disorders, and the global spread of infectious diseases have highlight the urgent attention to these problems. Consequently, the mounting pressure on global health infrastructures reinforces the need for innovative solutions, such as digital health technologies, to improve healthcare access and overall well-being. In the rapidly evolving landscape of digital healthcare, digital health startups are at the forefront of innovation, harnessing cutting-edge technologies like artificial intelligence, big data analytics, and mobile health applications to transform patient care, diagnosis, and treatment. Despite their increasing prominence, a significant knowledge gap remains in understanding how these digital health startups effectively create, capture, and deliver value, particularly within the intricate regulatory framework of the Dutch healthcare system.

This research directly addresses this gap by exploring the key elements of value creation, capture, and delivery specific to the digital health sector in The Netherlands to conceptually understand the core of the digital health startups. These elements—value creation, capture, and delivery-are fundamental components of any business model, as highlighted by researcher Alexander Osterwalder, as represent how a company creates value for customers, captures a part of this created value, and efficiently delivers its offerings, all of which are crucial for the success of digital health startups. Building on this, through a comprehensive analysis of existing business model frameworks, this study evaluates their applicability, points of alignment and misalignment with the current research's aim, ultimately leading to the development of a conceptual value framework. This framework is crafted to provide a holistic and conceptual understanding to business modeling, equipping Dutch digital health startups with better understanding, structured thinking and a birds-eye view of the processes necessary to successfully navigate the complexities involved in digital healthcare innovation. This research is only a preliminary step towards developing a tool, that can be practically used by the entrepreneurs for hands-on inputs and formulation of business strategies, through further research.

The findings of this research emphasize the critical importance of a well-structured business model that balances the demands of innovation, regulatory compliance, and patient safety. The practical implications of the framework include, offering a structured methodology that benefits entrepreneurs, mentors, and investors alike. This would especially be beneficial for first time entrepreneurs in the digital health field, guiding them through the complex processes with multiple stakeholders including the inherent complexities of the digital health field.

In terms of academic contributions, this conceptual value framework is first of a kind for the digital health startups, giving an overarching and holistic view of value creation, capture and delivery for Dutch digital health startups. As touched upon previously, this has also opened a new avenue to research further and build an easy to use tool for entrepreneurs to give them actionable insights. So in that view, conceptual value framework presented in this report is

really just a starting point for the further nuanced research in the topic. Similar to how the existing tools, say Business Model Canvas is widely utilized to guide startups across various sectors, this research initiates the development of a specialized tool tailored specifically for digital health startups. The conceptual value framework proposed in this study serves as an essential first step toward creating such a tool. Given that digital health startups operate within a unique regulatory and environmental landscape, this holistic framework is designed to address the specific complexities of the digital health domain, providing a comprehensive tool that encompasses its intricate requirements. In essence, the conceptual value framework presented in this study is just the beginning—a starting point for deeper, more nuanced exploration in this evolving field.

This research not only fills a crucial gap in the literature but also lays basis for further research that can serve as a detailed road map for digital health entrepreneurs, helping them to effectively align their business models with the unique challenges and opportunities presented by the Dutch healthcare system.

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Nomenclature

BM - Business Models
SQ - Sub research question
HC - Healthcare
EHR - Electronic Health Records
HIE - Health Information Exchanges
DHA - Dutch Healthcare Authority
BMC - Business Model Canvas
CDI - Critical Design Issues

1 Introduction

1.1. Background & Context of the study

Digital health innovations have proven to enhance health outcomes and make a shift in the overall healthcare sector (Kasoju et al. (2023)). Digital health is an overarching term that encompasses wide range of technologies and according to WHO,

" Digital health is the field of knowledge and practice associated with the development and use of digital technologies to improve health."(World Health Organization (2019))

This broad definition includes telehealth & telemedicine, which facilitate remote clinical and non-clinical services (Chakraborty, Edirippulige, & Vigneswara Ilavarasan (2023)). It also covers mobile health applications that empower patients through real-time health monitoring and personalized health insights and also Electronic Health Records (EHRs), which streamline patient data management and enhance care coordination, as well as wearable devices (Philip et al. (2021)) (Eysenbach (2001)). Additionally, electronic health technologies, such as AI and machine learning, are revolutionizing diagnostics and patient engagement (Kasoju et al. (2023)) (Philip et al. (2021)).

Digital health startups are becoming significant players in the healthcare industry and have seen a sharp rise in last few decades around the globe (Chakraborty, Ilavarasan, & Edirippulige (2023)). This is seen by a strong upward trend in the global health revenues that are currently 159.37 billion EUR in 2024 and projected to grow 241.98 billion EUR by 2028 (Statista (2024)). his growth reflects the rising adoption of digital health technologies and the ongoing digital transformation within the healthcare industry. Not only in case of the revenue but also the global user base for digital health services has seen a steady rise as represented by graph 1.1.

As seen in the graph, the number of users is projected to rise from 556.60 million in 2017 to over 2.1 billion users by 2029, with Digital Treatment & Care and Digital Fitness & Well-Being leading the growth. This trend highlights the growing adoption of digital health platforms, reflecting the increasing integration of these technologies into daily healthcare routines worldwide (Statista (2024)). As digital health continues to evolve, its impact on healthcare delivery, patient engagement, and business model innovation will likely become even more pronounced (Kasoju et al. (2023)).

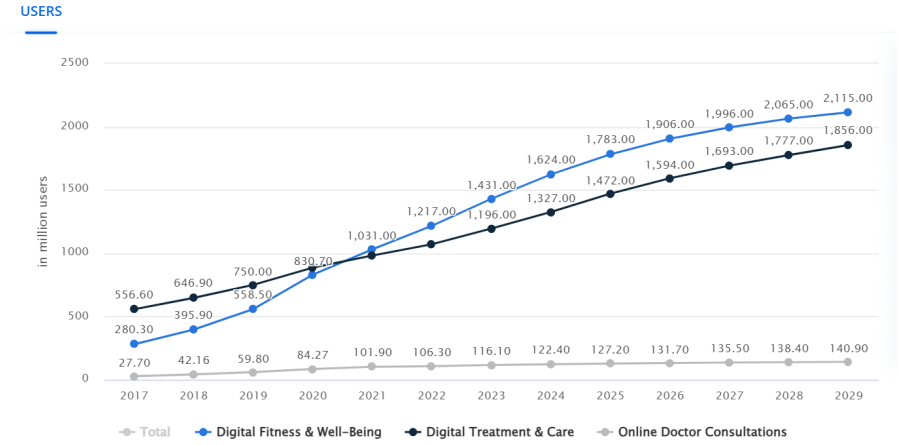

Figure 1.1: Digital health Global User Base *(source: Statista Market Insights as of June 2024)*

Dutch Digital Health Landscape

Focusing on the Dutch digital health scene is crucial due to the unique characteristics and advanced nature of its healthcare system, which provides a fertile ground for innovation and the development of cutting-edge digital health solutions.The reimbursement structure of The Netherlands, along with complexities of stakeholders involved, the decision making done by the hospital or organization management responsible for budget, purchased by technical service, the prescription is made by physicians and operation by the health professionals or technicians for which the repairing would be done by maintenance and application on the user and finally reimbursement by the insurance companies (Boru et al. (2015)).

Furthermore, the Dutch healthcare system is particularly proactive in adopting and scaling new technologies along with fostering innovation (Verhees et al. (2018)). The country's commitment to incorporating digital health solutions in primary care and affluence of funding (Verhees et al. (2018)), along with high willingness to engage with digital health applications as portrayed by the Dutch population (Folkvord et al. (2023)). These factors combined together make Dutch digital health landscape ideal.

Digital Health Startups in The Netherlands

Dutch Digital health startup ecosystem is home to most dynamic and innovative startups, rapidly expanding scale-ups, and top-tier talent in the world (Techleap.nl (2024)). Dutch startups are at the forefront of healthtech innovation, creating solutions that address critical healthcare challenges such as chronic disease management, telemedicine, and personalized care (Verhees et al. (2018)). These startups focus on various aspects of healthcare, including patient care, diagnosis, treatment, and health management, leveraging tools such as artificial intelligence, big data analytics, internet of things, cloud computing, machine learning etc.(Bente et al. (2024)).

The Dutch government plays a pivotal role in nurturing these startups by offering substantial financial support and creating a favorable regulatory environment (Techleap (2021)). Initiatives such as the Health Innovation Fund and the eHealth at Home program exemplify this support, (Techleap (2021)) helping startups navigate the regulatory and stakeholder complexities of the healthcare sector while encouraging the integration of digital technologies into mainstream healthcare services (Boru et al. (2015)).

Importance of Business Models for Digital Health Startups

Business models are central and crucial for digital health startups as they play an important role in defining the journey of a startup. Business models define the rationale of how an organization creates, delivers, and captures value (Osterwalder & Pigneur (2002)) (van Limburg et al. (2011)). To assure a smooth execution of strategy, there needs to be a very clear communication of concepts between the stakeholders and this is where the importance of rigorously defined business models becomes important (Osterwalder & Pigneur (2002)). A well-structured business model is vital for the sustainability and growth of startups, particularly in the dynamic and highly regulated healthcare sector. Effective business models enable startups to identify and exploit opportunities, manage resources efficiently, and deliver superior value to customers (Teece (2010)) (Menko et al. (2013)). In the context of digital health, where technological advancements rapidly evolve, robust business models help startups navigate market and stakeholder complexities and regulatory challenges(Chen et al. (2013)).

In addition to this frameworks play a critical role in the study and application of business models, providing structured approaches to analyze, design, and implement business strategies. These concepts such as Business models and frameworks are comprehensively discussed in Chapter 3 of this report. In general terms, frameworks help in understanding the key components and interactions within a business model, facilitating a comprehensive analysis of how value is created, delivered, and captured (Allee (2008)). The application of these frameworks is essential for digital health startups to systematically approach innovation and market entry, ensuring that they can sustain and scale their operations effectively (Åström et al. (2022)).

1.2. Research Problem & Research Gap

The research problem centers on the critical role that business models play in the success of startups, particularly within the complex and rapidly evolving field of digital health(van Limburg et al. (2011)). In the context of the Dutch healthcare system, which is characterized by its intricacies and regulatory demands, there is a significant gap in the availability of conceptual frameworks tailored specifically for digital health startups. An inadequacy of such a business model framework is identified as a reason for the restricted widespread adoption of digital health (Pascarelli et al. (2023)). As mentioned by (Dong (2019)), these structured frameworks play an essential role in digital entrepreneurship within highly regulated environments like the Dutch healthcare sector. These frameworks are essential as they provide entrepreneurs with a systematic approach to understanding and navigating the intricate processes of value creation, capture, and delivery. Specifically, in a complex regulatory landscape, such as that of healthcare, a clear framework helps digital entrepreneurs identify and respond to regulatory challenges, align their innovations with industry demands, and adapt their business models to ensure compliance and scalability. Without this structured approach, entrepreneurs often struggle to achieve the dynamic capabilities necessary for success, ultimately hindering their ability to sustain and grow their ventures in the healthcare industry (Dong (2019)) (van Limburg et al. (2011)) (Osterwalder & Pigneur (2002)).

Moving on, there is a strong evidence that suggests Dutch digital health startups are focused on technological developments, while at times overlooking the business models and strategies leading to failure in initial years (Kaltenbach (2016)). This can lead to challenges in scaling and market sustainability despite having strong technological foundations (Henz et al. (2022)). Additionally, an analysis of the Dutch startup ecosystem by McKinsey also pointed out that

while technology and R&D investment remain strong, especially in sectors like health tech, there is room for improvement in how Dutch startups structure their business strategies to scale effectively (Henz et al. (2022)).

In addition, a significant problem identified from my personal experience, which I would highlight here. During a six-month period under an incubator program in Delft, I was involved in developing a healthcare startup. The focus of the guidance provided was primarily on creating a business plan, including financial, legal, with Business Model Canvas and Value Proposition Canvas central to it. However, the complexity of the healthcare sector, particularly within the context of the Netherlands, presented unique challenges that the generalized Business Model Canvas or Value Proposition Canvas could not adequately address. Specifically, critical elements unique to healthcare—such as regulatory compliance, patient data privacy, and sector-specific market dynamics—were not sufficiently covered by the standard tools provided. This gap underscored the need for a more specialized framework tailored to the healthcare industry. Thus, the research problem originates from the inadequacy of existing generalized business models in effectively supporting healthcare and digital health startups as well, particularly in nuanced and highly regulated environments along with the extra considerations that digital health startups demand. Given that the digital health domain has been developing only in last couple decades, it is important to address the details that digital health startup need to address for smooth functioning and sustenance (Dong (2019)).

Furthermore, in terms of societal influence, digital health advancements have a direct relation with improving the public health and in influencing the national healthcare and addressing healthcare problems of a larger population set (Tan et al. (2023)). Without a robust business model framework, digital health startups can struggle in terms of sustenance and in-turn fail to reach broader public (van Limburg et al. (2011)). Digital health advancements have the potential to significantly improve the health of populations across nations and continents by contributing to a state of complete physical, mental, and social well-being, as defined by the World Health Organization (WHO), which emphasizes not merely the absence of disease but holistic well-being. These developments are also pivotal in advancing the United Nations' Sustainable Development Goals (SDGs), particularly SDG 3, which aims to ensure healthy lives and promote well-being for all at all ages (UN (2015)) (World Health Organization (2024)).

To address the research problem discussed earlier, this study aims to close the identified gap and aid in addressing these gaps that have been identified from practical and academic sides. This research aims to address this gap by developing a conceptual value framework that reflects the specific challenges and opportunities within the Dutch digital healthcare system that shall be discussed in the upcoming chapters. In the next section, the research questions will be introduced, helping to clarify the focus of the research. These questions will guide the research, ensuring that it remains structured and targeted.

1.3. Research Questions

In section outlines the research questions that will guide the research that will provide a structured approach. These questions were designed to explore key aspects of the research topic.

The main research question that emerges for this research is as follows:

What conceptual framework would demonstrate a holistic view of the Dutch digital health startups?

The main research question question seeks to design a comprehensive conceptual framework that provides a holistic approach to value creation, capture, and delivery, specifically tailored for digital health startups in The Netherlands.

This main research question will be answered based on the following sub-research questions:

Sub-research question 1: ***What are the key elements involved in value creation, capture and delivery in the digital health domain?***

This question aims to identify the essential components that drive value creation, capture, and delivery in the digital health sector, focusing on how these elements contribute to successful business models.

Sub-research question 2: ***What are the main frameworks used to discuss business models in the Digital health domain, and how do they align or diverge from the unique requirements of Dutch digital health startups?***

This question explores the most widely used business model frameworks in digital health, and determine how they align or fall short in catering the specific needs of the Digital Health domain.

Sub-research question 3: ***What are the key elements involved in value creation, capture and delivery in the digital health domain, according to Dutch digital health startups?***

It is important to note that conceptual framework mentioned in the main research question, is only a first step of research towards a tool that can actually be used in practice by the entrepreneurs and give actionable insights to the entrepreneurs. Thus this study only conceptualizes the value creation, capture and delivery for the Dutch digital health startups and not act as a practical tool that can be employed directly in practice. At this stage, the framework can act like a checklist for the entrepreneurs to ensure if all the relevant and necessary points have been taken into consideration. It can also aid in structuring the thought process of the startup teams and in getting a holistic view about the elements of business models of the digital health ventures in a more comprehensive way.

1.4. Connection to Management of Technology

The field of Management of Technology (MoT) plays a key role in linking technological innovation with effective business strategies, which is particularly important for digital health startups. These startups in The Netherlands face unique challenges, as they work with cutting-edge technologies like telemedicine and AI diagnostics while also needing to fit within healthcare's regulatory and market constraints. Management of Technology aids in offering ways to align these technological innovations with business models that actually work while catering

to a societal problem or a gap. Through this research, deep insights from Management of Technology have been used to develop a value framework that helps digital health startups navigate in a complex environment and wide range stakeholders.

On top of that, Management of Technology is about managing the uncertainty and complexity that come with technological change, something digital health startups face all the time. The learning from the course offers way a to help these startups make smarter decisions when it comes to adopting new technologies, investing, and scaling up their businesses. After all, it's evident from the course that businesses are not just about making a profit—it's about ensuring these innovations contribute to better healthcare, fair access, and ethical practices. By integrating this with the unique challenges of digital health, the research aims to build a conceptual model for value creation, capture and delivery. This would act as a first step towards building a practical tool specific for digital health startups. Thus the conceptual model would give holistic view and structured thinking and understanding to the digital health practitioners but not act as a practical tool to be put directly into action.

1.5. Report Structure

This thesis is organized into several chapters to provide a structured exploration of the research topic. The **Introduction** outlines the research background, problem, and questions, setting the foundation for the study. The **Methodology for verifying & building conceptual value framework for the Dutch Digital Health startups** explains the research design and methods used for data collection and analysis in building the framework. The following chapter **Literature Review** examines relevant research and frameworks related to digital health business models. The **Conceptual Framework** chapter introduces a tailored framework for digital health startups, drawing on existing models. The **Results** chapter presents the findings, leading to the refinement of the conceptual framework. Finally, the **Discussion** revisits the research questions, reflects on the findings, and discusses the practical and theoretical implications, as well as the study's limitations and future research directions. Lastly, the thesis ends with a **Conclusion** chapter.

2
Methodology

This chapter presents the research methodology adopted in this study, detailing the processes involved in literature review, explaining the research design, data collection methodology and analysis methodology. The selected methods are thoughtfully chosen to ensure a thorough and accurate response to the research questions.

2.1. Research design

This research employees an exploratory qualitative approach focusing on the key elements of the value creation, capture and delivery within the Dutch Digital Health domain. The research questions mentioned in section 1.3, guide the study in understanding the nuance of the Business Models of the Dutch Digital Health Systems in a structured way. This section gives an overview of the research design and the sections that follow discuss nuances of methods employed.

The figure 2.1 represents the research design of this study and how chapters of this thesis report are divided. As seen in the figure, the design begins with the identification of a research gap. This is followed by a literature review in order to find a literature gap and narrow down to the main research question to guide the research, that leads to the three sub-questions (SQ1, SQ2 & SQ3). The primary aim is to develop a comprehensive conceptual framework that captures the value creation, capture, and delivery mechanisms within the digital health domain in The Netherlands. As seen in the graphical representation, the literature review is two fold and divided in two parts Literature Review I: Gap Finding and Literature Review II: Integrative Review. Initially, SQ1, SQ2 & SQ3 are attempted to answer through the integrative review based on which version one of the conceptual value framework is proposed. To determine whether the literature sufficiently answers the research questions and validates the conceptual framework, a decision point is introduced.

As literature fails to validate the framework from a practical perspective, the study proceeds to semi-structured interviews to validate and build on the elements of the conceptual value framework and to answer SQ3, a perception question which was inadequately answered based on the literature. The transcripts from the semi-structured interviews are subjected to thematic analysis leading to the results. This ensures SQ3 is answered and the final conceptual framework is validated, accounting for both literature insights and practical perspectives from the practitioners in Dutch digital health startups. This is followed by a discussion of the findings, a section on limitations and future recommendations, and finally, the conclusion of the study. This methodical approach combines both secondary data (literature) and primary data (interviews) to ensure a robust, validated framework for digital health startups in The Netherlands.

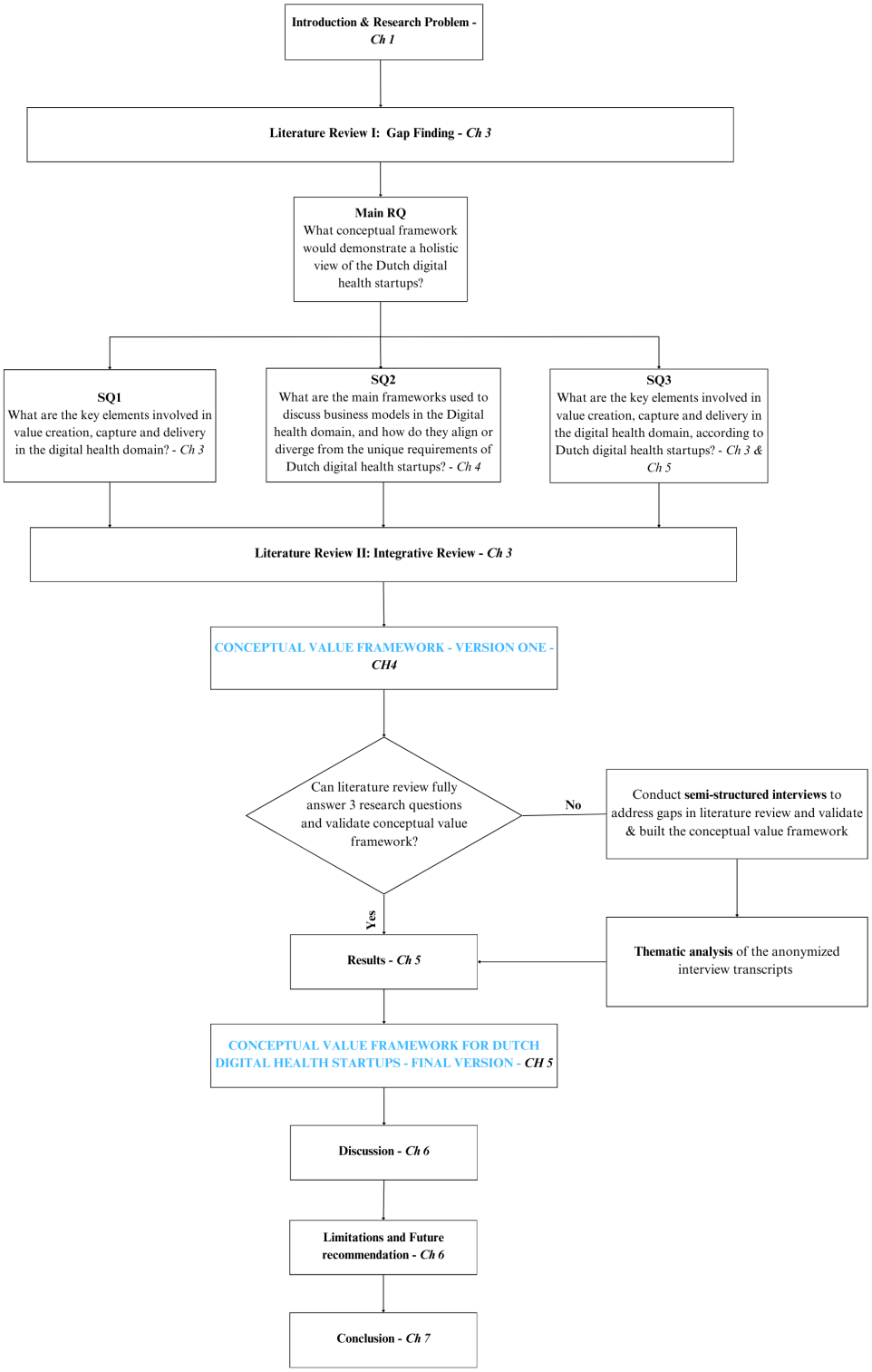

Figure 2.1: Research Design and approach *(where ch = chapter number of this thesis)*

The next sections discuss the methodology employed in literature review and in the semi-structured interviews in detail. Before delving into the methodological details, it is important to recognize the use of AI tools in this research. Certain sections of this thesis were paraphrased and refined for grammatical accuracy using the Grammarly plugin in conjunction with GPT.

2.2. Literature Review Methodology

The literature review for this research was two fold. The first part focused on the gap finding in the literature, for this the methodology is discussed in section 2.2.1 and the second part concentrated on filling the gap, through an integrative review and the methodology for this part is discussed in section 2.2.2.

2.2.1. Literature review I: Gap finding

The research started with a literature review to get an overview of existing research looking for research that discussed intersection of digital health ventures and business models. PubMed and Scopus were the two databases used in order to have an overview of an existing research and to identify a gap in the literature. In order to have a structured approach, the research articles that were related to digital health ventures and business models or related frameworks were selected and studied using a template as seen below.

Sr no	Author	Year	Title	Research Questions	Key argument(s)	Methodology	Frameworks used (if any)	Key arguments	conclusion/reccomendations	Notes

Figure 2.2: Template for Literature review for Gap finding *(made on MS Excel)*

The working research question during the review was *"What is the business model of digital health startups?"*. A full screening of 26 research papers using the template in figure 2.2 and title abstract screening of around 40 papers was done in total to finally find a research gap and narrow the research scope and the research questions as mentioned in the section 1.3. It was evident that there was no model in the literature that would elucidate the theoretical value framework for digital health startups especially for The Netherlands, given the complex healthcare and stakeholder systems present.

It was apparent from the full paper screenings that the existing research in the field of digital health startups has explored various elements of business model innovation and stakeholder engagements. For instance, studies like (Sibuyi et al. (2022)) focus on digital health implementation within digital health ecosystems mainly focusing on stakeholder engagements and collaboration. Multiple authors, like (Angeli & Jaiswal (2016)) have examined how business model innovation enable healthcare delivery in case of the bottom of the pyramid (BoP), focusing on the "Global South". In essence, the related studies mainly offered insights into value dimension of digital health startups applied to the bottom of the pyramid and seen through a stakeholder lens. Apart from this, the studies were either too focused on a single case study like (Beck et al. (2024)) without a holistic view or were systematic review studies like that of (Pascarelli et al. (2023)) in the digital health domain. This there remained a significant gap in literature concerning the development of a comprehensive, conceptual value framework tailored specifically to digital health startups. This gap highlighted the need for research that gives a comprehensive conceptual framework for the digital health startups, especially in case

of The Netherlands that is often considered as a part of ”Global North”; regions with higher levels of economic development & technological advancement.

Lastly, to ensure the validity of the identified research gap and confirm that no similar studies have been conducted, ResearchRabbit, an AI tool was utilized as a final verification tool for the topic (Research Rabbit (2024)). This was ensured by checking the author networks and by visualizing papers and links between them to confirm that no relevant papers have been missed as a part of Literature review I.

2.2.2. Literature review II: Integrative Review

As an outcome of the literature review I in the section 2.2.1 the academic gap was clear giving a direction to the literature review II. The intention of the second review was to clarify key concepts in the Digital Health Business Model literature by identify the key elements involved in value creation, capture and delivery as highlighted in the sections that follow.

Integrative Review

This section outlines the methodologies employed for the second part of the two-fold literature review, focusing on the integrative review. Review of this type especially comes handy in producing high level insights in a time-efficient manner providing with a technique to study extensive literature on the Business Models along with value creation, capture and delivery methods for the Digital Health Startups (Tricco et al. (2018)). Integrative review is the best suited method in order to synthesize literature in an integrated way to build new frameworks and perspectives on a particular topic (Cho (2022)). These reviews are quite widely used as they follow a systematic approach in order to map evidence on a certain topic and identify main theories, concepts, sources, knowledge gaps (Tricco et al. (2018)) (Cho (2022)).

Databases & Keyword string

The online databases referred to for literature review were Scopus and PubMed. Literature published after 2000 was added as a filter as Digital Health startups have more relevance post-2000, from 2000 until 2024. This time-frame is particularly chosen as as technological developments to aid digital health startups would not be as relevant before the year 2000, keeping in mind the rapid technological changes that the world has gone through over these years (Kasoju et al. (2023)). The intention was to retrieve the all the relevant literature available from 2000 onwards on these databases.

In order to narrow the keyword string, multiple iterations were made to have most relevant and apt keywords. The final keyword string used was:

”((”mhealth” OR ”mobile health” OR ”ehealth” OR ”electronic health” OR ”telehealth” OR ”telemedicine” OR ”digital health”)) AND ((”startup” OR ”venture” OR ”firm” OR ”company” OR ”entrepreneurial startups” OR ”enterprise” OR ”SME”)) AND((”business model” OR ”value creation” OR “business model innovation” OR ”value delivery” OR ”value capture” OR ”value network”) ”

The articles retrieved from this keyword search were screened based on the methodology described in the following section.

Screening of the Articles

Using the keyword string mentioned in the section 2.2.2, the total number of records retrieved from PubMed and Scopus together as of March '24 were 340. Out of these the duplicates were 98. 290 articles were checked manually for title-abstract-keyword and then 161 which were screened fully and then in the end were available for the review. Then 65 articles were selected in total and then 7 articles were added using snowballing, together making a total of 72 articles.

A web-based tool Rayyan was used to carry out the initial screening in this review. (Ouzzani et al. (2016)) The first step taken by Rayyan is scanning all the entries and detecting duplicates. Once all the duplicates are deleted, the articles were reviewed based on the title abstract and keywords and classified in 'included', 'excluded' and 'maybe' on the basis of the inclusion &exclusion criteria. In case of articles where decision making was difficult based on just abstract were included in 'maybe' that were scanned fully.

Research questions mentioned in section 1.3 were used as a reference for inclusion and exclusion For the title-abstract and keywords screening. The results after screening of title, abstract and keywords are summarized in the figure 2.3

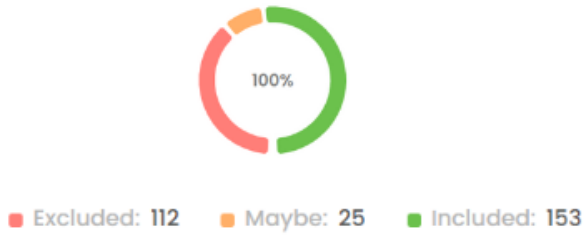

Figure 2.3: Results of Title-Abstract-Keyword Screening *(Software used: Rayyan)*

After this, the articles that were a part of 'maybe' and 'included' were fully screened in the next step. For the full screening an inclusion and exclusion criteria was defined.

Inclusion Criteria: The inclusion criteria used in the full screening of the studies is as mentioned:

1. Studies published between January 2000 until present to ensure inclusion of the most relevant and up-to-date research.
2. Articles that provide empirical data, case studies, meta-analyses, bibliographic analyses, or systematic reviews.
3. Articles that address digital health ventures and cover aspects such as business models, value creation, value capture, value delivery, innovation commercialization, market entry strategies, and scalability
4. Articles that address definitions, key components, tools and frameworks related to business models in digital health especially the one related to value creation, capture and delivery from around the globe.
5. Studies that that gave a direct insight into digital healthcare ecosystem globally, including The Netherlands.
6. Articles that are available in English language.

Exclusion Criteria: The exclusion criteria used in the full screening of the studies is as mentioned:

1. Exclude articles focusing on digital health technologies that do not address business aspects, such as purely clinical or technical studies without business model implications.
2. Exclude studies that are highly technical, focusing on software/hardware specifications, algorithms, or engineering details without any business context or implications
3. Studies that are a part of grey literature like unpublished theses, blog posts and similar.
4. Articles inaccessible due to subscription restrictions or available only as abstracts and summaries.
5. Studies with insufficient methodological details, such as those lacking a clear description of the intervention, sample size, or data analysis methods, to ensure the reliability and validity of included studies

These inclusion and exclusion criteria guided a selection and the total number of articles selected for the review are seen in the figure 2.4.

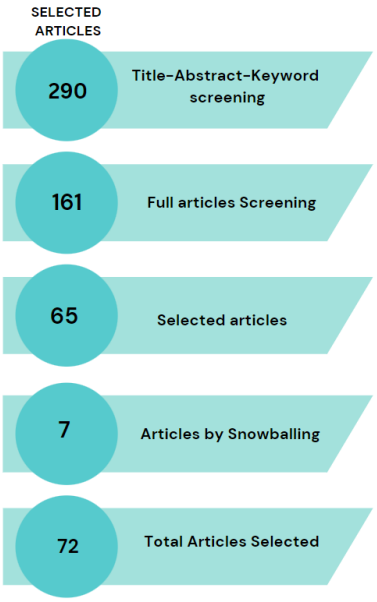

Figure 2.4: Article selection synopsis for the integrative review *(made using Canva)*

Thus based on the inclusion and the exclusion criteria, a total of 72 studies were included as a part of the literature review for which 161 studies were screened fully, out of which 65 of them were selected and 7 studies were added through snowballing.

2.3. Semi-structured Interviews: Methodology

Based on the themes emerging from the integrative literature review, they were inductively analysed to build the first version of the conceptual value framework for digital health startups as seen in chapter 4 . To ensure the validate & build the framework further, semi-structured interviews were conducted with experts in the field, as they are useful when the researcher has a clear research objective but requires flexibility in exploring deeper insights from respondents

(Sekaran & Bougie (2016)). The aim was that the framework is validated & built based on the practical experiences of the practitioners in the field. Data gathered from the interviews was analyzed using inductive approach. The upcoming sections mention details about methodologies for selecting the target population, sampling strategy, data collection and analysis.

2.3.1. Target Population

The experts that participated in the interviews were be classified into three categories based on their experience, expertise and role. The target population for this research consisted of practitioners and academics who function in the digital health field. The nuanced classification is into three main categories as follows. First being Digital Health startup founders, co-founders or team members. The second category consisted of startup mentors, advisors, strategists or scouts from Digital Health domain. The third category comprised of academic researchers in the field. The details about these three categories is as follows:

Digital Health Startup Founders, Co-founders, Team members: This category is the one most deeply connected to the practical experiences of setting foundation of a startup. They have a direct engagement in conception, development, deployment of the the digital health solutions. They are pivotal in identifying the initial challenges and opportunities in the digital health market (Cuff (2023)). Having an understanding of their journey from ideation until market entry to scaling through semi-structured interviews throws light on the practical implications. This category has an advantage of having an in depth understanding of a single case of their digital health startup.

Digital Health Startup mentors, advisors, strategists & scouts: Individuals in this category play a crucial role in shaping the trajectories of the startups by training and mentoring these startups at multiple stages of the startup. These individuals may offer strategic insights from their blend of industry experience and sometimes even prolonged mentorship to the teams (Tripathi & Oivo (2020)). By mentoring entrepreneurs, they help these startups navigate through complex Dutch digital healthcare landscape. They have a practical understanding of multiple cases of digital health startups that they mentor. Not to mention the experiences and understanding these individuals might have from their professional industry experiences in the Digital Health domain.

Academic Researchers in the Digital Health field: Academic researchers in the field of digital health provide a theoretical backbone to this research. Their insights have a more rigorous scientific understanding of the constructs involved. As academic researchers are involved in Digital Health research for multiple years, their experience helps verify claims and explore broader implication of framework. This category ensures that the conceptual framework is scientifically sound.

The rationale for selecting participants from these three groups was to ensure a comprehensive perspective on digital health startups. The first group, consisting of founders, could provide insights based on their direct, real-world experiences in building digital health startups. The second group, composed of advisors, had experience guiding a broad range of digital health ventures, enabling them to draw from a diverse set of examples across the sector. The third group, academic researchers, contributed to the rigor and theoretical grounding of the study, ensuring robustness in the research methodology. Notably, some experts possessed overlapping expertise, such as researchers who had also founded startups. These individuals were catego-

rized according to their primary expertise, but their multifaceted experience added depth to the analysis.

2.3.2. Sampling Strategy

Selecting a sample for verification of Business Model elements Of Dutch Digital Health Startups requires a careful consideration of multiple factors that includes scope of the study along with characteristics of the population, who would provide with relevant insights about value creation, capture and delivery within the sector. Purposive sampling technique is employed to recruit participants. The following points describe the parameters for the same.

Industry sector: Given the research questions, all the participants are involved with the Digital Health ventures. Digital Health domain is considered with its overarching nature and the experts would belong to multiple varied startups that may qualify as subsets of the Digital Health domain. For instance, startups involved mobile health, electronic health, telemedicine and telehealth as described in the section 3.2.2.

Organization size: As this research concerns about startups, it was ensured that the experts were closely associated with startups and not established bigger companies. The experts in the second category as described in subsection 2.3.1 who acted as mentors, advisors, strategists and scouts may also have an experience in a larger organization or a multi-national company along with an experience of guiding/ mentoring multiple startups in the field.

Position of the participants: The practitioners hailed from multiple high level positions in the companies and had a direct role in the strategy and decision making which could directly affect the business model. They either had considerable years of experience in the digital health domain or had shown an exceptional performance in the domain in a short time.

Geographical location: Business models of Digital Health startups can vary across different regions and countries. As this research concerns the Dutch Digital Health startups, the selected region for this research is The Netherlands.

Accessibility and willingness to participate: The chosen participants that are included in the sample are accessible and are willing to participate in the research.

2.3.3. Ethics Approval

The Human and Ethics Committee (HREC) of TU Delft (Delft University of Technology (2024)) approved the research and all participants showed a willing participation. The Data stewards of TU Delft verified the data management plan for the study. All the semi-structured interviews were conducted online using video call over MS Teams. The experimental data was anonymised and the personal data collection was stored separately maintaining the participant data confidentiality.

2.3.4. Participants

The fact that this is a qualitative research, the sample size would not be determined by statistical calculations. Instead the sample size would be determined by the principle of data saturation that is the point where collecting data does not lead to any new insights. (Guest et al. (2006)). Personal, professional and social network was used to find suitable experts for this study. 56 potential candidates were reached out to for scheduling an interview with them. For reaching

out to people via social network LinkedIn, the following message structure was used with some personalized lines for some individuals to reach out to people.

" Your expertise in Digital Health domain inspired me to send a connection request as I am doing my master thesis exploring Dutch Digital Health Startups at TU Delft. As a part of my methodology I am conducting expert interviews in the field. I was wondering if you could spare 30 mins for an online interview? I promise to keep it short. Your expertise would indeed contribute greatly to the research."

There was a 26% response rate, that is 15 people responded positively. Upon receiving a response and their details from the participant, they were sent an email with an attachment of Research overview Document and the Informed Consent form. This email is mentioned in the appendix The informed consent form and the Research Overview Document is added in the Appendix The informed consent form mentioned had received an approval from HREC.

2.3.5. Data Collection Method

Interviews with respondents for retrieving data about the relevant topic of research is a common method used in Business Research.The semi-structured interviews began with open ended question in order to have a general understanding (Bougie & Sekaran (2019)) of how the experts perceived the process of value creation, capture and delivery and any experiences that they would like to share about their experience in dealing with digital health startups in The Netherlands. Although the experts were given a high level definition of value creation, value capture and delivery in the research overview document (as mentioned in Appendix A) beforehand, the experts were free to perceive the in depth meaning of these relevant terms based on their experience and position in order to an unbiased understanding. The further part of the interview was conducted using the visual aid of Miro Board (Miro (2024)) as discussed in detail in Appendix A. The next steps are briefly discussed below:

- The participants were presented the version 1 of the Conceptual Value Framework for Dutch Digital Health Startups as seen in the figure 5.3 The experts had to go through each value creation, capture and delivery in the framework and comment on two aspects:
  A. If the existing elements under value creation, capture and delivery are valid and are appropriately placed from their view.
  B. If there are any additional elements under each of value creation, capture and delivery that need to be considered from their view.
- The next step in the interview included questions about the factors that externally influence the process of value creation, capture and delivery. They were also asked to draw from personal experiences about external influencing factors.
- Moving ahead, the experts were interviewed about how they would visualize the processes of value creation, capture and delivery and place their comments about the interrelations and iterative nature in detail. They were also asked if they see any inter-relations within the elements.
- In this step the experts were asked the elements they deemed of high importance from each value creation, capture and delivery keeping in mind a perspective of Dutch digital health startups.The participants were free to select as many points they considered of a high importance.

- In the last step, the experts were asked how they perceived the practical relevance of the framework. Secondly, they were asked what are the tools that they use in practice, similar to Business Model Canvas etc. This question was set to understand the practical aspect of the framework and the frameworks currently used by digital health startups in practice.

Any new points discussed in the interview were further delved in depth to get a better understanding. The main intention was to know the experiences of the experts from all three categories as mentioned in section 2.3.2 namely the first one consisting of digital health startup founders, co-founders, team members and second one with digital health startup mentors, advisors, strategists & scouts and lastly academic researchers in the digital health. The unique perspective of each of these groups brought in a more holistic view on value creation, capture and delivery and also for verification of the version 1 of the Conceptual Value Framework for The Netherlands. Their views about the conceptual framework were insightful as their role, position, background, network etc gave them a unique point of view to the framework. This made the process of verification more reliable and holistic. This idea of unique perspectives could be represented through the figure below.

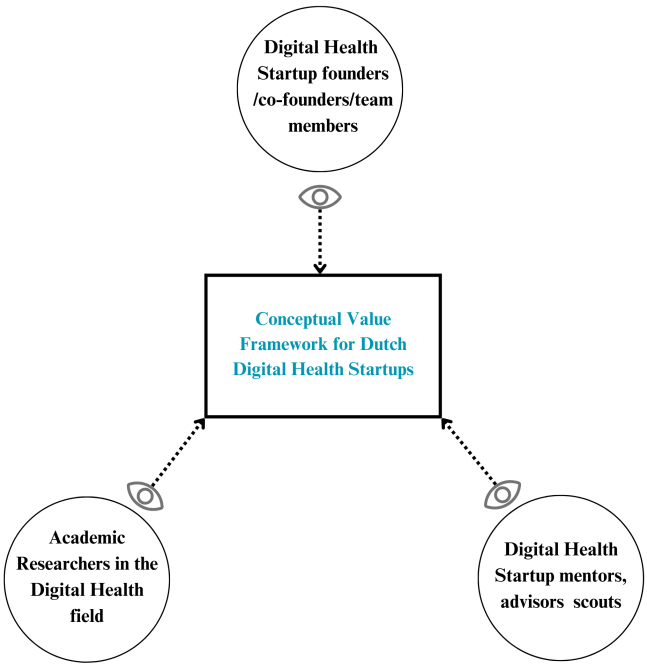

Figure 2.5: Pictorial representation of perspectives in framework verification

The participants in the research are given a specific ID based on their category and role to maintain anonymity. The job role is changed into a more generalized role to maintain anonymity.

Participant ID	Type of the company/	Location	Function	Facilitators/incubators
ST1	Medical Devices & Diagnostics	Delft	Business Developer	YES!Delft
ST2	Clinical Decision Support Systems	Den Bosch	CMO & Co-founder	JADS Playground
ST3	AI-powered diagnostic tool	's-Hertogenbosch	Director	NA
ST4	Clinical Decision Support	Eindhoven	Business Developer	NA
ST5	Teledermatology and preventive medicine	Amsterdam	Product Developer	NHS Innovation Accelerator (NIA)
ST6	AI-powered diagnostic tool	's-Hertogenbosch	Operations Manager	NA
SM1	University medical Centre	Utrecht	Director of Digital Health	UtrechtInc
SM2	Incubator	Delft	Startup Scout	YES! Delft
SM3	Medical Consortium	Breda	Innovation manager	NA
SM4	Consultancy firm	NA	Consultant	NA
SM5	Health IT Organization	NA	Digital health Strategist	WHO Advisory
A1	Digital health advisory + Educational institute	NA	Chief Regulatory Officer	_
A2	Educational institute	Delft	Trainer	_
A3	Educational institute	Delft	Assistant Professor	_
A4	Educational institute	Delft	Lecturer	_

Figure 2.6: Participant ID

Out of these 15 participants, some experts had one major category of the three but also had an some experience in other fields as well. The details of each category is mentioned in section 2.3.2. A visual representation of position and background of these experts is as shown in the figure 2.7.

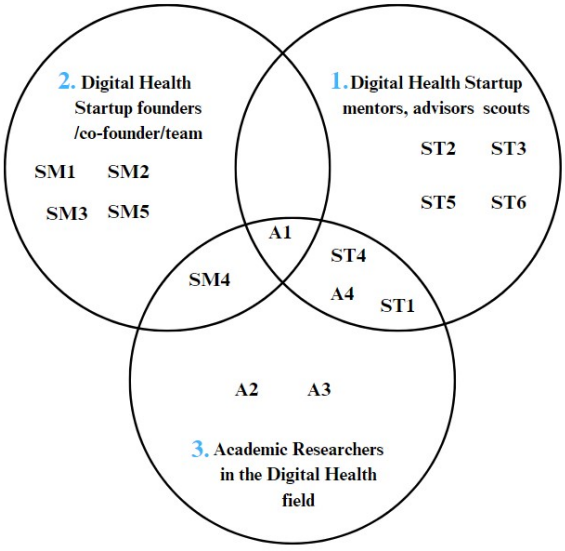

Figure 2.7: Participant Expertise Mapping

2.3.6. Data Analysis method

After every interview, the transcript was retrieved and anonymised. Analysis was conducted on these transcripts where important themes and aggregate dimensions were identified based on Gioia Methodology. As a part of this process, the transcript data was read and re-read in order to ensure that the codes are correctly assigned to themes and the codes were correctly formulated, using concepts suggested by Gioia et al. Thus data was coded using concepts from the Gioia methodology (Gioia (2021)) where first order concepts (informant centric) were retrieved from the interview transcripts which were then translated to second-order themes (researcher centric) that pointed to a aggregate dimension (Gioia (2021)). Gioia methodology, as conceptualized in the figure 2.8, gave a structured approach to the process of analysis.

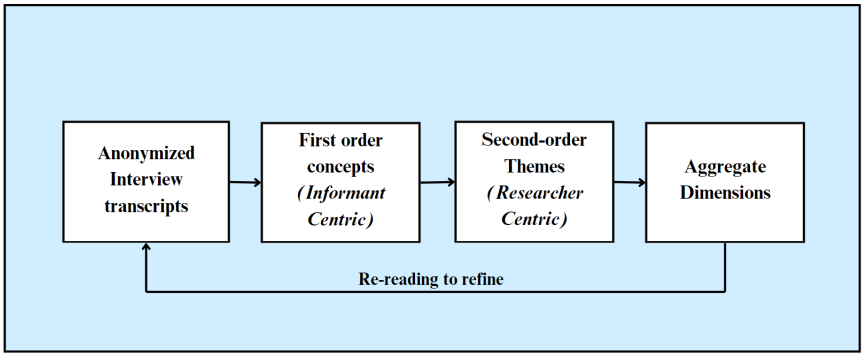

Figure 2.8: Data Analysis method (Gioia (2021))

In the first step of the semi-structured interview in the section 2.3.5, the personalised experiences that were mentioned by the participants in the first step were anonymized and then coded using Gioia methodology. Significant moments in the data were identified and were assigned as first order concepts that were later translated into second-order themes. This step was taken before interpretation to ensure that the complex qualitative data is captured. Each of the 15 transcripts of the expert interviews were analysed and the quotes were selected that gave an insight about the research questions. This process of analysis was done in canva in order to have a visual representation of the quotes, as suggested by Gioia (Gioia (2021)). An example of this is follows. A first order concept mentioned by the participant was as follows, *"We see doctors and patients both as our customers, so problem which we are solving in Healthcare is a two sided problem."* - ST5

The second order theme for this was - "Multi-sided markets" and this goes under the aggregate dimension of value creation (based on the definition of value creation mentioned in the chapter 3), as a sub-part of customer sensing seen in the figure 5.14. This is mentioned in more depth in the Appendix B. The participant IDs are used throughout the report to maintain the anonymity of the participants abiding to the HREC. The participant codes used can be found in Table 2.6.

In the final stage, the final version of the Conceptual Value Framework, developed from both the literature review and the insights gained from the semi-structured interviews, was sent back to the participants via email. This step was taken to provide them with the opportunity to review the framework and suggest any additional points or perspectives they felt may have been overlooked.

2.4. Conclusion

In conclusion, this section gives a comprehensive overview of the research design and the course of action employed for the literature review and semi-structure interviews about value creation, capture and delivery of digital health startups in The Netherlands. Qualitative interviews with the digital health startup founders, teams, strategists, advisors, mentors and academics gave an holistic idea of the conceptual value framework for the Dutch Digital Health startups and aided in answering the research questions holistically, especially SQ3 and the main research question. The research's rigour and validity is ensured by ethics approval, sampling strategy, and data collection methods mentioned in this section.

Thus, the methodology chapter does a groundwork and gives a deeper understanding of what steps were taken in this research for providing in depth understanding of the business models and its elements in case of the dutch digital health startups.

3
Literature Review

This chapter explores the Literature Review II and its outcomes in depth. This involves literature on the BMs in the digital health domain. The sub-questions SQ1 is answered and basis for SQ3 is laid based on the existing literature. as explored in this chapter. The key objective of this chapter is take an exploratory approach about the theories and concepts related to business models of digital health Startups, focusing on value creation, capture and delivery aspect and frameworks used for the same. Among these, identification of Dutch specific studies on digital health as also a key objective. Literature review is the basis on which this research builds, that subsequently aids in answering the main RQ and SQs mentioned in the section 1.3

The chapter starts by analyzing the trends in the literature and then delving deeper into the outcomes of the review. It is important to note that these are outcomes and trends of Literature Review II: Integrative Review as mentioned previously in section 2.2.2. As 'Literature Review I: Gap Finding' was a shorter version, it is discussed adequately in section 2.2.1 and hence not described further in this chapter.

3.1. Analyzing Literature Trends

It is described in the section 2.2.2, about the methodology used for the Integrative review of the literature. This section gives a short overview of the trends in the literature.

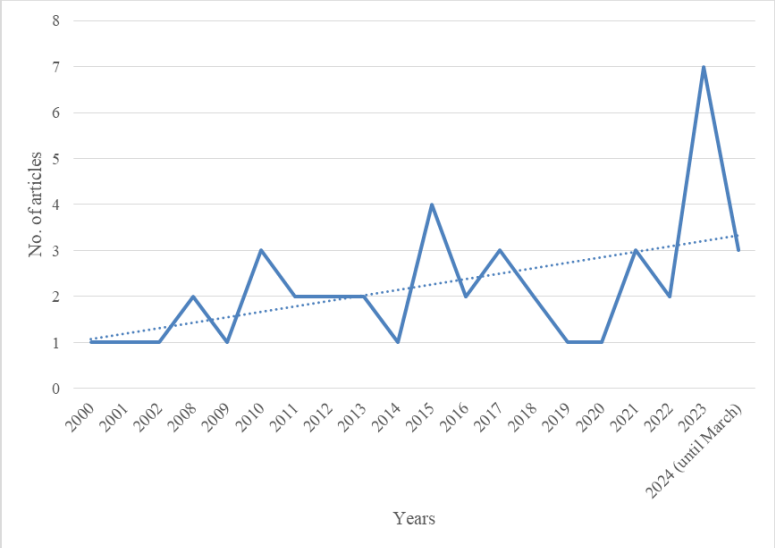

Figure 3.1: Documents by year: Integrative review

The distribution of the selected documents, as portrayed in the figure 2.4 selected through a

Integrative review over the years can be seen in the graph below. With time, the research in digital health domain and business models has grown, a steady rise starting from 2020 with especially a sharp rise from 2022 to 2023. As studies retrieved from 2024 are only until the month of March, there is a dip in for the year 2024.

Subsequently, VOS viewer software (Effendi et al. (2021)) was used to get a visual overview of keyword occurrences between the selected 72 documents. The occurrence was set to 10 and the keyword co-occurrence map retrieved was is as shown in the figure 3.2

The keyword co-occurrence map gives an overall idea of the main key word clusters involved in the studies that are a part of the Integrative review.

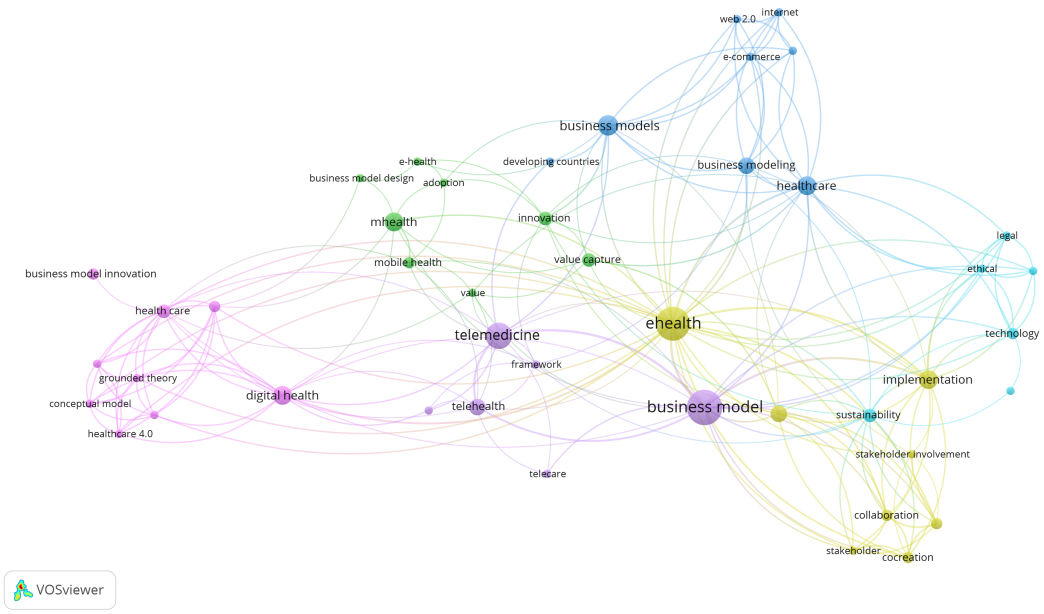

Figure 3.2: Keyword co-occurrence Map

The keyword co-occurrence map signifies the relationships and patterns between frequently occurring terms within the dataset, helping to visually represent the central themes and how different concepts are interrelated. This visualization aids in identifying core topics and uncovering hidden structures in qualitative data if any (Effendi et al. (2021)). Two major clusters that be observed in the keyword co-occurrence map in figure 3.2 are about digital health or its sub parts like ehealth, telemedicine etc. In recent times the term ”Digital Health” has been gaining popularity at the expense of other associated terms like ”ehealth”, ”telemedicine”, ”mhealth”(Pascarelli et al. (2023)). Another major cluster is about business models capturing terms like business model innovation, value capture etc. Some terms are not seen in the map due to their lower occurrence. However when seen in the actual software, zooming into the map does reveal other terms with relatively lower occurrence such as value creation and delivery and the technologies that form a part of digital health.

This section provides a comprehensive analysis of literature trends through bibliometric data and keyword co-occurrence patterns, highlighting key areas of research focus. These insights

enable a deeper understanding of the upcoming themes and touches briefly upon the trends that the research follows with a temporal aspect to it.

The aim of the Integrative review aims at providing a robust foundation of the research. Firstly, it seeks to define the key concepts of business models, value creation, value capture, and value delivery, along with their elements in the literature. These definitions offer a clear and comprehensive understanding and delineation of the concepts necessary for analysis. Secondly, the review explores the various frameworks that have been utilized to study business models within the digital health context. By evaluating these frameworks, the review will identify their relevance to the purpose. In the upcoming sections, major outcomes of this Integrative review are discussed in detail.

3.2. Literature Review II Outcomes

3.2.1. Startups: perspectives & views

Startups are defined as businesses that are newly established and are designed to scale by leveraging innovative products, services or business models (Blank & Dorf (2012)). In academic literature about startups, innovative nature, high growth potential are emphasized. They are young firms founded with an intent to innovate through new technologies, new business models or a unique market approaches (Block et al. (2017)). In the realm of entrepreneurship, **Schumpeterian** and **Kirznerian** perspectives offer distinct yet complementary views. Kirznerian entrepreneurs identify gaps in the market and seize opportunities to create value via incremental improvements instead of radical innovation (Kirzner (1997)). On the other hand in case of Schumpeterian view, entrepreneurs disrupt existing markets through novel products and services or processes. Economist Joseph Schumpeter emphasizes creative destruction in economic development (Block et al. (2017)). Although the digital health startups can align with both of these views, Schumpeterian view in digital health sector may introduce groundbreaking technologies that transform healthcare practices and Kirznerian view can lead ti improvements in these technologies and identify new markets and applications.

The research regarding the digital health startups by (Chakraborty, Edirippulige, & Vigneswara Ilavarasan (2023)) categorizes them in two types based on the technology front - **Tech-enabled startups** and **Tech- driven startups**. The former ones use existing technologies and contribute in solving issues regarding operations or improve on the customer experience aligning closely with the Kirzenerian view (Chakraborty, Edirippulige, & Vigneswara Ilavarasan (2023)) (Kirzner (1997)). The later ones, tech driven startups utilise technology innovations and use advanced technologies for their products, aligning better with the Schumpeterian perspective (Chakraborty, Edirippulige, & Vigneswara Ilavarasan (2023)) (Block et al. (2017)).

3.2.2. Digital Health & Sub-types

Although advancements in digital health technologies is transforming the healthcare sector around the world, there is indeed an ambiguity in the academic literature about the definitions of digital health and what it entails (Fatehi et al. (2020)). As the details of definitions and delineation is not in the scope of this research, we shall stick to the information relevant for the current study and general definitions, well accepted by the research community.

Digital health an overarching term for a field of knowledge and practice that encompasses multiple sub-types that use of computer sciences like artificial intelligence (AI), big data, ma-

chine learning and information and communication technology (ICT) that aids in improving the overall health and wellness outcomes, services and research (Yibeltal (2023)) (World Health Organization (2019)). A short description of the main sub-types is as follows.

eHealth or electronic health is a field where health service and information is delivered or enhanced through internet and related technologies that includes a wide range of applications like Electronic Health Records (EHRs), Health Information Exchanges (HIEs), online health services and similar. (Eysenbach (2001)) Although there is no clear delineation of the subsets within digital health, many researchers agree that mHealth, or mobile health, is a subset of eHealth, where eHealth is a subset of digital health. (Philip et al. (2021)) (Modolo et al. (2023)) (Yamaganti et al. (2023))

mHealth or mobile health attempts to leverage on mobile devices and mobile application in order to support healthcare practices and patient care. This field includes a multiple tools from patient monitoring, disease prevention, health education, personal digital assistants through medium of smartphones and wearable devices. (Bally & Cesuroglu (2020)) It is because of this, that the patient is able to take a participatory role in the diagnosis and treatment. The services that the companies in mHealth domain offer are quite diverse, ranging from medical or health sector to companies in consumer goods industry including wellness and fitness sectors. (Mueller (2020))

Telehealth refers to the remote healthcare that includes non-clinical services such as provider training, admin meetings, medical education, along with the clinical services (Velayati et al. (2022)). It is highlighted by (Chakraborty, Edirippulige, & Vigneswara Ilavarasan (2023)) that telehealth attempts to leverage advancements in technology to provide a wide range of services from virtual consultations to remote monitoring and health information exchange, significantly impacting the overall healthcare ecosystem. Telehealth encompasses telemedicine as well as a variety of other digital healthcare activities that facilitate the remote exchange of health information (Chakraborty, Edirippulige, & Vigneswara Ilavarasan (2023)).

Telemedicine utilizes telecommunications technology to deliver healthcare services remotely. Using this approach, healthcare providers can diagnose, treat or monitor patients without the physical presence. (Chen et al. (2013)) (Bashshur et al. (2014))

Although there could be other sub types to each of the above described subsets of digital, only the major ones that are seen repeating in the literature are mentioned here due to the fact that the delineation as there is ambiguity about it (Fatehi et al. (2020)). Only the relevant information for this research from a BM perspective has been mentioned.

3.2.3. Understanding Business Models

Business Models & what it entails

Before we delve deeper into Business Models for digital health, it would be beneficial to understand what exactly is meant by business models (BM) and what aspects it entails. The concept of Business Models has emerged in last couple decades. Based on the Business Model review of (Zott et al. (2011)) there is no agreement in scholars on what business model. Additionally, it highlights that research in this area is fragmented, with studies largely conducted in isolation based on the specific phenomena of interest to individual researchers. This being said, there are emerging common themes among scholars of business models mentioned in the review by

(Zott et al. (2011)) as follows:

1. BM highlights a system-level, holistic approach for understanding how firms operate.
2. The firm is a central aspect of the Business Models.
3. BMs attempt to answer how value is created and captured.

Business Model Thought Streams

In general (Rose et al. (2017)) has identified two general streams of thought about business models mentioned below:

The first stream of thought, also mentioned in definition by (Teece (2010)) BMs are reflections of leader's/ management's anticipation about what customers want, how they want it while keeping in mind how the firm can meet those needs in a best possible way and also get paid for it. BMs are used by the firms understand the value that the user needs and create and construct that value. (Zott et al. (2011)) This stream of thought is supported and mentioned by (Baden-Fuller & Haefliger (2013)) (Baden-Fuller & Morgan (2010)) (Doganova & Eyquem-Renault (2009)) & (Teece (2010)).

According the second stream of thought, BMs are seen as a descriptive tools with its main focus on value creation/capture. BM as defined by (Osterwalder et al. (2005)) is a tool that contains a set of objects, concepts and their inter-relations to the business logic of a specific firm. This BM definition points to a simplified version equating BM with value creation, capture and delivery (Osterwalder et al. (2005)). This stream of thought is also reflected in the definition by (Chesbrough & Rosenbloom (2002)) where BM is defined as a device that acts as a link between tech development & economic value creation. The scholars with this school of thought, often present design tools that can aid in optimization of a firm's BM (Osterwalder et al. (2005)).

3.2.4. Exchange Value and Use Value

The concept of value is central to ample business literature (Alalääkkölä et al. (2021)). Value is often understood to be the advantage that raises an actor's perceived well-being as a result of a process of effectively deploying resources (Chesbrough et al. (2018)). On these lines, according to (Eggert et al. (2018)) there is a continuum of value conceptualization involving the dimensions of value-in-exchange and value-in-use. Value-in-exchange or exchange value is viewed as subjective evaluation of the worth of an item that may translate into users willingness to pay (Harrison & Wicks (2013)) (e Silva & Zancul (2023)). It is the monetary amount that is realized after the seller has exchanged the goods at the market (Bowman & Ambrosini (2000)). Value-in-use or use-value is closely associated to the benefit and qualities of the offerings as perceived by the customers based on the needs and expectations(Bowman & Ambrosini (2000)).

While evaluating digital health startups, both exchange value and use value play an important role. In case of exchange value, it refers to the financial worth of a product or service in the marketplace. While it is essential for the sustainability and profitability of digital health startups, it is intrinsically linked to the perceived use value. (Zott & Amit (2017)) emphasize that the potential for value capture through exchange value is greatly enhanced when the use value is evident. Therefore, creating high use value often translates into higher exchange value, as customers are willing to pay for solutions that provide clear and significant benefits. On the

other hand in case of the digital health startups, use value is critical as the primary goal is to improve patient outcomes, enhance healthcare delivery, and increase accessibility to health services. As (Bowman & Ambrosini (2000)) explain, creating substantial use value is essential for sustaining operations and fostering long-term innovation, especially in sectors where user satisfaction and health outcomes are paramount. Furthermore, (Teece (2010)) underscores that successful business models in digital health must balance both use and exchange value to achieve economic viability and scalability. This balance ensures that while startups are generating meaningful health outcomes i.e use value, they are also capturing sufficient financial returns i.e exchange value to sustain their operations and fund further innovations.

3.2.5. Value Creation, Capture and Delivery

Based on the research by (Zott & Amit (2017)) value creation, capture and delivery encompass collectively the essential processes defining functioning of business models. Value creation is driven by innovation, improved efficiency, complementarities and is central to understanding how digital health startups differentiate themselves and provide digital healthcare solutions to their customers (Amit & Zott (2001)). Value Capture is a process through which businesses retain a part of the value it creates. Capturing value is essential for sustaining business operations and to fuel the innovation further. (Bowman & Ambrosini (2000)) This being said the value capture can vary from financial value to public value or non-financial value and these details shall be discussed in the upcoming chapters. Value delivery in digital health refers to the mechanisms through which healthcare innovations are effectively communicated and provided to end-users, ensuring that the intended benefits reach patients, healthcare providers, and other stakeholders (Hwang & Christensen (2008)).

The key elements involved in each of the three as identified through the literature are described in this section. The methodology employed for this purpose is described in the Chapter 2. This review aided in answering SQ1 and SQ3 partially.

Value Creation

Value creation in is a multifaceted process by which business design mechanisms and activities that generate value, particularly through innovation, efficiency, and enhancing customer utility (Teece (2010)). This is in alignment with the description of value creation mentioned in the previous section by (Zott & Amit (2017)).

As a part of Integrative review, the literature was screened for open coding to find first order concepts based on Gioia methodology (Gioia (2021)) that pointed towards with the aggregate dimension value creation. The literature references for the primary concepts related to value creation are listed in the table 3.1 represents critical aspects of value creation in digital health domain.

Sr no	Primary Concepts	References
1	Detecting new Customers Comprehensive needs assessment & adapting strategies Customer engagements through multi-sided markets	(Rose et al. (2017)) (van Limburg et al. (2011)) (Vimarlund & Mettler (2015))
2	Cross sector Collaboration - Joint efforts/problem solving, Public Private Partnerships Inter-organizational Collaboration - Hospital-Tech Firm Collaboration, Partnerships with Academic Institutions	(Alalääkkölä et al. (2021)); (van Limburg et al. (2015)); (Miller & French (2016)) (Kho et al. (2020)); (Kijl et al. (2010)); (van Limburg et al. (2011))
3	Advancements in AI, ML, IoT etc. Tech Advancements leading to operational efficiency/better system integration	(Sprenger (2016)); (Bente et al. (2024)); (Kijl et al. (2010)); (Åström et al. (2022)) (Firouzi et al. (2022)); (Zott et al. (2011)); (Anwar & Prasad (2018)); (Van Dijck & Poell (2016)); (van Limburg et al. (2011))
4	Self-management tools Personalized Care models Advanced patient provider interaction	(Bartels et al. (2022)) (Calvo-Lerma et al. (2017));(Sprenger (2016)) (Stanimirovic (2015))
5	Stakeholder Feedback and co-creation	(Latuapon et al. (2023)), (van Limburg et al. (2015)); (Allee (2008)); (Van Dijck & Poell (2016))
6	Product Differentiation Competitor study Market Segmentation	(Bowman & Ambrosini (2000)); (Zott & Amit (2017)) (Chakraborty, Edirippulige, & Vigneswara Ilavarasan (2023)); (Alalääkkölä et al. (2021)) (Chen et al. (2013)); (Lai et al. (2021)); (Mettler & Eurich (2012))

Table 3.1: Value Creation: Primary Concepts and References

In line with conceptualization by (Zott & Amit (2017)), value creation is the process by which startups generate novel solutions through innovation, enhanced efficiency, and customer-centric approaches. In table 3.1 detecting new customers and multi-sided market engagements serve as critical mechanisms for tailoring startup offerings to meet diverse healthcare needs, reinforcing the notion that value creation arises from understanding and fulfilling these needs (Teece (2010)).

Cross-sector collaborations and technological advancements in AI, ML, and IoT enhance value by integrating complementary assets, promoting efficiency, and fostering innovation (Alalääkkölä et al. (2021)). These strategies align with explanation by (Teece (2010)), which positions inno-

vation as a primary driver of value creation. Similarly, stakeholder co-creation and feedback, as noted in the table, are essential for iterative improvements in product offerings, reflecting (Chesbrough et al. (2018)) notion that continuous innovation is crucial for capturing and delivering value.

Furthermore, product differentiation and personalized care models empower users, offering customized solutions that enhance user satisfaction. This strategy of active user engagement resonates with (Chesbrough et al. (2018)) and (Zott & Amit (2017)), who argue that innovation tied to user needs not only creates but sustains value.

These primary concepts backed by the literature, are essentially first order concepts based on the principles of the Gioia method were then converted into second order themes through coding and that gave an aggregate dimension of value creation. These second order themes emerge based on the researchers interpretation and are higher order themes (Gioia (2021)). The process involves identifying patterns, relationships, and underlying structures within the data, leading to the development of aggregate dimensions, which in this case is value creation.

Application of Gioia methodology:Value creation

The figure 3.3 shows the visual data structure illustrating the relationships between first-order and second-order themes, along with aggregate dimension of value creation.

As seen in the figure, first-order concepts were grouped into broader second-order themes, resulting in six key themes: Customer Sensing, Collaborative Networks, Technology Innovation & System Integration, Patient-centric Innovations, Stakeholder Involvement, and Market & Competitor Study. The references for each of these are clearly mentioned in table 3.1 for consolidated and crisp reporting.

Each of these second-order themes reflects strategic mechanisms by which digital health startups create value, aligning with the literature on business models and value creation. For instance, customer sensing captures the startup's ability to identify and respond to customer needs, which is essential for tailoring digital healthcare solutions (Zott & Amit (2017)). Cross sector and inter organizational collaboration, boil down to the second order theme of collaborative network, reinforcing how complementary resources from academic institutions or healthcare providers enhance innovation. The theme of Technology Innovation & System Integration further emphasizes the role of advanced technologies, such as AI, machine learning, and IoT, in driving operational efficiency and improving system integration. This resonates with assertion by (Teece (2010)) that technology plays a central role in creating value. Patient-centric Innovations, including personalized care models and self-management tools, underline how engaging patients directly in their care leads to better health outcomes, enhancing value from a user-centered perspective. The next point about Stakeholder Involvement speaks to the co-creation processes, where engaging key stakeholders in feedback loops helps refine and improve healthcare offerings, ensuring alignment with user needs. Finally, Market & Competitor Study encapsulates the strategies digital health startups use to position themselves in competitive markets, differentiating their offerings to create value.

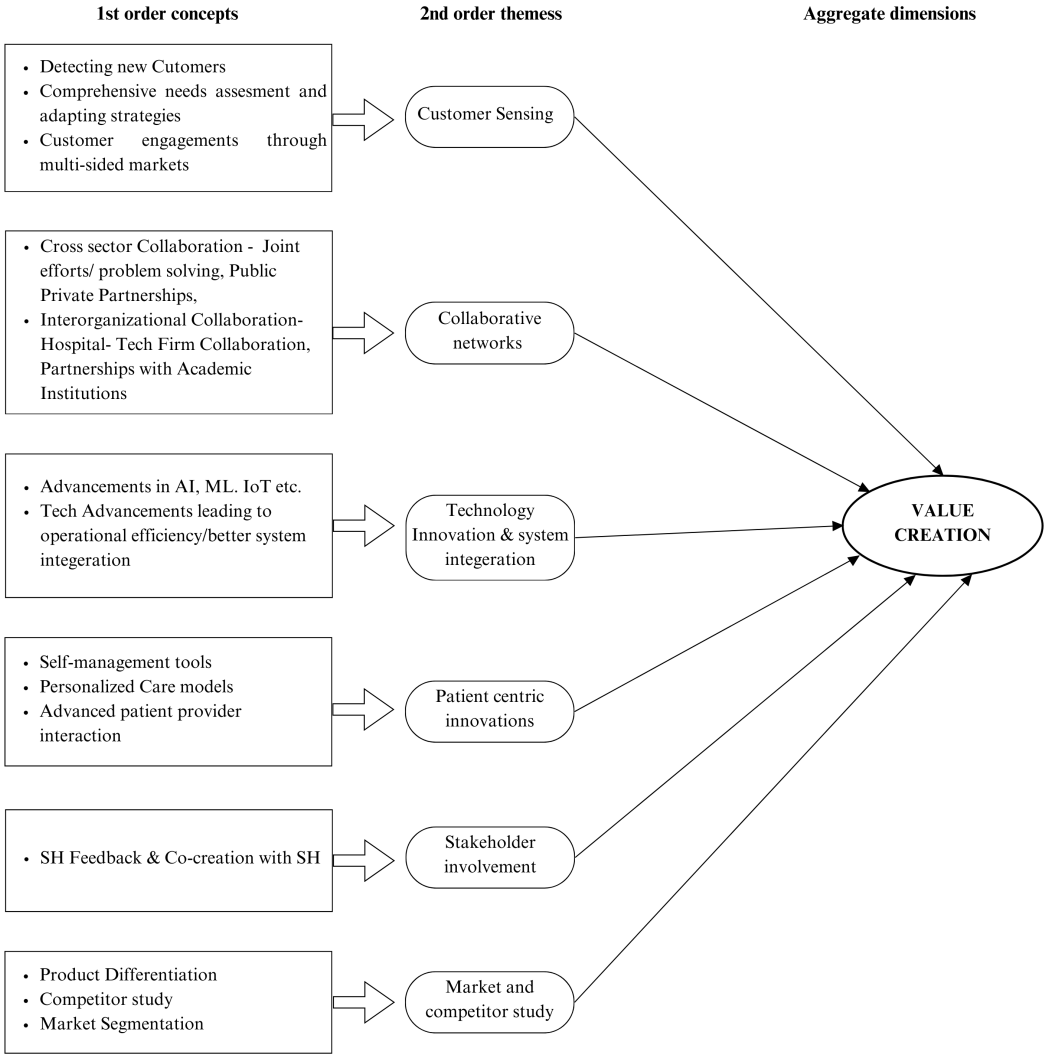

Figure 3.3: Gioia Methodology for elements of Value Creation based on Literature Review

In summary, this inductive process—moving from first-order codes to second-order themes pointing towards the aggregate dimension of value creation, provides a structured understanding of how digital health startups create value.

Value Capture

Value capture is the process of securing financial or non-financial returns from value creation, ensuring businesses retain some portion of the value they create (Chesbrough et al. (2018)). In addition to this Bowman & Ambrosini argue that value capture encompasses retaining a portion of created value, whether through financial gains, intellectual property, or strategic advantage (Bowman & Ambrosini (2000)).

As a part of Integrative review, the literature was screened for open coding to find primary

concepts based on Gioia methodology (Gioia (2021)) that pointed towards with the aggregate dimension value capture. The literature references for the primary concepts related to value capture are listed in the table 3.2 represents critical aspects of value capture in digital health domain.

The primary concepts of value capture mentioned in the table 3.2 reflect the details of the literature regarding value capture in the digital health domain. The inclusion of revenue models like one-purchase, licensing agreements, subscription models, and data monetization demonstrates how digital health startups convert value into income streams for firms. These concepts are crucial in capturing value by enabling flexible pricing and income generation from diverse user bases, ranging from individual patients to large healthcare systems. Cost-effectiveness and economic evaluations represent financial analyses that are critical for cost saving. Going forward, value-based pricing and risk-sharing agreements further solidify startups' ability to capture value by linking financial returns to the outcomes achieved. Moreover, government programs, healthcare funding initiatives, and venture capital, reflect external funding mechanisms that allow startups to capture financial value through seed funding or incentives. Furthermore, licensing agreements and royalty models allow startups to protect and monetize their intellectual property, ensuring they retain strategic control over their technology while capturing financial returns from third-party use. Finally, the last three points of the primary concepts retrieved from the literature in the table 3.2, contribute to non-financial value capture (Bowman & Ambrosini (2000)). These strategies enhance brand reputation and stakeholder alignment, ensuring long-term success through social and environmental impact. All the literature references for each of the primary concepts of value capture are clearly mentioned in the table 3.2.

Sr no	Primary Concepts	References
1	One-Purchase	(Pascarelli et al. (2023))
	Rental	(Pascarelli et al. (2023))
	Licensing Agreement	(J. C. Lin et al. (2020))
	Partner Revenue Sharing	(Vannieuwenborg et al. (2012))
	Pay-for-Performance	(Bitsaki et al. (2017))
	Subscription	(Pascarelli et al. (2023)); (Peterson et al. (2011)); (van Limburg et al. (2011))
	Micropayments	(J. C. Lin et al. (2020)); (Bitsaki et al. (2017)); (Åström et al. (2022))
	Freemium	(Pascarelli et al. (2023)); (Peterson et al. (2011)))
	Data Monetization	(J. C. Lin et al. (2020)); (Bitsaki et al. (2017)); (Lai et al. (2021))
	Government/insurance Reimbursement	(J. C. Lin et al. (2020)); (Bitsaki et al. (2017)); (Lai et al. (2021))
	National health insurance system	(Oderanti & Li (2018)); (Lai et al. (2021)); (Bente et al. (2024))
	Advertising	(Lai et al. (2021))
	More e-health BM patterns	(Sprenger & Mettler (2016))

2	Cost-Effectiveness & streamlining processes Economic evaluations and financial analyses	(van Limburg et al. (2011)); (Stanimirovic (2015)); (Visconti & Morea (2020)); (Christie et al. (2019)) (Kijl et al. (2010)); (van Limburg et al. (2011))
3	Value-based price Risk-sharing scheme & Risk-sharing agreements	(Naveršnik & Mrhar (2014)) (Kijl et al. (2010)); (Naveršnik & Mrhar (2014))
4	Government programs and incentives Healthcare funding initiatives Seed Funding Venture Capital Angel Investors	(Verweij et al. (2023)) (Bente et al. (2024)) (Pascarelli et al. (2023)) (Grustam et al. (2017)) (Chen et al. (2013))
5	Software/technology Licensing Patent sales and royalty agreements	(S. H. Lin et al. (2010)) (Zott & Amit (2017));
6	Improving the products Obtaining approvals Finding new uses for startup offering	(Alalääkkölä et al. (2021)) (van Limburg et al. (2011))
7	Increasing visibility - participating Media events, increasing awareness	(Alalääkkölä et al. (2021)) (Konopik & Blunck (2023))
8	Capturing ESG goals	(Visconti & Morea (2020))

Table 3.2: Value Capture: Primary Concepts and References

Application of Gioia methodology : Value Capture

The figure 3.4 shows the visual data structure illustrating the relationships between first-order and second-order themes, along with aggregate dimension of value capture.

The figure 3.4 showcases the first order concepts and the broader second order themes for value capture in the digital health domain. Gioia methodology was applied to group similar primary concepts into broader themes that encapsulate the mechanisms through which startups secure financial and non-financial value.

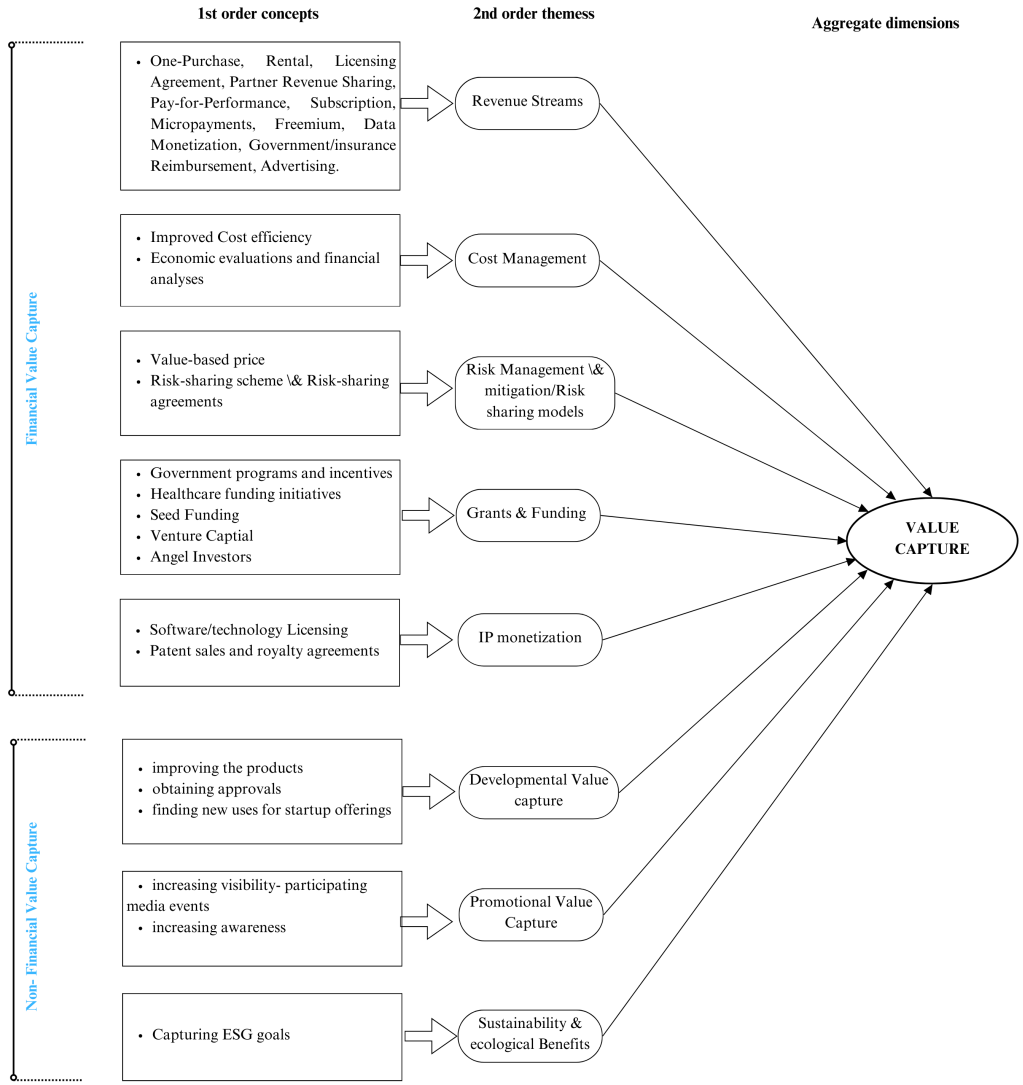

Figure 3.4: Gioia Methodology for elements of Value Capture based on Literature Review

It is evident from the figure that diverse revenue models such as subscription and licensing agreements were grouped into revenue Streams. These models allow startups to convert their offerings into consistent revenue streams, aligning with the core definition of value capture as securing financial returns (Chesbrough et al. (2018)). Similarly, concepts like cost efficiency and economic evaluations were categorized under cost management since they reflect methods to streamline operations and capture value by reducing expenses. Moving ahead, the inclusion of value-based pricing and risk-sharing agreements under the second order theme of risk management & mitigation/risk sharing models reflects how startups capture value by linking financial returns to healthcare outcomes. This ensures that compensation is tied to performance, mitigating risks for both the provider and the customer. The next second order theme of grants

& funding formed by grouping reflects how startups capture value by linking financial returns to healthcare outcomes. This ensures that compensation is tied to performance, mitigating risks for both the provider and the customer, critical in early development stages. The last second order theme under financial value capture is IP monetization which includes the primary concepts of licensing agreements and royalty contracts ensure that startups capture value by monetizing intellectual property, securing financial returns through commercialization of proprietary innovations.

Using the Gioia methodology for non-financial value capture, three second order themes emerged. The first one, developmental value capture reflects the inductive process where first-order concepts like product improvement, approvals and new use cases are abstracted into the broader theme. Similarly, promotional value capture groups concepts like increasing visibility into a strategic theme, showing how reputational gains drive financial benefits. Lastly, sustainability and ecological benefits link first-order concepts of ESG goals to broader stakeholder trust, capturing non-financial value and ensuring long-term impact. This forms the non-financial value capture part as also mentioned in (Chesbrough et al. (2018)). To reiterate, detailed the references from the literature are systematically represented in the table 3.2, providing a comprehensive view of the key concepts discussed in this section.

In summary, this inductive process—moving from first-order codes to second-order themes pointing towards the aggregate dimension of value capture, provides a structured understanding of how digital health startups capture value.

Value Delivery

Value Delivery is a mechanism through which businesses ensure that the created value reaches the end-users encompassing activities regarding customer interaction (Teece (2010)). In addition to this, (Hwang & Christensen (2008)) define it for digital health, noting that value delivery involves the communication and provision of innovations that meet the needs of patients and healthcare providers, ensuring practical utility of the solutions provided.

As a part of the Integrative Review, the literature was screened for open coding to find first order concepts based on Gioia methodology (Gioia (2021)), that pointed towards with the aggregate dimension of value delivery. he literature references for the primary concepts related to value delivery are listed in the table 3.3 represents critical aspects of value creation in digital health domain.

Sr no	Primary Concepts	References
1	Continuous customer support for technical issues Training customers (on boarding sessions, user-manuals)	(Konopik & Blunck (2023)); (Bowman & Ambrosini (2000)); (van Limburg et al. (2011)) (Bente et al. (2024))
2	Integrating sales, marketing, and customer care service Policies and processes to retain and provide service to customers	(Oderanti & Li (2018)); (Chalmeta (2006))
3	Adapting strategies to customer needs Focus on user-experience & accessibility Inter-organizational Collaboration for engagement	(Silven et al. (2022)) (Chakraborty, Ilavarasan, & Edirippulige (2023)); (Folkvord et al. (2023)) (Casey & Töyli (2012)); (Angeli & Jaiswal (2016))
4	Efficient delivery channels and well established networks Strategies for successful implementation and adaptation	(Alalääkkölä et al. (2021)); (Kijl et al. (2010)); (Chen et al. (2013)) (van Limburg et al. (2011))
5	Seamless integration with existing HC systems Interoperable technologies with existing HC systems	(Zott & Amit (2017)); (Allee (2008)) (Bente et al. (2024))

Table 3.3: Value Delivery: Primary Concepts and References

The primary concepts mentioned in the Table 3.3 represent essential mechanisms for value delivery in digital health startups. These primary concepts were included as a part of inductive reasoning based on the definitions discussed previously in this section. mechanisms for value delivery in digital health startups. Customer support and training are fundamental because they facilitate the effective use of the technology by patients and healthcare providers, ensuring that the delivered innovation serves its intended purpose. Sales and customer care integration helps maintain strong customer relationships, critical for ensuring that the value reaches and remains with end-users. Adapting strategies to customer needs and focusing on user experience ensure that startups can adjust their offerings to meet changing demands. Efficient delivery channels and well-established networks guarantee the smooth implementation and adaptation of healthcare solutions. Finally, seamless integration with existing healthcare systems ensures interoperability and efficient use of digital tools, improving overall value delivery (Zott & Amit (2017)).

Application of Gioia methodology : Value Delivery

The figure 3.5 shows the visual data structure illustrating the relationships between first-order and second-order themes, along with aggregate dimension of value capture.

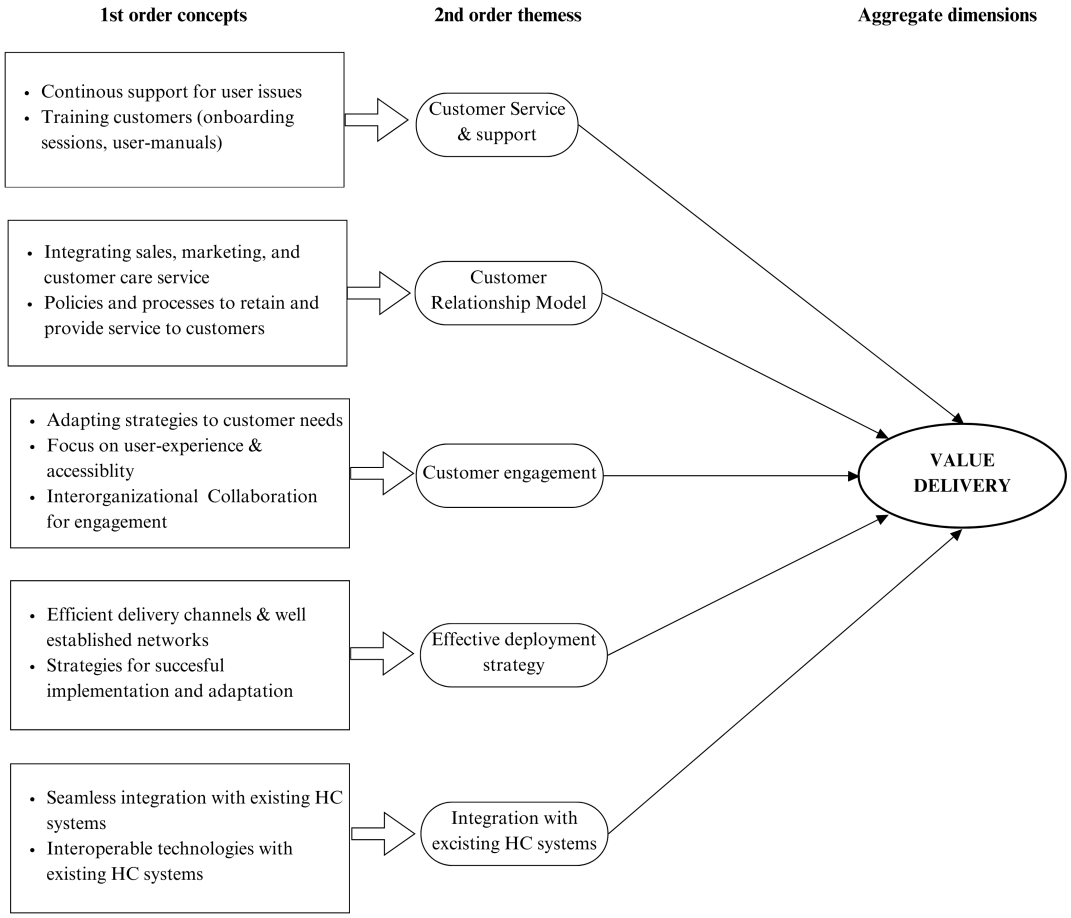

Figure 3.5: Gioia Methodology for elements of Value Delivery based on Literature Review

As seen in the figure 3.5, applying the Gioia methodology (Gioia (2021)), the first-order concepts like customer support and training are grouped under the second-order theme of Customer Service & Support. Similarly, integrating sales, marketing, and customer care evolves into the Customer Relationship Model, emphasizing how startups retain and build relationships with their users by having an integration of multiple business functions. Moving on, adapting strategies to customer needs and focusing on user experience are grouped under customer engagement, highlighting the importance of understanding and responding to user preferences for successful value delivery. Additionally, efficient delivery channels and well-established networks form the theme of effective deployment Strategy, as these are crucial for implementing healthcare solutions at a scale and in a an orderly manner. Finally, seamless integration with existing healthcare systems transitions into Integration with Existing HC Systems, recognizing the need for interoperability and compatibility to ensure smooth operation and utility of digital health innovations. These second-order themes encapsulate the broader mechanisms by which digital health startups ensure their solutions reach and benefit end-users. As also mentioned in

the previous sections, detailed the references from the literature are systematically represented in the table 3.3, providing a comprehensive view of the literature regarding the key concepts discussed in this section.

In summary, this inductive process—moving from first-order codes to second-order themes pointing towards the aggregate dimension of value capture, provides a structured understanding of how digital health startups deliver value.

Referring back to the research questions in section 1.3, this section identifies key elements in the digital health domain, answering SQ1 and laying ground for answering SQ3. The themes identified here will be validated further and complemented with insights specific to Dutch digital health startups to address SQ3 more comprehensively. The remaining unidentified elements related to value creation, capture, and delivery will be explored in detail in Chapter 5, ensuring a holistic response to the research questions.

3.2.6. Digital Health scenario in The Netherlands

The Netherlands has emerged as a significant player in the digital health landscape, driven by robust healthcare infrastructure and a proactive approach to integrating technology into healthcare services. This section provides an overview of the current state of digital health in The Netherlands. The next section will explore Dutch-specific aspects of the digital healthcare landscape, building on the insights discussed thus far.

Overview of HC system in The Netherlands

Before delving into the details of Digital Health scenario in The Netherlands, it would be essential to understand the overview of the Dutch HC system. In The Netherlands, there are three most prominent HC providers - GPs, hospitals and nursing homes (Custers et al. (2007)). As described by (Verhees et al. (2018)) self-care is at the foundation of the Dutch Healthcare system that highlights individual role in managing their health through preventive measures, lifestyle choices etc. Doing ahead in a overview of patient flow by (Verhees et al. (2018)), GP is the first contact for the patient and acts like a gatekeeper in Dutch Healthcare system (Jani & Peter (2013)). Adjacent to GPs, diagnostic centres offer laboratory testing and diagnostics. GP and Diagnostic Centres together form a part of primary care (Verhees et al. (2018)). The secondary care tier consists of hospitals and the patients are referred to the hospitals by the GPs and lastly in the tertiary tier there are academic/specialist centres where most complex and severe health conditions are handled that require highly specialized expertise (Verhees et al. (2018)). Graphical representation of the overview of the Dutch HC system from a patient flow point of view as mentioned by (Verhees et al. (2018)) is as in figure 3.6.

Although the flow of patients is not directly related to the Digital Health, it is essential to have a overview of the HC system as it greatly affects the Digital Health sector deeply, in terms of resource allocation, patient management efficiency, and integration of digital health solutions into existing care pathways. Understanding the structure and functioning of the healthcare system helps in identifying key points where digital health interventions can be most effective, ensures compatibility with existing workflows, and addresses regulatory and operational challenges that may arise when implementing new technologies (Bally & Cesuroglu (2020)) (Verhees et al. (2018)) (Rakers et al. (2023)).

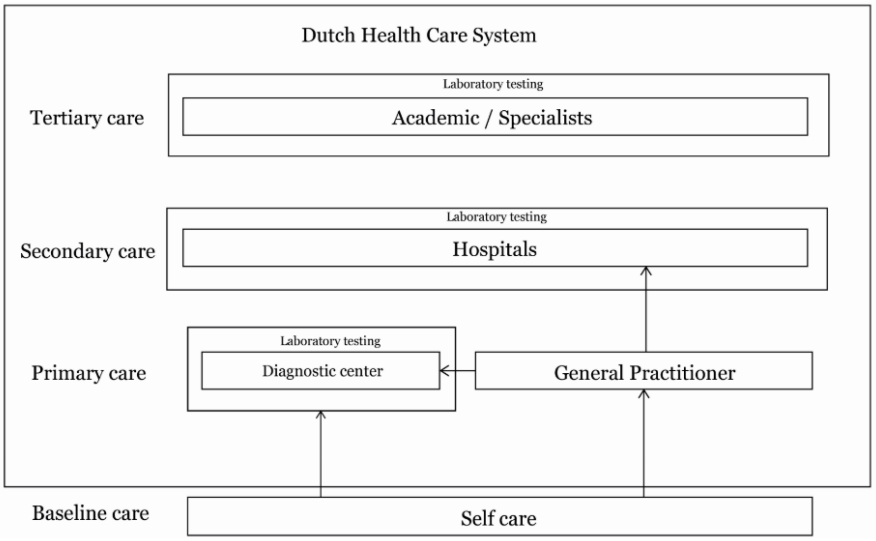

Figure 3.6: Overview of Dutch HC system: patient flow (source: (Verhees et al. (2018))

Special characteristics of Dutch HC

As described before, having Dutch digital health context is particularly interesting due to the unique healthcare landscape and the culture of fostering innovations and aiding startups. The reimbursement structure of The Netherlands, along with complexities of stakeholders involved, the decision-making done by the hospital or organization management responsible for budget, the prescription is made by physicians and operation by the health professionals or technicians for which the repairing would be done by maintenance and application on the user and finally reimbursement by the insurance companies(Boru et al. (2015)). These stakeholders, namely the health insurers, care providers, the end users or care consumers and the government have also been identified by (Rakers et al. (2023)) in the Dutch Healthcare system. Health insurers are mostly private companies and are obliged to accept everyone registered with them for basic insurance.

The tridiac model as represented by (Rakers et al. (2023)) identifies three markets in the Dutch HC system. First being the Health insurance market where health insurers supply health insurance to their care consumers. It is very difficult to compete on the prices of the basic package in this market. Second market identified by (Rakers et al. (2023)) is the Health purchasing market where the health insurers buy care from the providers of healthcare. Here the insurers and providers negotiate in terms of care price, volume and quality. The third and the last market as identified by (Rakers et al. (2023)) is the Health provision market where the care consumers can choose to make use of the provided care. A visual representation of this can be seen by the figure 3.7 adapted from (Rakers et al. (2023)).

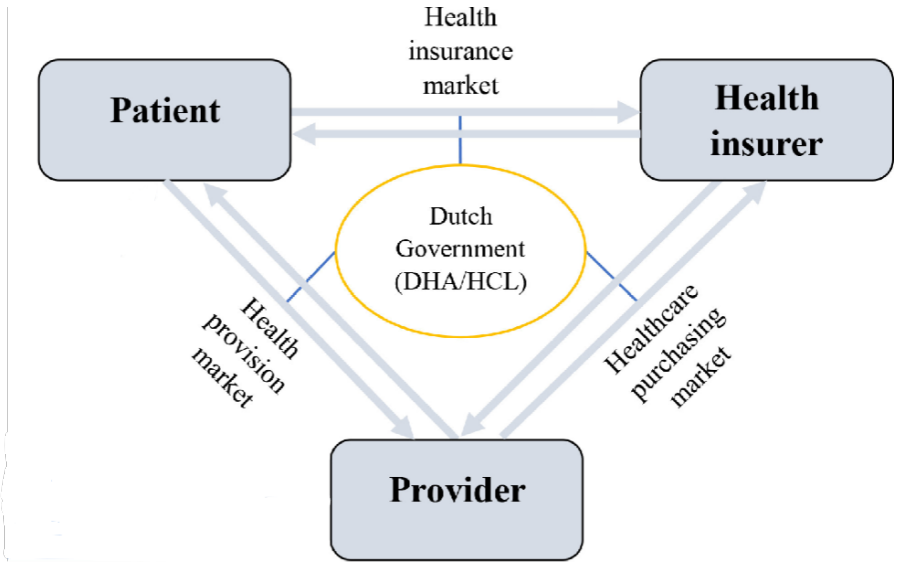

Figure 3.7: Main Parties in the Dutch Healthcare system *(source: adapted from (Rakers et al. (2023)))*

In the figure 3.7, **DHA is Dutch Healthcare Authority** is an administrative authority that falls under the Dutch Ministry of Health, Welfare and Sport (VWS). Secondly, **HCL is National Care Institute** that maintains the quality and prices of the of HC in The Netherlands and is responsible for tasks about Dutch statutory health insurance schemes.

Now that the basic groundwork of the Dutch HC is laid, the upcoming section will throw some light on the Dutch digital health scenario.

Trends in Digital Health in The Netherlands

The current state of the Dutch digital health system reflects a robust integration of technology within healthcare frameworks, driven by innovation and comprehensive policy support. Over the years, The Netherlands has systematically embraced digital health solutions to enhance patient care, streamline operations, and foster collaboration among healthcare stakeholders.

Based on the statistics, the revenue generated by Digital Health Domain in The Netherlands shows a consistent increase in total revenue. Revenues rise from €411.02 million in 2018 to an estimated €1,995.17 million in 2028. The data was last updated in June 2024. The source of the data is Statista MarketInsights.(Statista (2024)).

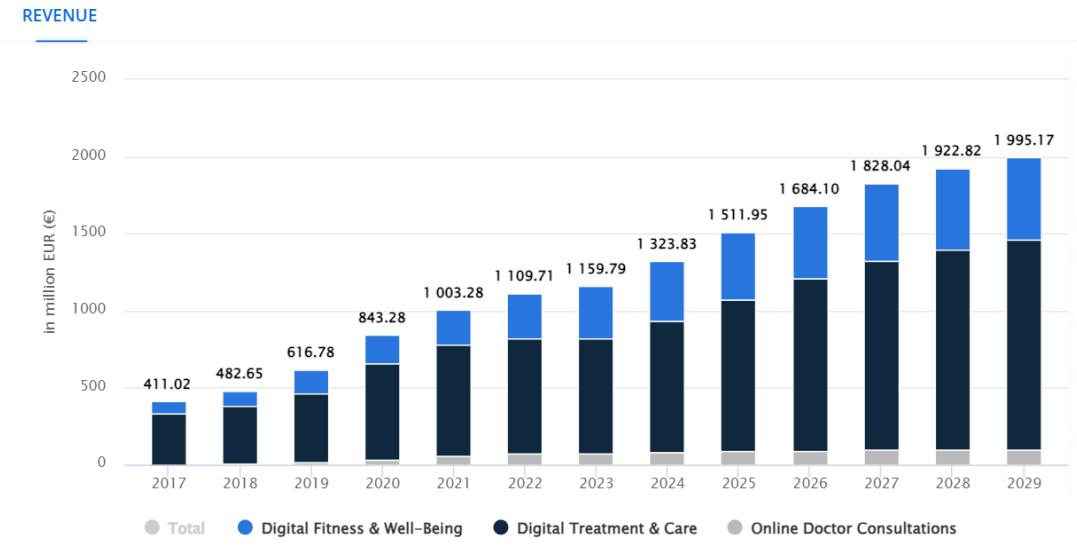

Figure 3.8: Revenue Trend for Dutch Digital Health Domain (in EUR) *Source: Statista*

Apart from the revenue, the users in the Digital Health domain have seen an increasing trend around the world but also in the Netherlands as seen in the in figure 3.9. Although online doctor consultations grow at a low pace as compared to the Digital treatment& care and Digital fitness & well-being, the growth is positive for all the three. Looking at these trends, the Netherlands would undoubtedly see an increase in the number of startups and ventures in the Digital Health domain. (Statista (2024))

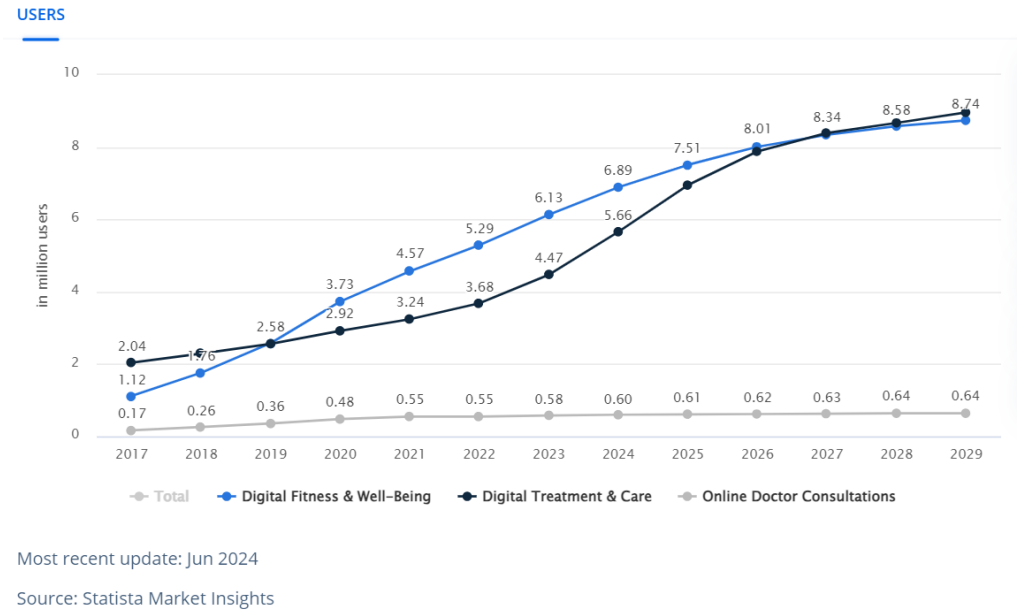

Figure 3.9: Trend for users in the Dutch Digital Health (in EUR) *Source: Statista*

3.3. Conclusion

Thus Chapter 3 presents outcomes of the integrative review focused on understanding the mechanisms of value capture and value delivery in digital health startups, utilizing the Gioia methodology and in-turn answering SQ1 and laying basis for SQ3. This chapter also analyzes the literature trends through a graph of documents per year and a keyword occurrence map to give a bird's-eye view of the evolution of research focus and the most prominent themes in the digital health domain over time. It also delves perspectives discussed in the literature about startups and BMs, along with the sub-types of digital health. This chapter presents a comprehensive literature survey about each value creation, capture and delivery. Using this literature, main elements of Value creation, capture and delivery were identified by reviewing articles selected for the integrative review as mentioned in Chapter 2. After a detailed examination of these aspects, the chapter proceeds to discuss the digital health landscape in the Netherlands, highlighting its unique characteristics and concluding with an overview of the latest trends in the Dutch digital health sector. This concludes the first part of the integrative review. The second part of the outcome of the integrative review, which covers the frameworks employed in the digital health sector, will be explored in Chapter 4.

This foundation will guide further exploration in subsequent chapters, particularly around value creation, capture and delivery and the specific challenges faced by Dutch digital health startups in the upcoming Chapter 5.

4

Framework Review and Development

Having delved into the literature to understand the details of value creation, capture and delivery and their elements in Digital Health startups in Chapter 3, this chapter, gives an overview of the commonly occurring business model frameworks in the research articles retrieved in the Integrative Review in the first part and in the second part, the initial version of Conceptual Value Framework is presented.

4.1. Rationale for Framework Adoption in Digital Health Research

As described by (Ostrom (2007)) (Ostrom (2011)) theoretical research can be undertaken at three levels and these are often confused with each other. These three foundations are formed by : (1) Frameworks (2) Theories (3) Models. At each level analysis gives a different level of specificity. Frameworks aid in recognizing elements and relationships that are required for institutional analysis. They present a generalized list of variables that should be used to analyze and compare institutional theories where these elements contained in a framework can help in generating the questions that are required to be addressed when the analysis is first conducted. Frameworks can help in identifying which elements of framework are relevant to certain questions (Ostrom (2007)). This explanation gives the rationale behind the title 'conceptual framework'. According to (Ostrom (2007)) A theory is a set of specific assumptions that explain how certain elements within a framework interact to produce outcomes. Theories help in diagnosing phenomena, predicting outcomes, and explaining processes within a defined context. They are often compatible with multiple frameworks and focus on general explanations that can be applied across different situations (Ostrom (2007)). A model is a more specific and simplified representation of a theory that makes precise assumptions about a limited set of variables. While models provide a simplified representation of reality to predict outcomes based on a theory, tools are the actual instruments used to carry out these predictions or analyses. Models are abstract representations that help us understand the relationships between variables within a theory, while tools are the practical means by which these models are tested, validated, or applied in real-world scenarios(Ostrom (2007)).

Since this research explores the value dimensions of digital health, elements within the digital health domain are identified and a conceptual structure for value creation, capture, and delivery is proposed. Therefore, this conceptual structure can be appropriately referred to as a framework.

4.2. Existing frameworks in the literature

There have been certain number frameworks and tools in the realm of digital healthcare that conceptualize Business Models discussed in the literature. It is essential to look at these existing frameworks that aid in conceptualizing the business models and look at the benefits and drawbacks of the existing frameworks. Especially looking at the aspects that are incomplete in conceptualizing value aspects of Business Models in digital health domain.

4.2.1. Business Model Canvas

Most commonly used frameworks for Business Models in the digital health literature is Business Model Canvas (Osterwalder et al. (2010)) as mentioned in studies (Kho et al. (2020)), (van Limburg et al. (2015)), (Chen et al. (2013)), (Sprenger (2016)), (van Limburg et al. (2015)). Business Model canvas is a widely used official tool for ideation and technology commercialization. Osterwalder's Business Model is based on the nine building blocks as described by (Osterwalder et al. (2010)).

1) **Customer Segments** includes grouping the customers into common needs, behaviours etc. Once this is finalised, BM can be designed around this understanding of customer needs.

2) **Value Proposition** is how products and services for a specific customer need are catered and shows how a certain company stands out from the rest of competitors. This looks at what value is being delivered to the customer.

3) **Channels** describe how a particular company communicates with the customer segments and reaches them in order to deliver their value proposition.

4) **Customer Relationships** describe the kind of relationship the company wants to establish with a certain customer segment with a view to acquire customers, customer retention and boosting sales.

5)**Revenue Streams** depict the cash generated by the company from each customer segment. Every revenue stream can have different pricing mechanisms.

6)**Key Resources** are the resources that allow an enterprise to create and offer value proposition to reach the markets. These resources could be physical, financial, intellectual or human.

7) **Key Activities** describes the most important things a company must carry out in order to make the business model work and operate successfully.

8) **Key Partnerships** describes the supplier & partner network required to acquire and allocate resources and deliver value.

9)**Cost Structure** describes all costs incurred in order to have the business model operational.

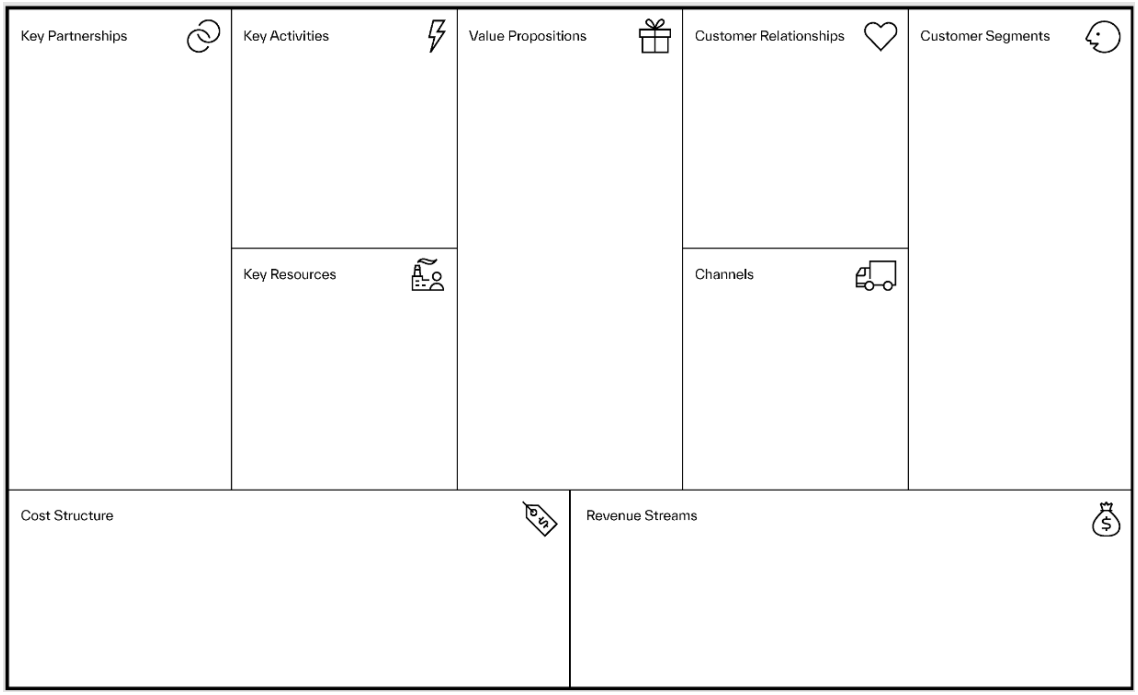

Figure 4.1: Business Model Canvas adapted originally from (Osterwalder et al. (2010))

The figure 4.1 shows the business model canvas along with its nine elements. The upcoming section discusses the points aligned to the purpose of this research and the points are not aligned with the purpose of this research.

Points aligned with the purpose: In the digital health field, multiple authors have employed CANVAS in order to study Business Model for the cases that they describe. The study by (van Limburg et al. (2011)) looks at the CANVAS like a empty framework that is filled with success factors and choices in turn describing how the digital health business goes about value creation. In the study (van Limburg et al. (2015)) as well it is described that the Canvas can give an overview of the relevant critical success factors; key areas that need to be right for BM to succeed. BMC can be implemented quickly and thus does not need as much time or resources, giving a holistic understanding of the critical success factors that are necessary in making revenues (van Limburg et al. (2010)). In case of (Chen et al. (2013)), BMC is used in order to compare multiple cases in telemedicine, giving a birds-eye views of the BM of the cases. BMC may also provide the viability challenges right at the beginning of a venture and thus help in ensuring a robust and sustainable model (Sprenger (2016)).

***Points not aligned with the purpose*:** This being said, CANVAS lacks in emphasizing on the importance of digital economy and also when it comes to the functionalities of the core enabling technologies (Nikou & Bouwman (2017)). Furthermore, CANVAS fails when it comes to the multi-sided service platforms and the applications where multiple business models are to developed at the same time (Nikou & Bouwman (2017)). Apart from these points, CANVAS brings in a high level discussion only at ideation level and is strongly depends on the opinions of the experts (Van Limburg & Van Gemert-Pijnen (2010)). Due to high level of abstraction, there is very little attention to the details and specificity and this could lead to a potential oversight of minor yet crucial details (Sprenger (2016)). Also, as comprehensively mentioned by

(Khodaei & Scholten (2024)) there is no analysis of competition or mention of key performance indicators with no consideration of the strategic purpose of the company.There is an overall consensus that BMC is highly generic and on a high level can be made applicable to any industry, thus not catering to the specific needs that the digital health field demands where patient safety and risk reduction are the highest held values than revenue and earnings.

In conclusion, while Osterwalder's Business Model Canvas is a valuable tool for business model design, especially due to its structured and comprehensive approach, it has certain limitations when applied to specific industries like digital health. To overcome these limitations, the integration of industry-specific design patterns, such as e-health business model patterns, is necessary. This combination enhances the viability of the business model by addressing specific challenges and ensuring that the model is robust, realistic, and tailored to the needs of the digital health sector.

4.2.2. STOF Framework

The STOF framework, initially developed by Odin van Houtum and Harry Bouwman, offers a comprehensive approach for analyzing and designing business models, particularly in the context of service innovation (Bouwman et al. (2008)). In healthcare, the framework has proven valuable in structuring business models for e-health and telemedicine services, ensuring that these innovations meet the complex requirements of the healthcare environment while remaining financially viable(Bouwman et al. (2008)). In digital health domain, multiple studies like (Kijl et al. (2010)), (Menko et al. (2013)), (Spil & Kijl (2009)), (Visser et al. (2010)) employ STOF framework.

STOF framework is structured around four interrelated domains as described below:

1. **Service Domain:** The service domain provides description about the service offering, including its value proposition and the market segment it is intended for.
2. **Technology Domain:** The technological capability needed to provide the service offering is described in the Technology domain.
3. **Organization Domain:** The Organization domain contains a description of the multi-actor value network's structure, which is necessary to develop and provide the service offering and to characterize the focal firm's place within it.
4. **Finance Domain:** The finance domain describes how revenues are generated by the value network from a particular service offering.

STOF Model can be visually represented as seen in the figure 4.2 (Kijl et al. (2010)) & (Spil & Kijl (2009)).

The figure 4.2 shows the STOF Framework. The upcoming section discusses the points aligned to the purpose of this research and the points are not aligned with the purpose of this research regarding the STOF framework.

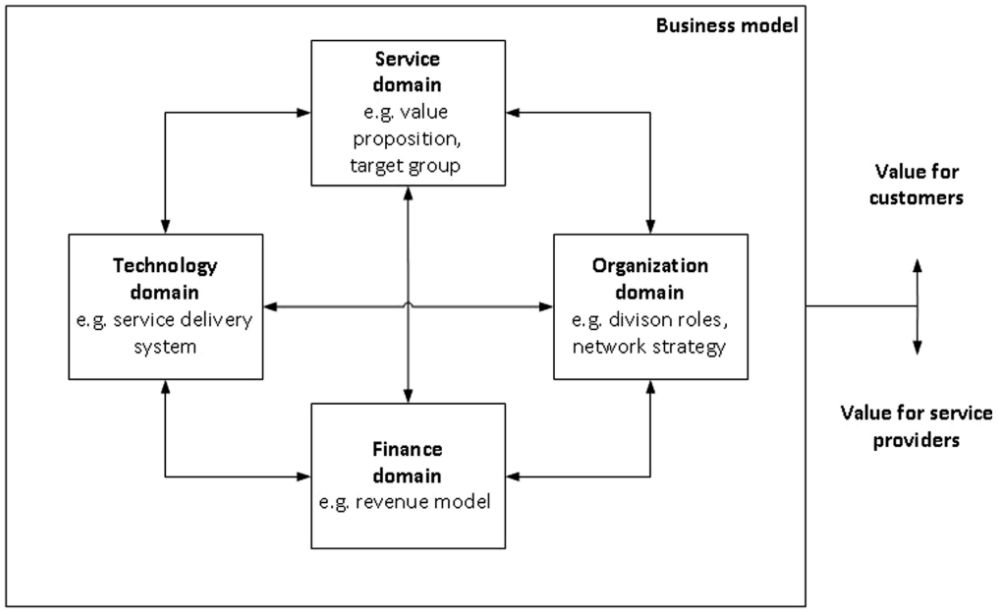

Figure 4.2: STOF framework as mentioned in (Bouwman et al. (2008))

Points aligned with the purpose: STOF framework covers all major domains ensuring that all critical aspects of BM are considered (Bouwman et al. (2008)). The framework lays an emphasis on the customer value and service providers both making sure that the customer requirement are effectively catered to while keeping the value for service provider in mind. STOF provides a detailed description about dealing with the critical design issues (CDIs). Critical Design Issues (CDIs) in business models refer to the essential factors and challenges that must be addressed to ensure the success and viability of a business model (Nikou & Bouwman (2017)). Furthermore, STOF framework is flexible and can be adapted for various industries bringing in versatility for BMs. It has widely been used to cater the needs of business modelling in the digital health sector by (Kijl et al. (2010)) (Spil & Kijl (2009)) (Menko et al. (2013)) (Visser et al. (2010)).

Points not aligned with the purpose: First and foremost limitation for STOF framework is that it can be applied only to the service based businesses (Nikou & Bouwman (2017)) thus leaving behind digital technologies that come in the form of a product or a combination of a product or service. Based on the multiple cross case analyses mentioned in the literature, it is evident that especially for digital health sector, the BM is not static but have a dynamic nature (Spil & Kijl (2009)) (Bouwman et al. (2008)). STOF fails in capturing this dynamicity. In addition to that, the framework does not consider the contextual or external factors specific to the digital health sector (Spil & Kijl (2009)). There is also a risk of misalignment in the intended value and the perceived value in the service domain that can potentially impact customer satisfaction and overall success of the service (Spil & Kijl (2009)). Overall, there is very less attention paid to the value aspect in STOF framework.

In conclusion, STOF framework represents a robust approach to business model innovation, offering a well-rounded perspective that integrates critical aspects of service design, technology implementation, organizational structure, and financial planning. Researchers acknowledge that while STOF's comprehensive nature makes it a valuable tool, its true potential is realized

when organizations effectively manage the intricacies of its implementation, ensuring that all stakeholders are aligned and engaged in delivering the intended value. The limitations regarding the static nature and the effect of the external factors of the STOF framework, are overcome through dynamic version of the framework.

Dynamic STOF Framework

Dynamic STOF framework caters to the limitations of the static STOF framework. The evolved business model framework, STOF, is a dynamic framework where the four core components of a business model—namely, service, technology, organization, and finance—are integrated into an environment of extrinsic forces: market trends, technology evolution, and changes in regulation. This dynamic nature reflects the adaptability of the STOF framework across different phases of a business model life cycle—specifically, the technology/R&D phase, the implementation/roll-out phase, and the market phase(Bouwman et al. (2008)) (Kijl et al. (2010)).

The figure 4.3 shows the dynamic STOF framework as mentioned by (Bouwman et al. (2008)).

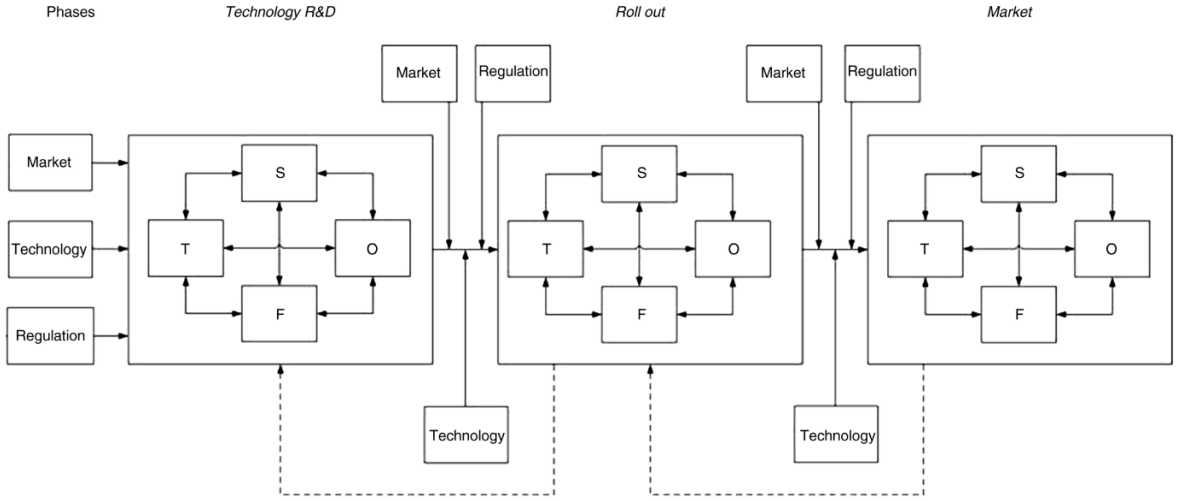

Figure 4.3: Dynamic STOF Framework as mentioned by (Bouwman et al. (2008))

The top part of the framework the three phases taken into consideration. In the Technology/R&D phase, technology is the primary driver of new business model development with ICT innovations playing a significant role in shaping business opportunities. The framework emphasizes the importance of aligning technical innovations with market needs and regulatory requirements (Spil & Kijl (2009)). During the Implementation/Roll-out phase, the focus shifts to operationalizing the business model. At this stage, regulatory compliance, market competition, and technology adoption become critical factors that influence the success of the business model. This phase also involves refining the business model based on feedback from early adopters and ensuring scalability and branding are adequately addressed (Bouwman et al. (2008)). Finally, in the Market phase, the business model is fully operational, with an emphasis on retaining customers and optimizing processes (Bouwman et al. (2008)). It is important to note that these phases are iterative in nature as seen in the figure 4.3.

Points aligned with the purpose: Quite naturally the strong points of the static STOF apply to the dynamic STOF as well. In addition to that, the biggest strength of this model is the dynam-

icity that is captured along with the phase-specific focus in turn giving a clearer picture to the businesses in the digital health domain and helping them prioritize their efforts effectively.

Points not aligned with the purpose The effectiveness of the dynamic STOF relies on the accurate forecasting technological trends, market developments, and regulatory changes. Misjudgments in these areas can lead to sub optimal business model designs (Bouwman et al. (2008)). As the framework spans multiple phases, there is a risk of misalignment between different components (e.g., technology and organization), particularly if changes in one area are not effectively communicated or integrated across the others(Bouwman et al. (2008)). Going ahead, only three phases of development are considered without the details of the intermediate phases or the phases that could be a part of pre-R&D phases, that are especially relevant to a startup. Moreover the dynamic STOF framework is still applicable only to the service based businesses without being applicable to the product based digital health ventures. The clarification about value to customer and the venture and flow of value is missing in case of the dynamic STOF. The framework has applicability to wide range of business and thus fails to capture the nuances that could be specific to the digital health sector and especially the startups in the sector.

STOF-V

STOF-V is a variation of the STOF framework where importance of value creation and overall value concept is placed centrally (Spil & Kijl (2009)). In order to make this model dynamic, (Spil & Kijl (2009)) have stated that it can be combined with the dynamic STOF model as shown in the figure 4.3. STOF-V framework builds upon the four dimensions as described in section 4.2.2 with an additional fifth dimension: Value (Bouwman et al. (2008)). The value domain is concerned about how the value is created, distributed and captured within the BM. Value exchange among various stakeholders is highlighted in V-STOF (Spil & Kijl (2009)). The visual representation of STOF-V as seen by (Spil & Kijl (2009)) is in the figure 4.4.

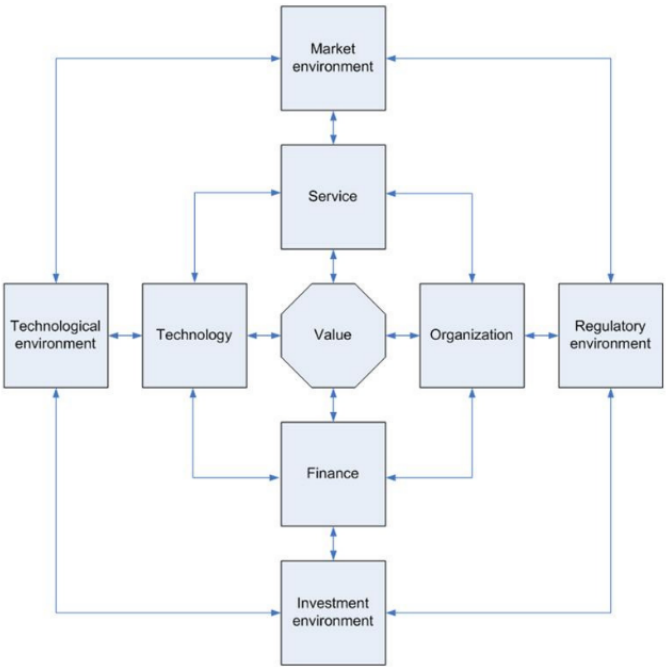

Figure 4.4: STOF-V as represented in (Spil & Kijl (2009)), originally from (Bouwman et al. (2008))

Although the weak points regarding the value aspect is solved, the rest of the limitations about STOF are also applicable to STOF-V model such as applicability only for service domain and failure to capture the cultural and social aspects that plays a significant role in healthcare domain. Moreover it fails to capture all the criterion for BM framework dynamicity as mentioned in (Khodaei & Ortt (2019)).

4.2.3. VISOR Framework

The VISOR framework developed by (El Sawy & Pereira (2013)) is often viewed as a theoretical lens to aid in determining the relationship between technical inputs and economic outputs like profits and public health values (Nikou & Bouwman (2017)). VISOR is recent as opposed to CANVAS and STOF and has not been as widely used yet and shares quite some commonalities.

The framework consists of five core components: Value Proposition, Interface, Service Platforms, Organizing Model, and Revenue Model, each playing a critical role in shaping effective digital service- based business models. Here's a breakdown of the essential elements of VISOR.

1. **Value Proposition:** This is the core of any business model framework and ensures that the value provided meets the needs and expectations of the target audience aligning with their needs and expectations, offering distinct benefits that differentiate the service from competitors (El Sawy & Pereira (2013)). In terms of digital health, this value boils down to economic value as well as health related value (Nikou & Bouwman (2017)).
2. **Interface:** (El Sawy & Pereira (2013)) define the interface component as the interaction between service platform and the customer service experience and underscores the importance of scalability, security, and interoperability in platform design, ensuring that the platform can grow with the business and integrate with other services(Nikou & Bouwman (2017)). It is further noted by (Nikou & Bouwman (2017)) that in digital health services, platforms must facilitate seamless data exchange between patients, healthcare providers, and other stakeholders, while also maintaining data privacy and security
3. **Service Platform:** Within VISOR framework, service platforms facilitate and uphold the stakeholder interactions including competitors, complementors, collaborators, and platform owners. This includes logistical stream, IT infrastructure, IT infrastructure, key resources etc.
4. **Organizing Model:** The organizing model specifies how an organization or group of partners will arrange business procedures and the underlying value chain, as well as the interactions between various stakeholders and partners in the ecosystem. Other difficulties covered by the organizing model include an organization's dependence on its partners and vice versa (El Sawy & Pereira (2013)).
5. **Revenue Model:** This part looks at the way the delivery of the offering along with with investments in the platform ensure that the revenues exceed the costs (El Sawy & Pereira (2013)). (Nikou & Bouwman (2017)) highlights that in digital services especially in healthcare, the revenue model must also consider the diverse needs of different stakeholders, including patients, providers, and insurers, to create a viable and scalable business.

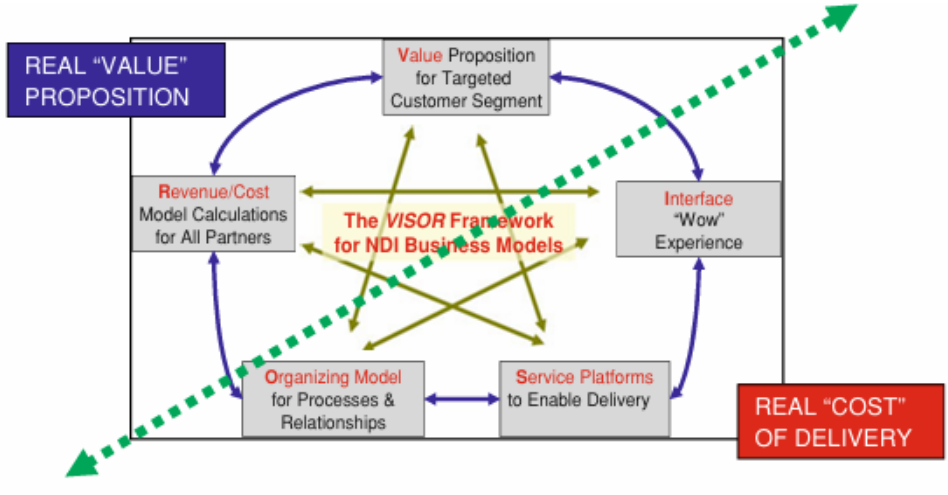

Figure 4.5: VISOR framework as mentioned by (El Sawy & Pereira (2013))

The figure 4.5 gives a overview of VISOR framework for NDI (Networked Digital Infrastructure) BMs. Each of these five components interact with one another to create a comprehensive and dynamic business model suited for the digital economy. The figure 4.5 offers the dynamic balance between the value offered to customers (value proposition) and the cost incurred in delivering that value (cost of delivery). This balance is critical for the sustainability of the business model. The arrows and the interconnected structure in the diagram emphasize that these components do not operate in isolation. Instead, they are interdependent, and the success of the business model relies on how well these elements are integrated (El Sawy & Pereira (2013)).

Points aligned with the purpose: VISOR framework gives a complete representation of digital service design making it particularly suitable for the healthcare sector where complex digital services, such as mobile health and wellness applications, are essential unlike other frameworks that were rather generalised than suited for healthcare (Nikou & Bouwman (2017)). VISOR has highlighted the critical role of interface to ensure a successful service delivery, that is missing in STOF. Especially in case of healthcare, user-friendly interfaces that enhances patient engagement and service adoption (Nikou & Bouwman (2017)). The Service Platforms component of VISOR ensures that digital healthcare solutions can be scaled and adapted to meet the growing and changing needs of the healthcare system. This is particularly important given the rapid technological advancements and the increasing demand for digital health services (El Sawy & Pereira (2013)).

Points not aligned with the purpose: VISOR framework is not particularly applicable for the digital health companies that operate in the product or service-product domain. The VISOR framework does not explicitly address the stringent regulatory and legal challenges that are inherent in the healthcare industry. While the framework is robust in terms of business and technological components, it may not fully account for the complexities of healthcare regulations, which can significantly impact the feasibility and success of digital health services (Nikou & Bouwman (2017)). Although VISOR includes components like the Organizing Model, it may not fully address non-technological factors such as cultural, social, and emotional elements that are crucial in healthcare. The framework's focus on digital infrastructure and processes

might overlook the softer aspects of healthcare service delivery that are essential for patient trust and acceptance (Nikou & Bouwman (2017)). In spite of the fact that VISOR has been considerably used in the digital health service ventures, it is still generalised and not specifically made for the Digital health domain and thus not encompass the nuances existing in the digital health domain.

4.3. Conceptual Value Framework for Digital Health Startups- Version One

Having gone through the frameworks and tools in the literature that are most commonly used for conceptualizing Business Models for digital health ventures in subsection 4.2, it was identified that there very limited research when it comes to conceptual value framework especially for the startups in the digital health domain in The Netherlands. The aim of the conceptual value framework is to capture the value creation, value capture and value delivery specific to the Digital Health startups and build a theoretical base. It is important to note that the outcome of this research is not a framework that can be directly put to practical use, however it is only a first step of research towards having a practical tool for digital health entrepreneurs that can provide actionable inputs. This conceptual framework would aid in getting a comprehensive and nuanced understanding about value creation, capture and delivery in digital health startups.

Given the fact that digital health startups function in complex regulatory environment, balancing innovation and patient safety along with guiding overall credibility, a comprehensive framework can help ventures operate effectively and have a structured approach (Jarrin & Parakh (2021)). In case of digital the health ventures, outdated frameworks struggle to keep pace with the rapid advancement in the field (Jarrin & Parakh (2021)).

This subsection has attempted to partly answer the SQ3 and mostly answer SQ1 and as an outcome have the first version of the conceptual value framework for the digital health startups as is also described in chapter 2. The version one of the framework would be based on the insights from the literature and this version of the framework shall be verified through semi-structured interviews of practitioners and academics in the field. This step shall give us the final version of the conceptual value framework specific to the Dutch digital health startups discussed in the chapter 5.

As stated above, the criteria to develop a framework will be detailed in the next sections.

Value creation | Value Capture | Value Delivery

As mentioned before, the conceptual value framework consists of value creation, capture and delivery which in turns describes BM as by (Osterwalder et al. (2005)). The elements under value creation based on literature for the first version of the framework. The elements under each value creation, value capture and delivery are taken from section 3.2.5 based on the first order concepts and second order themes under aggregate dimension of value creation, capture and delivery as depicted in the figure 3.3, figure 3.4 and figure 3.5.

The figure 4.6 of the framework is based on the literature and aids in answering SQ1 and partially the SQ3. The final version of the framework will be finalised based on the insights, themes and recommendations from the semi-structured interviews.

4.4. Conclusion

In conclusion, this chapter throws light of the second part of the outcome of integrative review looking at the frameworks used most commonly in relation with the digital health and evaluating how well they align with or diverge from existing research. This analysis directly addresses SQ2, which examines the primary frameworks used to discuss business models in the digital health sector and their compatibility with the unique needs of Dutch digital health startups. The chapter concludes with the development of the initial version of a conceptual framework for the digital health domain, that is purely based on the elements identified in value creation, capture and delivery in Chapter 3 through the integrative review. As mentioned before, the version one of the conceptual value framework better explains SQ1 and lays basis for answering SQ3.

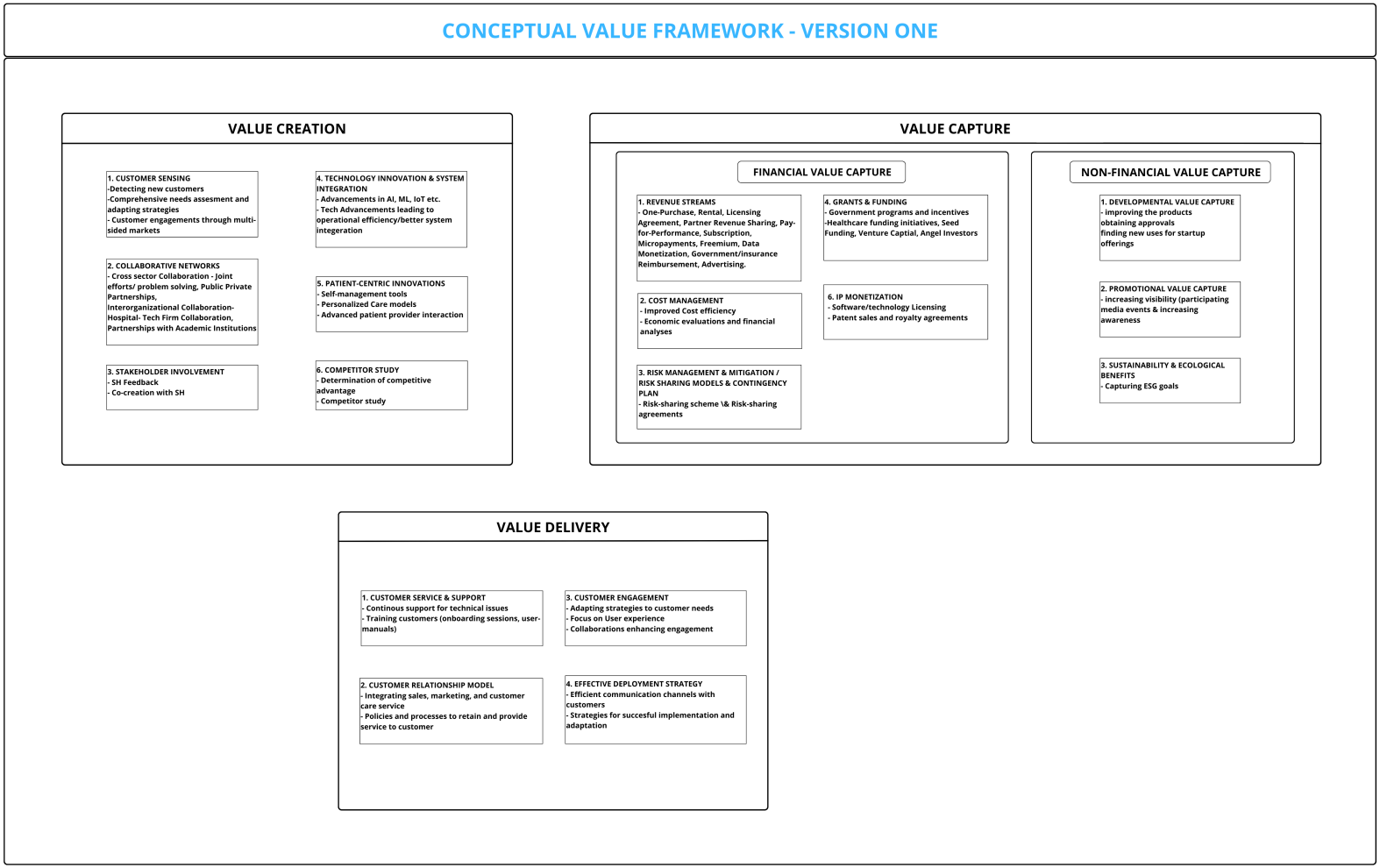

Figure 4.6: Conceptual Value Framework for Digital Health Startups - Version one

5
Interview Findings and Analysis

The following chapter presents the findings of the 15 semi-structured interviews, that aided in building and validating the conceptual value framework based on the practical insights from the practitioners and academics in the field.

This section is divided into four parts. The first section 5.1 focuses on elements of version one of the conceptual framework as confirmed through the interviews with practitioners. The second section 5.2 explores the missing elements in the version one of the framework identified by the practitioners in the interview. The third, section 5.3 discusses the external factors influencing value creation capture and delivery. The last section, that is section 5.4 gives the final version of the conceptual Value Framework for the Dutch Digital health Startups that answers the main RQ.

5.1. Verification of the elements of version one of conceptual value framework

This section focuses on verifying the elements of the first version of the conceptual framework. The aim is to assess the relevance and accuracy of these components by comparing them against real-world practices and insights gathered through the semi-structured interviews. The participants were essentially asked to answer the question ' Do you think the elements in version one of the conceptual value framework are relevant for the Dutch digital health startups?'. The participants were also asked to select the elements from each value creation, capture and delivery that were found most important. This question regarding prioritization in the interviews helped in deciding the order in which the elements in each section would be placed in the final version of the framework.

5.1.1. Value creation - verification of existing elements

The value creation segment in the conceptual value framework as shown in the figure 4.6 was presented to the experts in order to verify the elements under each.

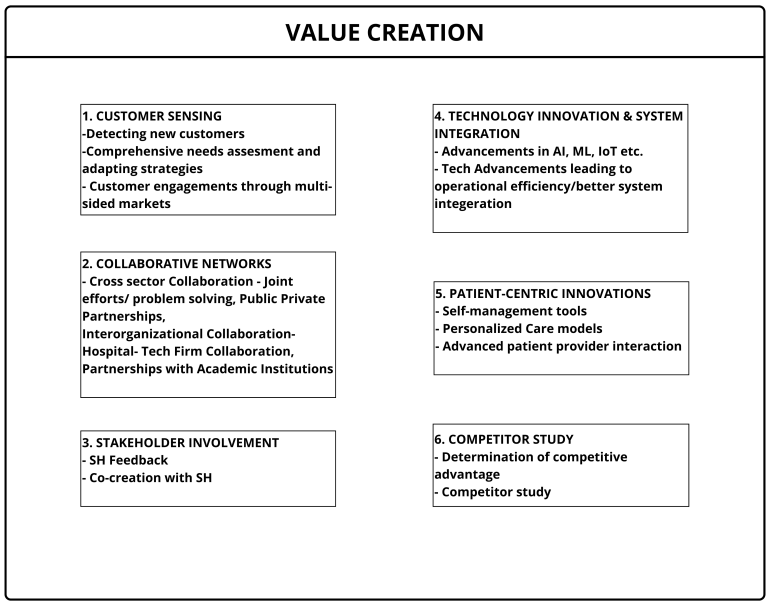

Figure 5.1: Value Creation segment of Conceptual Value Framework (version one)

The radar graph in figure 5.2 shows the order of priority for each element in value creation. The six elements of value creation are seen on the periphery and the numbers represent the number of times that particular point was stated as high priority point. The graph represents prioritization individually for three different categories of the interviewees. As mentioned in the methodology chapter, the first category labelled as 'ST' consists of the startup founders/co-founders/team members. The second one labelled as 'SM' consists of startup mentors/consultants and the third category labelled 'A' consists of academic researchers in the field.

There was an overall consensus among the participants about the all six existing elements involved in value creation as was presented to the participants in the figure 5.1 and this is apparent from the participant quotes mentioned later on in this section.

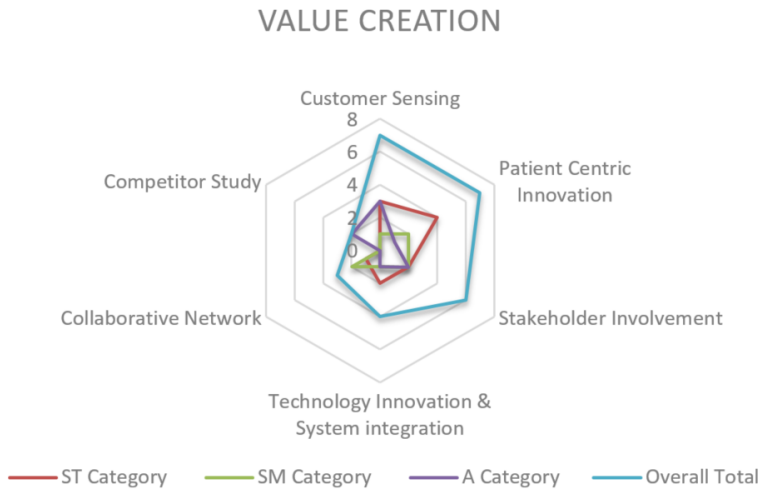

Figure 5.2: Graph representing the prioritization of elements of value creation by participants

Each individual point is addressed step by step in this section. The first point, customer sensing, was highlighted as crucial in value creation as seen under the overall total in the graph. This was the most important point from a perspective of academic researchers in the digital health as seen by the purple line. However, it was also emphasized that a clear distinction must be made between different types of customers, especially given the complexities of the healthcare environment. Thus customer sensing should encompass end user, patient, paying customer as well in order to have the holistic understanding of the customer. This point was emphasized in the interview by participants from all the three categories of the participants as mentioned in the section 2.3.1, and their representative view is depicted by the following by ST2 in the following quote:

'I think we we did a lot of customer sensing indeed. We have focused a lot on the customers of our solution, but really on the end users of our solution, I think that's a very important thing in health and digital health, that the customer might be hospital or hospital directly director or in our case, sometimes even an NGO" -ST2 Thus for the next version, it was ensured that this differentiation in customers was made.

An equal priority was given to patient centric innovation, as that of customer sensing. From a perspective of startup founders and teams, this point was regarded highest as seen by the red line in the graph. Once different stakeholders are identified, the technological innovation can be made keeping patient centric innovation central in the innovation processes, as mentioned by ST1 and other startup team member ST4, experienced in application of personalized care model states:

"I believe patient centric innovation is our main goal in healthcare technology, a must in value creation and the main point" -ST4

Moving ahead, stakeholder involvement along with its sub-elements stakeholder feedback and co-creation were posited next in priority by the participants as seen in the overall total in the graph. Multiple participants corroborated the use of co-creation and engagement with stakeholders like patients, doctors, advisory boards etc right from the beginning. A representative view is seen in the quote,

"Most of the Dutch startups have good practices around value creation is by really using stakeholder engagement very early on." -SM5

The next point based on the priority allotted by participants is technology innovation and integration into the existing healthcare system. It was pointed out by the the participants that the Dutch Startups do really well in terms of technology development and advancements in AI, ML etc. that further lead to better system integration. A representative quote for this point was mentioned by ST1 as follows.

"*I really that you have technology innovation, so the the subterm of tech advancement leading to operational efficiency and better system integration, I really like that one (from a startup point of view)"* - ST1

Collaborative Network and competitor study come next in hierarchy based on the participant's view. Importance of collaborations is highlighted by ST5, a Dutch digital health startup team member, talking about collaborations with hospitals, doctors.

"So we created the startup by using a collaborative research, but I'm a team by a team of der-

matologists based out of (country name), so the the the solution was created by doctors and then we brought it into the Dutch market where we used the customized solution... the partnership we have with our healthcare providers is very strong Advisory Board of dermatologist who still helps us in our day-to-day operations." - ST5

A common view among participants was that before starting out, it is of utmost importance to know who are the major players in the market that a startup is planning to enter as corroborated by participant SM3.

"I think it's also good to know who are all parties in your field of expertise. So who are your competitors? So you have to know the business, the field, you want to enter." - SM3

Thus, as a conclusion all the existing elements under value creation for version one of the conceptual value framework were verified along with the prioritization of the elements for all three categories separately and together. The missing elements pointed by the participants will be discussed in the next section 5.2.

5.1.2. Value Capture - verification of existing elements

The value capture segment of the conceptual value framework, illustrated in Figure 5.1 , was presented to experts for validation of the elements and points under each element.

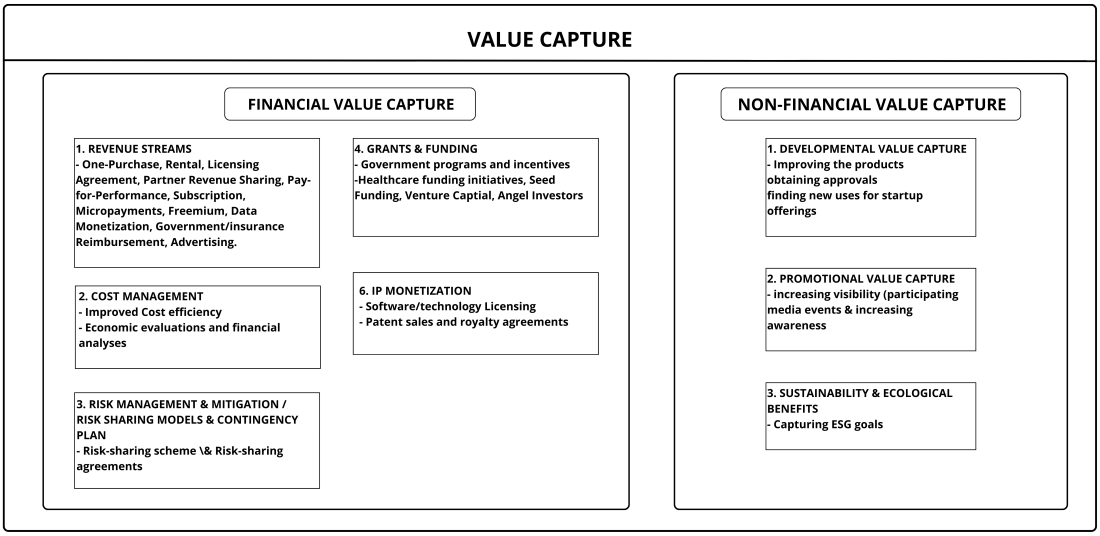

Figure 5.3: Value Capture segment of Conceptual Value Framework (version one)

The radar graph for prioritization of the financial value capture is seen in the figure 5.4 for that of the non-financial value capture is seen in the figure 5.5. On the periphery are elements under each and the numbers represent number of times the experts prioritized that particular element. These graphs will aid in ordering the elements under each for the final version of the framework. The differences in prioritization from the perspectives of the three categories of the interviewees separately is seen in the graph. The overall total in the graph, represents the combined prioritization across all three categories.

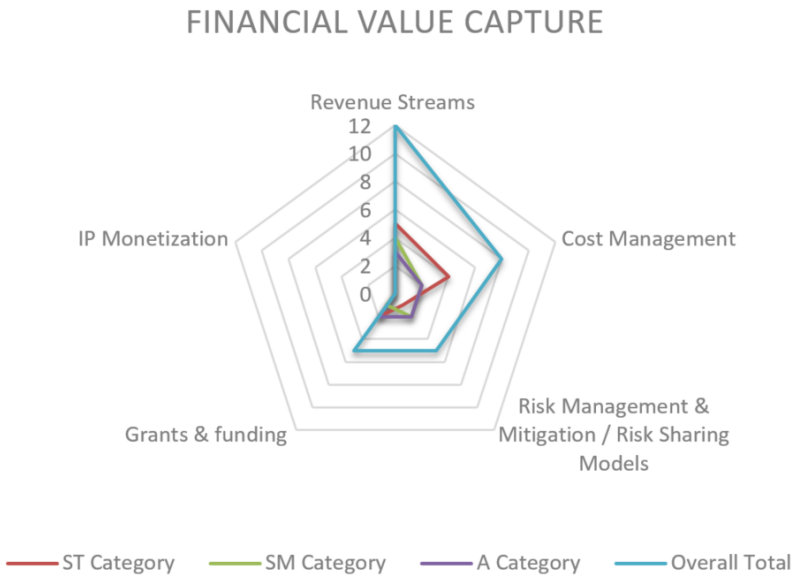

Figure 5.4: Graph representing the prioritization of elements of financial value capture by participants

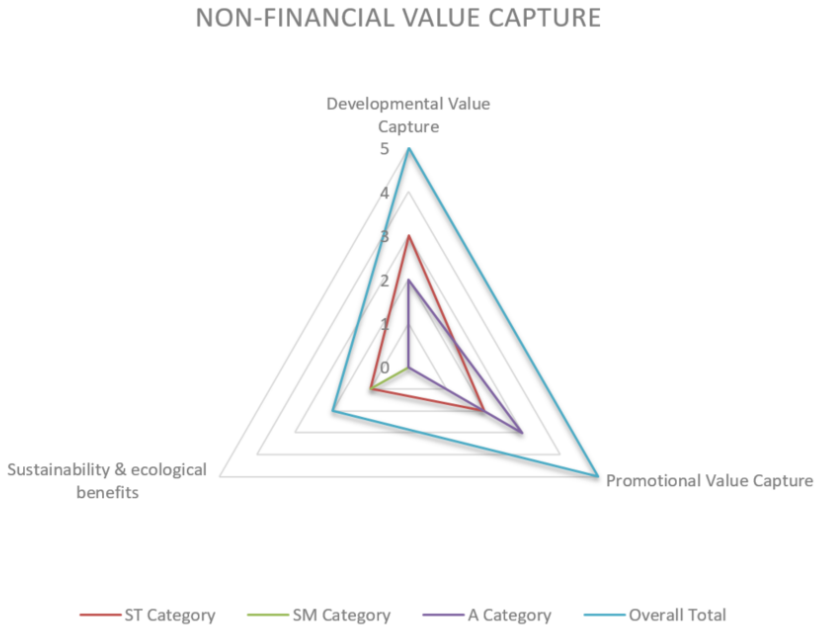

Figure 5.5: Graph representing the prioritization of elements of non-financial value capture by participants

Financial Value capture: Overall there was a consensus about validity of all the five elements under value capture by the participants.

Revenue Streams was the most given the highest priority by all the three participant categories together and individually as well. The importance of having a clear understanding of the revenue streams was well acknowledged. The multiple revenue streams mentioned in the literature were identified even in case of practical examples in the interviews. The second priority was

given to cost management by the participants and it was also stated that revenue streams and cost management more or less goes hand in hand as seen in this representative quote:

"If you know your customer you know which type of revenue stream you need to use, you need to you know what your cost management is." -ST1

The point about risk management & mitigation and risk sharing models shares equal place with grants & funding in terms of priority. Participant ST5 pointed out the importance of grants and funding if the startup is in its nascent stages and the importance of revenue streams in mature stages.

So it also depends on if you are an existing one or a zero to 1.If you're starting something from scratch, then you need grants, funding, IP grants and funding, and then you go to revenue streams. - -ST5

Importance of the risk management plan along with mitigation plan was stressed upon by the participants as not everything can be foreseen when it comes to startups and especially for digital health startups that function in highly regulated environment and deal with large amounts of data, functioning especially in a volatile zone. Thus startups need to foresee and have risk management plans for multiple scenarios as portrayed by a representative quote:

"I will put risk management and mitigation strategy as well on a value capture. There are going to be things that you cannot oversee straight away. So you wanna have a plan of risk assessment and mitigation strategies, especially on how you manage personal data, because you're talking about digital assets." - A2

Although IP monetization was termed important enough to be a part of the framework by the participants, none of them deemed it as the top-most important point, thus putting it at the end. The potential reason behind this as pointed out by SM2 was that IP is not as critical in digital health as startups do not usually patent the code but they just leave that open access at times.

Non-financial Value Capture: There was a consensus about the first two points under non-financial value capture, namely developmental value capture and promotional value capture both at an equal level of importance. While the 'SM' and 'A' categories did not consider developmental value capture as the most relevant factor, unlike the 'ST' category of startup teams, there was still a strong emphasis on the overall importance of both developmental and promotional value capture. However, about the third point sustainability and ecological benefits there were mixed views. It was agreed by all the participants that sustainability aspect and capturing relevant ESG goals is indeed important on paper, however when it comes to practicality, regulations and operations in a real-life scenario, this point is not taken as much into consideration by most startups.

The developmental value capture in terms of making use of the network for building value is quoted by A4 highlighting the non-financial value capture.

"If you have amazing team members really good advisors, you have mentors etc who are actually doing this as we see this value that they bring in from their network, their experience, their skills, etc, fall under the non financial value capture" -A4

Under promotional value capture, importance of visibility and marketing the startup offering was discussed by the participants in relation to selecting right channels for the offering and for

increasing the visibility to the users.

"So there are a lot of complex concepts coming in where you have you decide on the media because old if you target older age groups, website is always a good thing because they see on the biggest screen they use laptops. If you're target the younger generation, you go for phones." - ST5

Lastly, about the third point about capturing the ESG goals ST6, a startup founder emphasized its importance in non-financial value capture. *"I would say non financial value capture is like improvement of whichever SDGs you're working on."* - ST6

However SM2 a startup mentor expressed sustainability aspect to not be as relevant due to the digital nature of the startups. Due to higher level of experience of ST6 and at least twice the level of experience of SM2, the understanding of ST6 shall be given higher importance. The opinion of ST6 also aligns with the literature by (Visconti & Morea (2020)) and hence sustainability and ecological benefits shall be retained as a part of non-financial value creation.

Thus in conclusion, all the points under financial and non-financial value capture have been adequately validated through the interviews.

5.1.3. Value Delivery - verification of existing elements

The value delivery segment of the conceptual value framework, illustrated in Figure 5.6 , was presented to experts for validation of the all elements under this segment.

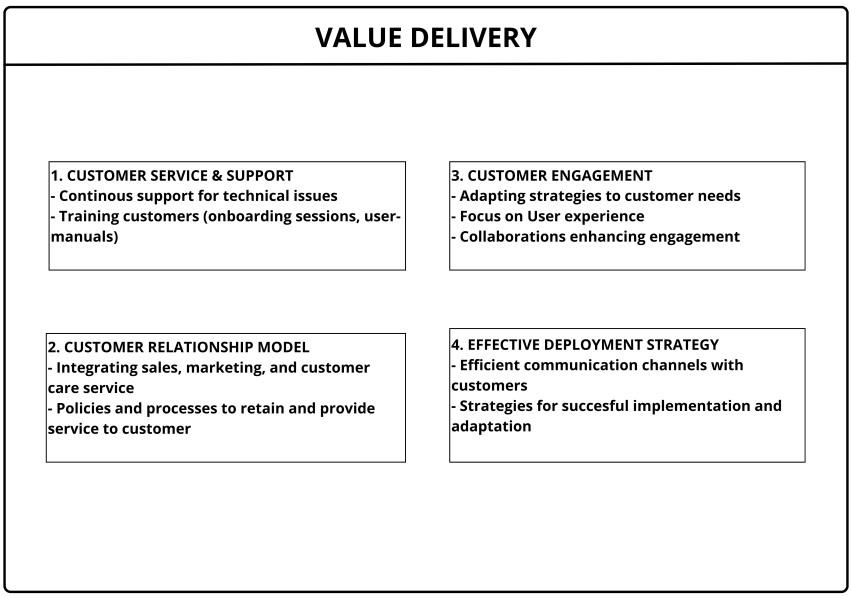

Figure 5.6: Value Delivery segment of Conceptual Value Framework (version one)

The radar graph for prioritization of the value delivery is seen in the figure 5.7. On the corners are the four elements under value delivery and the numbers represent number of times the experts prioritized that particular element. The graph represents value delivery for all three categories individually and together as represented by the blue line. These graphs will aid

in ordering the elements under value delivery for the final version of the conceptual value framework.

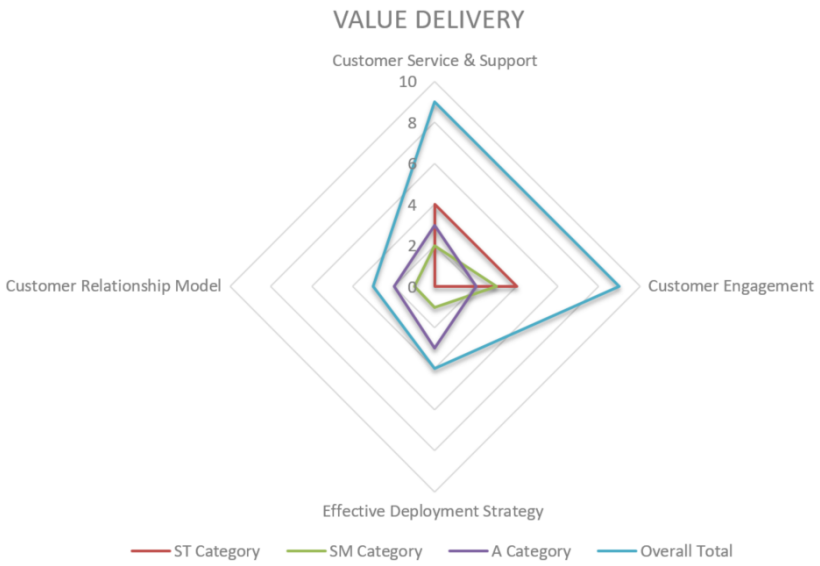

Figure 5.7: Graph representing the prioritization of elements of value delivery by participants

As seen in the figure 5.7, customer engagement and customer service & support were stated as top most important points overall and also by the startup team category, followed by effective deployment strategy and lastly customer relationship model.

Customer engagement was one of the top important points for overall category and for startup founders and startup mentors. Customer engagement was deemed important to adapt strategies to customer needs, to improve user experience, enhance overall engagements and better collaborations as represented by

"So you do need customer engagement.You do need people to to engage with, to understand are they liking what you have, like the lemonade example "- ST3

The "lemonade example" [1] is a metaphor for launching a small business emphasizes the importance of understanding customer needs, efficiently managing resources, and adapting based on feedback, as discussed by ST3.

As is for almost every business, customer service & support was deemed of high importance for the Dutch digital health startups too. Especially for digital health, digital literacy is a prerequisite and hence support for technical issues along with on-boarding sessions and user manual showing a clear understanding of product/service needs to be taken care of by the startups in this domain.

Participant ST6 touched upon the importance of training and maintenance as a part of a startup that aims delivering end to end solution.

[1]The "lemonade stand" example is a common analogy used in business literature to illustrate the basic principles of entrepreneurship, revenue generation, and cost structure. It simplifies complex business concepts by demonstrating how a small, straightforward operation, such as selling lemonade, by actually catering the needs of the customers.

"It's really important that you're training them (users) how to use it, that you're continue being on standby for maintenance and other services post sales." - ST6

The next point based on the overall priority graph is about effective deployment strategy which is an essential as having a product/service without proper channels and strategy for deployment, can significantly undermine its success and limit its impact in the market and possibly sustenance of the startup itself as represented by the SM3.

"It's a bit like the service and support and the engagement, deployment strategy is always very important... all those because when you have a beautiful product, but you don't have a good implementation strategy or deployment strategy, then it's not going to work." - SM3

The last point on overall priority about customer relationship model was regarded top important by A1 pointing towards the importance of aligning sales, marketing along with customer care as also mentioned in the literature by (Chalmeta (2006)).

In conclusion, the existing elements of the conceptual value framework for Dutch digital health were validated through interviews with practitioners and academics in the field. With these elements now confirmed, the second part in section 5.2 will explore the new elements identified by participants that were missing in the first version.

5.2. Additional Elements of Value Creation, Capture, and Delivery - Insights from Interviews

The aim of the semi-structured interviews was also to complete the missing elements from the framework and in-turn build the final version of the framework based on the practical insights about the Dutch Digital Health startups. Having confirmed the existing elements of the framework in section 5.1 this section would mention the new elements that would aid in making the framework more holistic as the insights come digital health startup founders/teams, academics and startup mentors from The Netherlands.

5.2.1. Value Creation - Additional elements

On the value creation side, in total there were eight new points brought in by the participants. The supporting first order quotes along with second order themes for the aggregate dimension of value creation using Gioia methodology is as seen in the figure 5.10. The detailed evidence of the supporting quotes by the participants for each point can be seen in Appendix B in the table B.1.

As illustrated in the figure 5.8, each of the nine elements of value creation will be discussed in detail below.

Understanding of the Healthcare Value Chain: As mentioned by two participants, 'understanding of the Healthcare value chain' is an essential element of value creation as was pointed out by two participants SM1 & A3.

"You need to really make sure that you understand your value chain properly and that should happen all in that value creation part before you start thinking about modeling your value capture and value deliver." -SM1

It was stressed upon that recognizing the complex web of stakeholders, understanding their

varying perceptions of value, and identifying where your product or service can make a meaningful impact is necessary. As there are multiple entities involved in healthcare like patients, providers, and payers, clarity in value chain dynamics right at the start ensures that the value creation process addresses the needs and urgencies of the right stakeholders.

Validation and Proofing of the Offering: In healthcare, validation is not just a formal step; it is a critical component that includes proving the safety, efficacy, and real-world applicability of your product, whether it's a medical device or a digital health solution as was stated by two participants SM1 and SM5.

"I think it's the value part especially in healthcare is validation of your proposition that is missing. Validation, meaning the its safety efficacy, especially if it's a medical device, but even if it's not a medical device, if it's a workflow change, proofing and validating scientifically (is important)." - SM1

The quote highlights the importance of engaging with actual users and validating assumptions through scientific methods. Without this rigorous validation, digital health startups risk developing solutions that do not effectively address real needs or gain necessary regulatory and market acceptance, especially the tough regulatory scenario in The Netherlands.

Identifying and Addressing Market Gaps Before Technology Development: It was stressed by the participant ST3 & SM3, that the digital health startups need to focus first on the socio-technical and market gaps i,e the emphasis here needs to be on being problem-driven rather than technology-driven. This approach avoids the pitfall of developing solutions in search of a problem and ensures that the technology developed is truly needed and impactful within the healthcare context as represented by quote.

"What are you going to solve with your new development of your new technology? So it has to be and a question driven it you don't want a technology push but you want really to invent or develop a solution which helps to solve problem an actual problem." -ST3

Distinction Between End-User, Patient, Buyer, and Other Stakeholders: In digital health the lines between end-users, patients, buyers, and other stakeholders can be blurred, but it is crucial to differentiate between them as stated by SM2, SM3, ST2.

"We have focused a lot on the customers of our solution, but really on the end-users of our solution, I think that's a very important thing in health and digital health. That the customer might be hospital or hospital directly director or in our case, sometimes even an NGO" -ST2

For example, the end-user might be the healthcare provider, the patient is the recipient of care, and the buyer could be a hospital or insurance company. Each of these stakeholders has different needs and definitions of value, so it's important to tailor the value proposition accordingly. This distinction is critical for aligning the product's benefits with the expectations of each stakeholder group. This nuance has been also mentioned in the literature (Boru et al. (2015)).

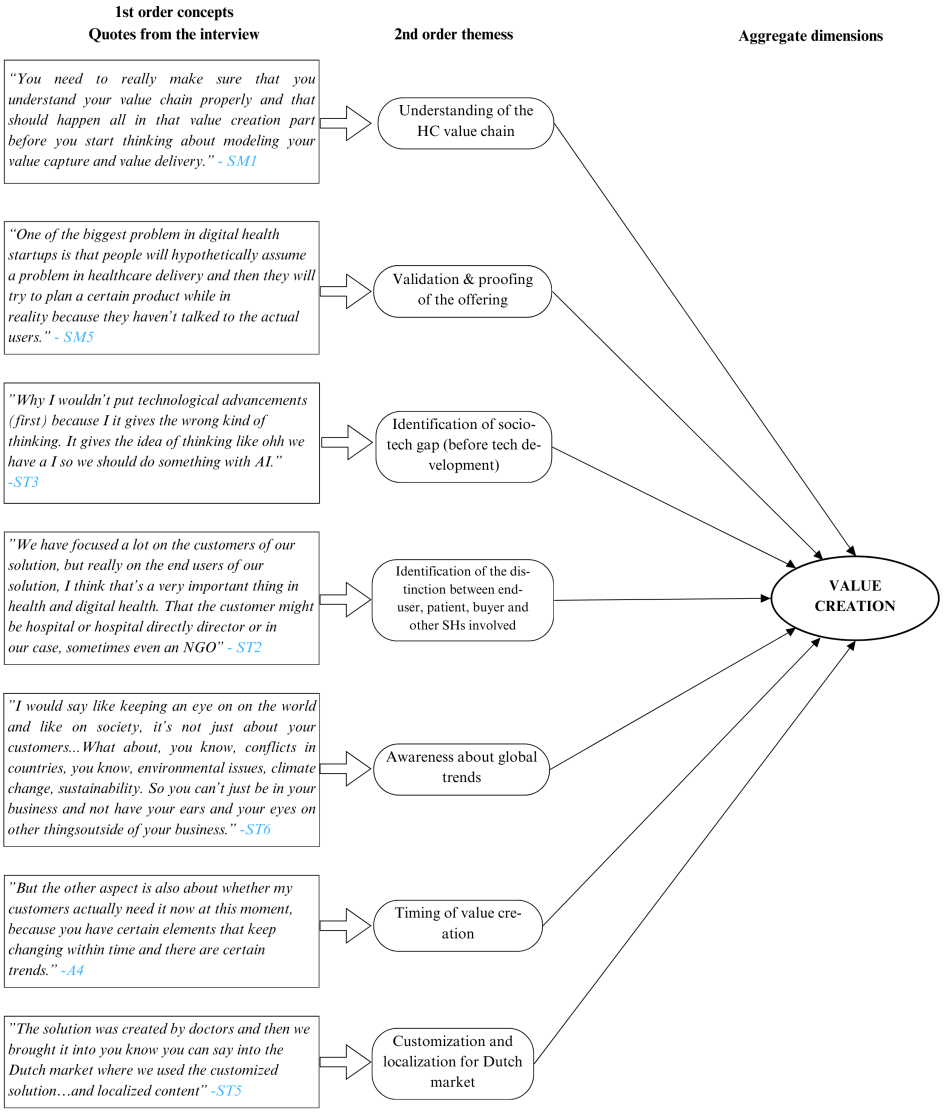

Figure 5.8: Value Creation: Additional Elements (Gioia Methodology)

Awareness of Global Trends: In today's interconnected world, digital health startups cannot operate in isolation. Being aware of global trends such as climate change, geopolitical shifts, and broader societal changes is crucial. These factors can influence market dynamics, regulatory environments, and even patient needs. Staying informed and responsive to these trends allows startups to remain relevant and resilient in a rapidly changing landscape and can immensely affect how these startups create value, as seen in the representative quote by ST6.

"I would say like keeping an eye on on the world and like on society, it's not just about your customers...What about, conflicts in countries, environmental issues, climate change, sustainability. So you can't just be in your business and not have your ears and your eyes on other things outside of your business." -ST6

Timing of value creation: As is valid for most startups, it was pointed by A4 out through the interviews that timing is a crucial factor in the success of digital health innovations as directly quoted, *"But the other aspect is also about whether my customers actually need it now at this moment, because you have certain elements that keep changing within time and there are certain trends."*

Although this aspect is partially a part of value delivery it was emphasized that it is necessary for the startups to understand if it is the right time for them to create the value in the first place, keeping in mind the trends digital health domain.

Customization and Localization for the Dutch Market: Although it is possible that some elements of value creation, might remain the same irrespective of the country that the startup operates in, it is important to acknowledge that localization and customization tailored to fit the specific needs and context of the Dutch healthcare system is necessary.

This was captured by a startup team member ST5, *"The solution was created by doctors and then we brought it into you know you can say into the Dutch market where we used the customized solution… and localized content"*

This involves not only adapting the product to local regulations and standards but also customizing content and functionality to align with the cultural and operational specifics of the Dutch market. Localization ensures that the product is relevant and effective in addressing the unique challenges faced by Dutch healthcare providers and patients.

The integration of both the existing and newly identified elements, i,e from the literature review and the interviews transforms the value creation framework, as illustrated below in figure B.2. Insights from both section 5.1 and section 5.2 and from the graph 5.2 were incorporated to develop this representation of the value creation segment. The prioritisation of the additional elements was made based on the researchers understanding based on the interviews. The elements highlighted in blue were the ones identified through semi-structured interviews and the rest were based on the literature review.

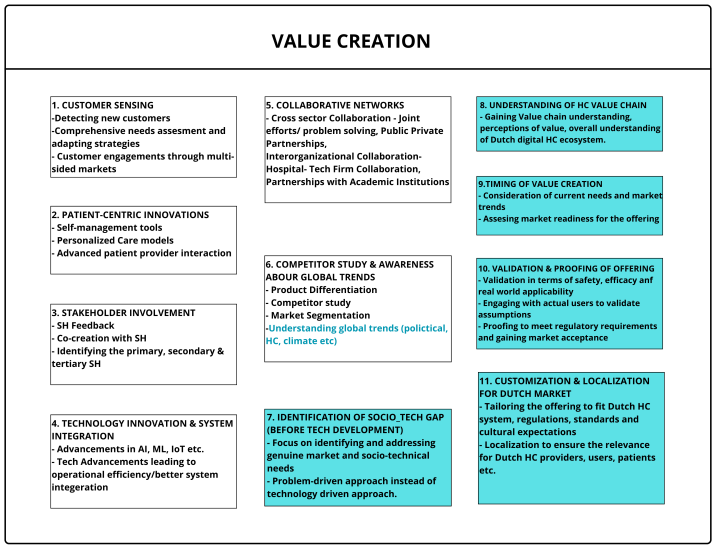

Figure 5.9: Value Creation - Additional Elements

5.2.2. Value Capture - Additional elements

In case of value capture, in total there were six new points identified by the participants as seen in the figure 5.10 where supporting first order quotes along with second order themes for the aggregate dimension of value capture are represented. The distinction between financial and non-financial was made based on the context of discussion with the participants. The detailed evidence of the supporting quotes by the participants for each point can be seen in Appendix B.

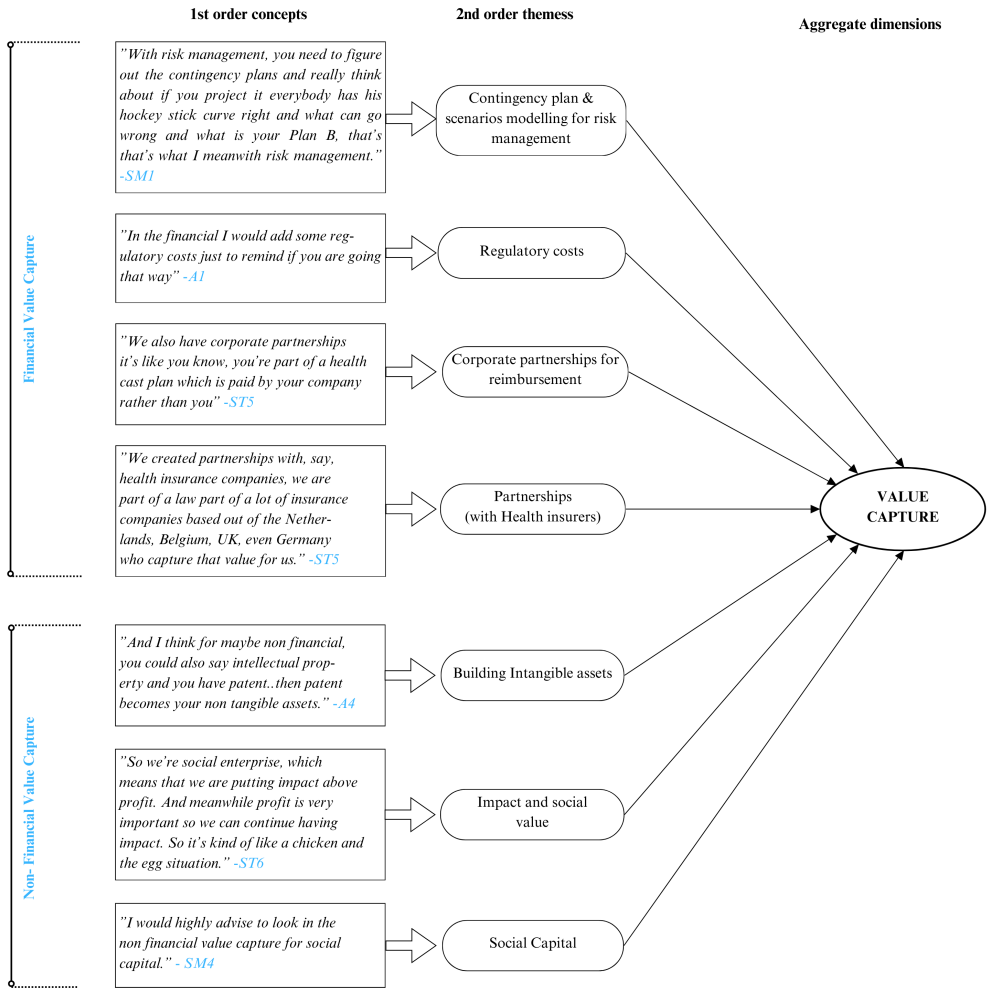

Figure 5.10: Value Capture: Additional Elements (Gioia Methodology)

Financial value capture

1. Contingency Planning and Scenario Modeling for Risk Management: Effective value capture requires robust risk management, including contingency planning and scenario modeling. Startups need to anticipate potential challenges, understand the risks associated with their financial projections, and develop alternative plans to navigate unexpected disruptions,

as echoed by the representative quote:

"With risk management, you need to figure out the contingency plans and really think about if you project it everybody has his hockey stick curve right and what can go wrong and what is your Plan B, that's that's what I mean with risk management." -SM1

2. Regulatory costs: It was pointed out that regulatory costs need to be taken into consideration in the cost management section of financial value capture. These costs can be significant, especially in healthcare, where compliance with regulations is critical. Properly accounting for these expenses ensures that the business model remains viable. Participant A1 with experience in regulatory advisory stated,

"In the financial I would add some regulatory costs just to remind if you are going that way." - A1

3. Partnerships for Reimbursement:

Corporate partnerships: Establishing corporate partnerships for reimbursement can be a key strategy for financial value capture, to be considered as an element of financial value capture. For instance, being part of a health plan sponsored by a company can ensure consistent reimbursement, adding a reliable revenue stream to the business model as articulated by ST5,

"We also have corporate partnerships it's like you know, you're part of a health cast plan which is paid by your company rather than you" - ST5

Partnerships with Health Insurers: Establishing strong partnerships with health insurers can prove to be essential for capturing value in the Dutch digital health market. Insurers are key players in the healthcare system, often determining which solutions are reimbursed and widely adopted. As reflected by ST5 collaborating with insurers, startups can ensure that their solutions are financially viable and accessible to a broader patient population, thereby enhancing their market penetration and impact.

"We created partnerships with, say, health insurance companies, we are part of a law part of a lot of insurance companies based out of The Netherlands, Belgium, UK, even Germany who capture that value for us." -ST5

Non-financial Value capture

4. Building Intangible Assets: In the non-financial realm, developing intangible assets such as intellectual property (IP) is crucial. Patents and other forms of IP can become valuable non-tangible assets, enhancing the long-term value of the startup by protecting innovations, stated by A4.

"And I think for maybe non financial, you could also say intellectual property and you have patent..then patent becomes your non tangible assets." -A4

5. Impact and Social Value: In case of most digital health or even healthcare enterprises, capturing value extends beyond financial profit to include social impact. Balancing profit with social impact is critical; profit enables sustainability, while impact drives the enterprise's core mission. This dual focus can differentiate the startup and attract support from socially conscious stakeholders. This was put forth by participant ST6,

"So we're social enterprise, which means that we are putting impact above profit. And meanwhile profit is very important so we can continue having impact. So it's kind of like a chicken and the egg situation." - ST6

6. Social Capital: Non-financial value capture also includes the accumulation of social capital. This involves building networks, relationships, and trust within the healthcare ecosystem, which can provide long-term benefits such as easier access to resources, partnerships, and influence within the industry as suggested by participant SM4, from the startup-mentor section illustrated,

"I would highly advise to look in the non financial value capture for social capital." -SM4

The integration of both the existing and newly identified elements, i,e from the literature review and the interviews transforms the value capture framework, as illustrated below in figure Insights from both section 3.2.5 and section B.2 and from the graph 5.4 for financial value capture and graph 5.5 for non financial value capture were incorporated to develop this representation of the value capture segment. The prioritisation of the additional elements was made based on the researcher's understanding based on the interviews. The elements highlighted in blue were the ones identified through semi-structured interviews and the rest were based on the literature review.

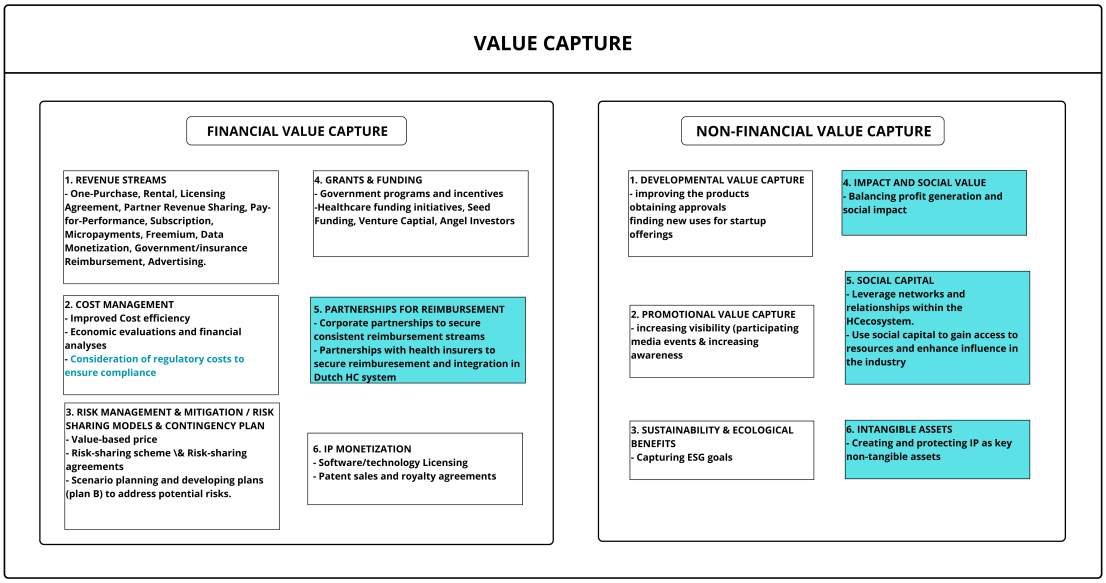

Figure 5.11: Value Capture - Additional Elements

5.2.3. Value Delivery - Additional elements

In case of Value delivery, in total there were eight new points identified by the participants. The supporting first order quotes along with second order themes for the aggregate dimension of value capture based on the Gioia Methodology is seen in the figure 5.12. The detailed evidence of the supporting quotes by the participants for each point can be seen in Appendix B in the table B.3.

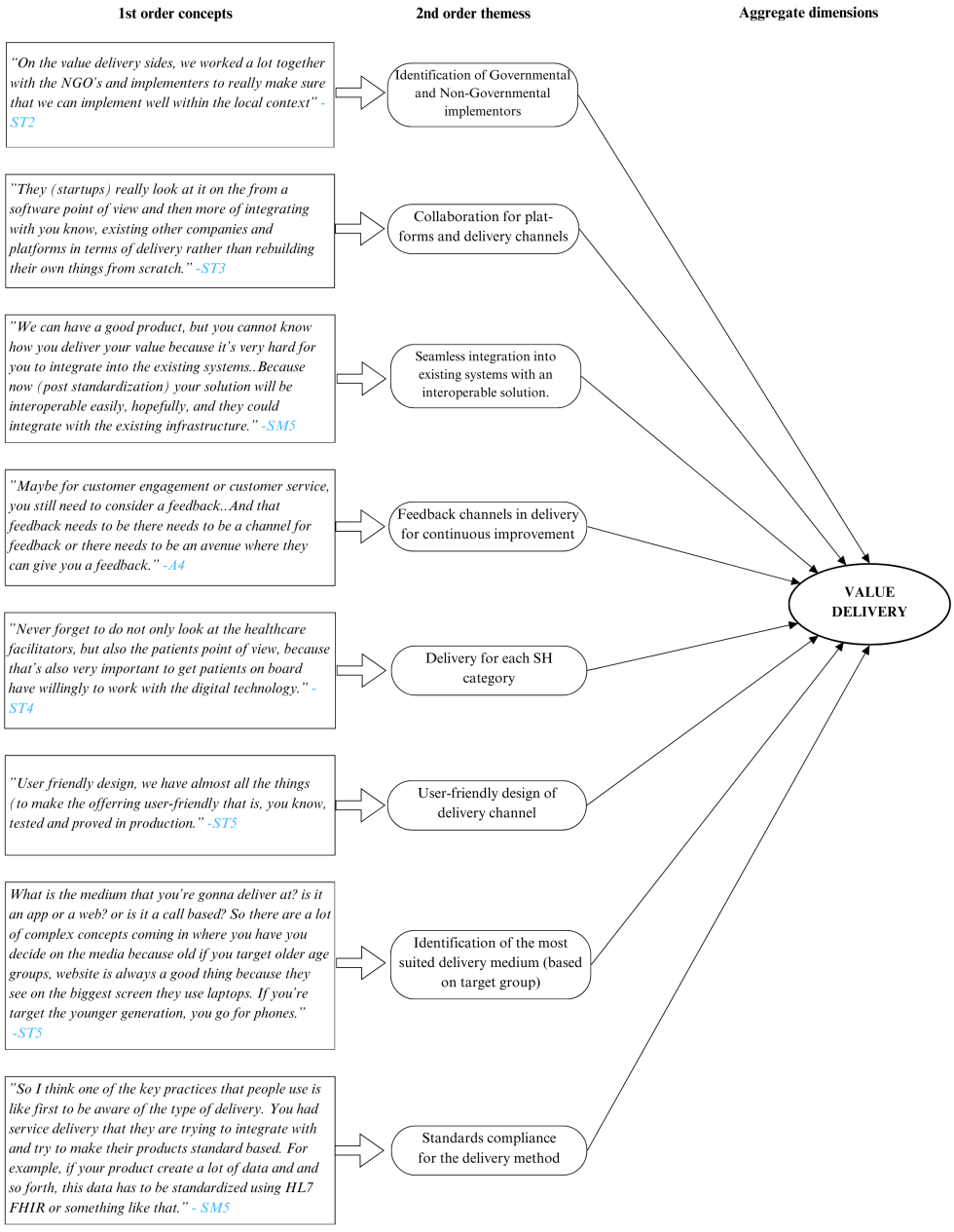

Figure 5.12: Value Delivery: Additional Elements (Gioia Methodology)

The description of each of these eight second order themes identified via interviews are discussed as follows:

1. Identification of Governmental and Non-Governmental Implementors: As mentioned by a startup team member, successful value delivery requires collaboration with governmental and non-governmental organizations (NGOs) to ensure that digital health solutions are effectively implemented within the local context. These partnerships help in navigating local regu-

lations and ensuring that the solution is adopted and scaled appropriately. A participant ST2, a startup founder quoted about this element under value delivery saying, *"On the value delivery sides, we worked a lot together with the NGO's and implementers to really make sure that we can implement well within the local context."* - ST2

2. Collaboration for Platforms and Delivery Channels: Startups often focus on integrating their solutions with existing platforms and companies rather than building new systems from scratch. This approach leverages existing infrastructure, facilitating faster and more efficient delivery while reducing development costs and complexities. This concept is well captured in the statement by the participant ST3, *"They (startups) really look at it on the from a software point of view and then more of integrating with you know, existing other companies and platforms in terms of delivery rather than rebuilding their own things from scratch."* - ST3

3. Seamless Integration into Existing Systems with an Interoperable Solution: For effective value delivery, it is crucial to ensure that new digital health solutions can be seamlessly integrated into existing healthcare systems. This involves developing interoperable technologies that align with current workflows and IT infrastructure, minimizing disruptions and enhancing adoption. This element was succinctly conveyed by participant SM3, A2 and SM5 and was deemed as one of the important point they consider in real life scenario. This is best captured in the words by SM5,

"We can have a good product, but you cannot know how you deliver your value because it's very hard for you to integrate into the existing systems...Because now (post standardization) your solution will be interoperable easily, hope- fully, and they could integrate with the existing infrastructure." - SM5

4. Feedback Channels in Delivery for Continuous Improvement: Establishing robust feedback channels is vital for continuous improvement in value delivery. Regularly collecting and integrating user feedback ensures that the product or service remains relevant, user-friendly, and capable of evolving in response to changing needs and challenges within the healthcare environment. This was articulated by participant A4, A1, ST5, SM5 and the essence is captured by the quote,

"Actively collecting information from the user to understand, first, what problems do they have and from the, regulatory standpoint of view, that can be an issue, what problems do they have or where could they see an improvement there? Where could there there use even usability or their workflow being proved?" -A1

5. Delivery for Each Stakeholder Category: It was addressed by participant ST4 & A3 tailoring delivery strategies to meet the needs of various stakeholders—such as patients, healthcare providers, and informal caregivers—is essential. This holistic approach ensures that all relevant parties are engaged and that the solution is effectively utilized across different user groups. This point is echoed in the statement,

"Think you need to look at the wording (about customers) with a more holistic picture here, because they're not, there are many more people than customers - children, family, informal, caregivers, nurses." -A3

6. User-Friendly Design of Delivery Channel: Participant ST5 highlighted, ensuring that the delivery channels are user-friendly is critical to the successful adoption of digital health solutions. The design must be intuitive and accessible, catering to the specific needs of the target audience to enhance usability and engagement. This is specifically important when it comes to digital health startups, as technology and digital literacy becomes an important aspect to consider in the design of the delivery channel.

"User friendly design, we have almost all the things (to make the offering user-friendly) that is, you know, tested and proved in production." - ST5

7. Identification of the Most Suited Delivery Medium (Based on Target Group): As pointed by participant ST5, hoosting the appropriate delivery medium—whether an app, website, or another platform—based on the target demographic is key to effective value delivery. For example, older users might prefer a web-based interface, while younger users might favor mobile apps, ensuring that the solution is accessible and user-friendly for the intended audience. This is articulated in the quote,

"What is the medium that you're gonna deliver at? is it an app or a web? or is it a call based...?..So there are a lot of complex concepts coming in where you have you decide on the media because old if you target older age groups, website is always a good thing because they see on the biggest screen they use laptops. If you're target the younger generation, you go for phones." - ST5

8. Standards Compliance for Products/Services and Delivery: Participant SM5 emphasized the importance of adhering to industry standards, such as HL7 FHIR for data interoperability, is crucial in the delivery of digital health solutions. Compliance with these standards ensures that the product can integrate smoothly with other systems, facilitating broader adoption and ensuring that data generated is compatible with existing healthcare infrastructure.

"So I think one of the things that the people or key practices that people use is like first to be aware of the type of delivery. You had service delivery that they are trying to integrate with and try to make their products standard based. For example, if your product create a lot of data and and so forth, this data has to be standardized using HL 7 FHIR or something like that." -SM5

The integration of both the existing and newly identified elements, i,e from the literature review and the interviews transforms the value delivery framework, as illustrated below in figure 5.12. Insights from both section 3.2.5 and section B.3 and from the graph 5.7 were incorporated to develop this representation of the value delivery segment. The prioritisation of the additional elements was made based on the researcher's understanding based on the interviews. The elements highlighted in blue were the ones identified through semi-structured interviews and the rest were based on the literature review.

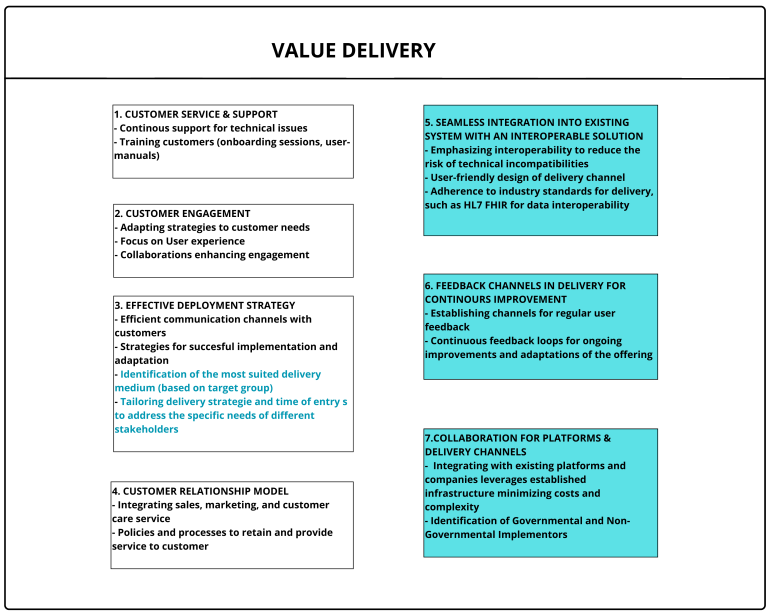

Figure 5.13: Value Delivery - Additional Elements

5.3. External Influencing factors on value creation, capture & delivery

The elements and sub-elements of value creation, capture and delivery have been captured in holistic way in sections 5.2, however based on the interviews, several external influences play a critical role in shaping value creation, capture, and delivery in Dutch digital health startups. These influences can be categorized into technological, social, economic, and regulatory-legal domains, each exerting a unique impact on the business models of these startups.

Technological influence: Technological advancements play a pivotal role in the development and deployment of digital health solutions(Zott & Amit (2017)). However, the integration of these technologies into existing healthcare systems presents significant challenges. As one participant ST5 noted, *"tech is more big problem because integrating to health systems to connect all the technologies is difficult."* Drawing an argument from the literature, technology innovation can facilitate integration of the digital health offering with the existing healthcare systems allowing seamless data sharing, better patient management, and coordinated care(Rose et al. (2017)).

Another view about technological influence consisted of influence of technological developments on how digital health startups in The Netherlands create, capture and deliver value. For instance, advancements in AI, IoT significantly affect operations and the nature of offerings of these startups as stated by ST1 talking about technological advancements in AI and how it affects their startup, *"The biggest hype cycle right now is of course, AI, which even someone some people call like the AI bubbles, like when it's gonna burst. Nobody really knows how to work with it."* It was also emphasized in the literature that technology innovations, such as AI, big data, and IoT can enhance customer interaction by providing more convenient and personalized healthcare experiences and can bring out structural changes in HC (Konopik & Blunck (2023)).

The startups need to keep updating their technology based on the overall advancements in order sustain and maintain the relevance of their offering, compared to the competitors.

Regulatory & Influence: Regulatory and legal factors are among the most significant external influences on digital health startups. These factors determine the standards that must be met and the legal implications of product deployment in the market.

In case of **regulatory influence**, it is important for digital health startups in The Netherlands to have a compliance with regulation for market access and for healthcare sector, compliance with regulation can necessitate adjustments to business model(Alalääkkölä et al. (2021)). Thus any changes in regulations can significantly affect the value, creation, capture and delivery of the startups and hence, navigating these regulations effectively is vital for startups, as failure to comply can result in significant delays, additional costs, or even the inability to bring a product to market(Åström et al. (2022)). Participant ST6 captured this while saying, *"In general, the EU and European countries also, I would think the global north has more regulations on like patient privacy. If we're talking about healthcare specifically, for example, but also, yeah, I would say that's probably the biggest one is like the data patient data, confidentiality, privacy, all of that"* - ST6

Furthermore, the regulatory landscape can create a trade-off for startups between product functionality and regulatory compliance. As highlighted in the interviews by SM6, startups often face a dilemma: *"A lot of startups will have to think, do I want to increase my functionality in my product to being classified as a medical device... or I will keep my functionalities down even when I know that might not be very meaningful in terms of value creation."* This reflects the challenge of balancing innovation with regulatory compliance.

Legal factors play a pivotal role in shaping the strategic decisions of digital health startups and thus is an important external influence (Bente et al. (2024)). For digital health companies, ensuring compliance with data protection laws such as the General Data Protection Regulation (GDPR) is not just a regulatory requirement but also a legal imperative that affects their reputation and trustworthiness in the market. Additionally, decisions regarding IP, such as whether to pursue patents or trademarks, can significantly impact a startup's ability to capture and protect the value of its innovations. This was captured by Participant A2 while discussing the following.

"I think that when you develop a digital health technology in The Netherlands, you there are a lot of rules that you need to respect, especially to make sure that the data that you put inside and it's for patients GDPR..extremely sensitive data for patients. " - A2

Moreover, participant ST1 highlights the differences in legal liabilities between the US and EU business models, particularly in digital health, particularly in terms of the power to sue the business. This is captured by the quote, *"..let's say liabilities legally which is an influence I would say..let's say in the US model and then the European one, a lot of these business models also for the digital ones"* - ST1

These two are in the same category as participant SM4 pointed out their similarity saying, "I would argue legal and regulatory are very similar.I would argue legal and regulatory are very similar."

Economic and Political Influence: Economic factors, such as labor shortages and financial incentives, directly influence how digital health businesses capture value (Rose et al. (2017)). Participant SM1 emphasized this point by saying, *"If you look at economical and if you look at these external factors, economical impact labor shortages."* In regions where labor shortages are prevalent, digital health solutions that enhance efficiency or reduce the need for manual labor may be particularly valuable. This economic context can determine the marketability and scalability of a startup's offerings.

Political influences, including national and regional policies, also play a crucial role (Janssen & Moors (2013)). As participant SM3 mentioned, "Political changes or programs to stimulate certain developments... it's national policy, but can also be a regional policy." These policies can either support or hinder the development and deployment of digital health technologies. For instance, government initiatives that promote digital health can provide startups with funding or favorable conditions for testing their products.

Social and Cultural Influence: Social and cultural contexts play a critical role in shaping how digital health solutions are received and adopted(Folkvord et al. (2023)) (Bastoni et al. (2023)). Cultural also encompasses healthcare culture of a particular region as the culture within healthcare institutions, particularly hospitals, can significantly impact the success of a new offerings, businesses. As participant ST4 mentioned, *"I think there is also a big cultural influence based on the culture of the hospital... if a doctor is not willing to change the way he's working because he's always working that way, you're never gonna be able to make a change."* This resistance to change within established healthcare practices can be a major barrier to the delivery of value, even when the technological solution is sound. Moving ahead in cultural factors, as pointed out by participant A4, particularly the risk adverseness inherent in Dutch society, can significantly influence the innovation landscape for digital health startups. The cultural hesitation to embrace risk can act as a barrier to the adoption of new ideas and technologies in especially finding investors. As observed by A4, *"The Dutch in terms of the culture, they're very risk averse...So Netherlands can be quite risk averse and they can be quite hesitant and in that sense, they kind of lose out on certain good ideas."* This cultural tendency may hinder the motivation of entrepreneurs who rely on the agility and boldness required to innovate in a rapidly changing field like digital health.

Additionally, the social aspect can affect the digital health businesses. One of the aspect here is digital literacy that is crucial in the adoption of digital health solutions. As captured by participant SM5, "*Social influence definitely helps literacy and tech literacy is a very important aspect... a lot of startups in the Netherlands will look at how these solutions could be used by people who are not tech savvy."* Furthermore, social influences those related to entrepreneurial ecosystem and external trends, play a significant role in shaping the trajectory of digital health startups in The Netherlands. The supportive environment of a country, in this case The Netherlands fosters innovation and entrepreneurship by providing ample resources and networks to help startups grow as was mentioned by A4.

In conclusion, the process of value creation, capture and delivery in digital health startups is heavily influenced by external factors such as technology advancements, regulatory and legal frameworks, social and cultural contexts, economic conditions, and political environments. As the interviews suggest, these factors are deeply intertwined and must be navigated carefully to ensure the success of digital health startups.

5.4. Conceptual Value Framework Final Version

In the section 5.1 the existing elements of the framework were verified, in section 5.2, new elements were identified based on practitioner and academics interviews and in section 5.3, additional external influences on value creation, capture and delivery for Dutch digital health startups were identified.

5.4.1. Nature of Interaction between Value creation, capture and delivery

In the next part of the interviews, the participants were asked how value creation, capture and delivery interacted with each other in Dutch Digital Health startups. All of the 15 interviewees mentioned the two-way iterative cycles between value creation, capture and delivery as also seen in figure 4.6. This is encompassed in a quote by SM1, *"It's a continuous process, so that those arrows go in both ways and that's why make a circle until you finally have something that is an MVP minimum viable product.."*

Furthermore, it was pointed out that the iterative process is not confined to the overall cycle of value creation, capture, and delivery but also occurs within each phase. As another participant SM5 pointed out, *"I would do like circles of iteration in the three of them, and then the three of them when they come together... within each one of them there is a huge iterative process."* This aids in highlighting that the process doesn't follow a strict linear path but instead involves going back and forth between the phases. For example, after an initial attempt to capture value, a startup might realize that adjustments in the value creation phase are necessary, prompting further iterations before the product or service is reintroduced into the market.

5.4.2. Building the conceptual Value Framework

For demonstrating a holistic view of the Dutch Digital health startups, the framework was developed based on key considerations, inspired by (Kamp et al. (2021)).

- The business model is subdivided into three components as described by (Osterwalder et al. (2005)): value creation, value capture and value delivery.
- The framework should be should have an applicability to broad spectrum of digital healthcare systems.
- The sub-elements under each value creation, capture and delivery are recognized in the framework.
- The application of the conceptual framework should primarily focus on the startups.
- The external factors affecting value creation, capture and delivery are identified.
- The interaction between each value creation, capture and delivery is identified in the framework.
- The final version (i.e version two) of the framework must be tailored to the contextual factors of The Netherlands.

Bringing in the practical aspects from the interviews in chapter 5, the version one of the conceptual framework in section 4.6 was validated and further developed to provide a more holistic final version of the conceptual value framework for Dutch digital health startups, as shown in the figure5.14.

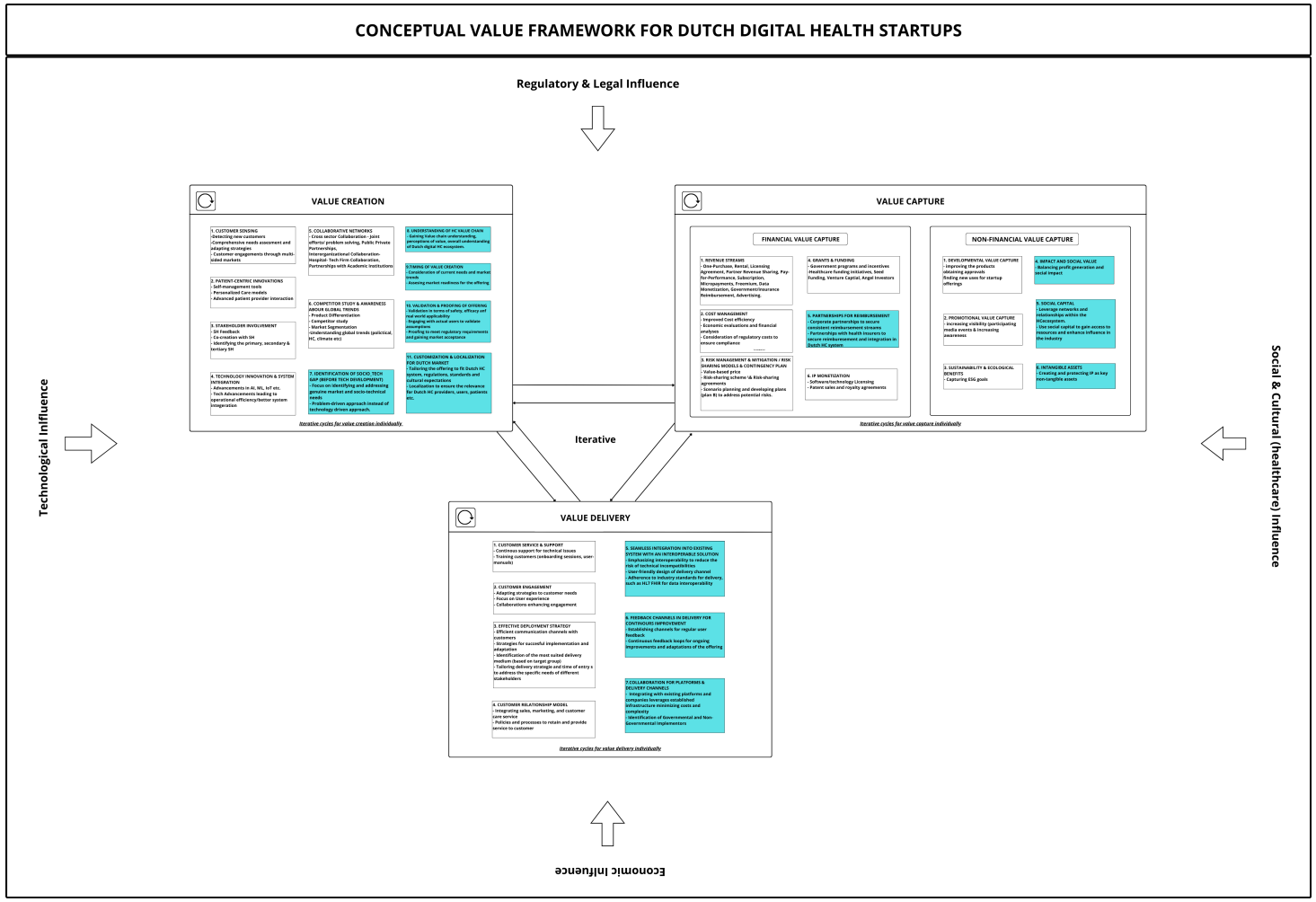

Figure 5.14: Conceptual value framework for Dutch Digital Health Startups- Final version

Capturing Dynamics in Business Model Framework

This section discusses the criteria essential for capturing the dynamic nature of business model frameworks based on work by (Khodaei & Ortt (2019)). The first criterion that reflect dynamics in BM frameworks based on (Khodaei & Ortt (2019)) is **Completeness**. This criterion refers to the comprehensive inclusion of both internal organizational aspects & external environmental factors that influence the model. This criterion has been captured here by incorporating key elements under value creation, capture and delivery alongside relevant external influential factors captured in the Conceptual Value Framework for Dutch Digital Health Startups.

The second criterion to capture dynamicity of BM frameworks is **Interrelationships**, which is the ability to identify and assess interrelationships between variables. These relationships could be within the internal components of the business model and between the business model and external environmental variables (Khodaei & Ortt (2019)). This aspect was addressed during the interviews, where participants were asked whether they perceived any interconnections between the elements of the Conceptual Value Framework for Dutch Digital Health Startups. This criterion about interrelationships is captured in the figure 5.15.

Based on the framework presented in figure 5.4.2, several interconnections are observed between the elements of value creation, capture, and delivery. There was strong interrelation of customer sensing and customer service and support and with customer engagement as pointed out by participant ST5 and A4 respectively. This was in line with (Rose et al. (2017)), arguing that health sector needs to closely integrate customer sensing mechanisms with customer support and engagement strategies to ensure a seamless feedback loop. The participant A2 pointed out the interrelation between stakeholder involvement as was also touched upon in (van Limburg et al. (2015)) stating that customer sensing is intertwined with the active involvement of end-users in the iterative co-creation process. Moving on, participants A4 and ST5 pointed out interrelation between revenue streams and cost management elements in financial value capture as optimizing operational processes can reduce costs while maximizing revenue (Stanimirovic (2015)). Another participant ST5 stated revenue streams & sustainability & ecological benefits had an interrelationship as was also highlighted by (Visconti & Morea (2020)) how integrating eco-efficiency models into financial mechanisms helps healthcare projects balance sustainability with profitability. Lastly, participant A3 pointed that there was strong interrelationship between the elements of financial and non-financial value capture at a higher level, as also highlighted in the literature by (van Limburg et al. (2011)) while discussing how eHealth solutions not only generate financial returns through cost-saving innovations but also create value through non-financial elements like improved patient outcomes and system efficiency. This integration of financial and non-financial factors is key to capturing the full value in the healthcare system (van Limburg et al. (2011)) (Christie et al. (2019)).

The third and fourth criterion to capture dynamics are **Interrelationships Over Time** and **Framework Changes** respectively (Khodaei & Ortt (2019)). Although these points are not captured in this research due to inherent limitations, it indicates that the conceptual framework discussed should evolve in response to internal and external changes considering the third criterion. For example, the influence of regulatory and legal factors on value creation might shift as a startup grows, which in turn would alter the pathways for capturing and delivering value. In case of the fourth criterion, the conceptual framework needs to be adaptable, reflecting the need for continuous innovation in response to changing market conditions and disruptive technologies (Khodaei & Ortt (2019)).

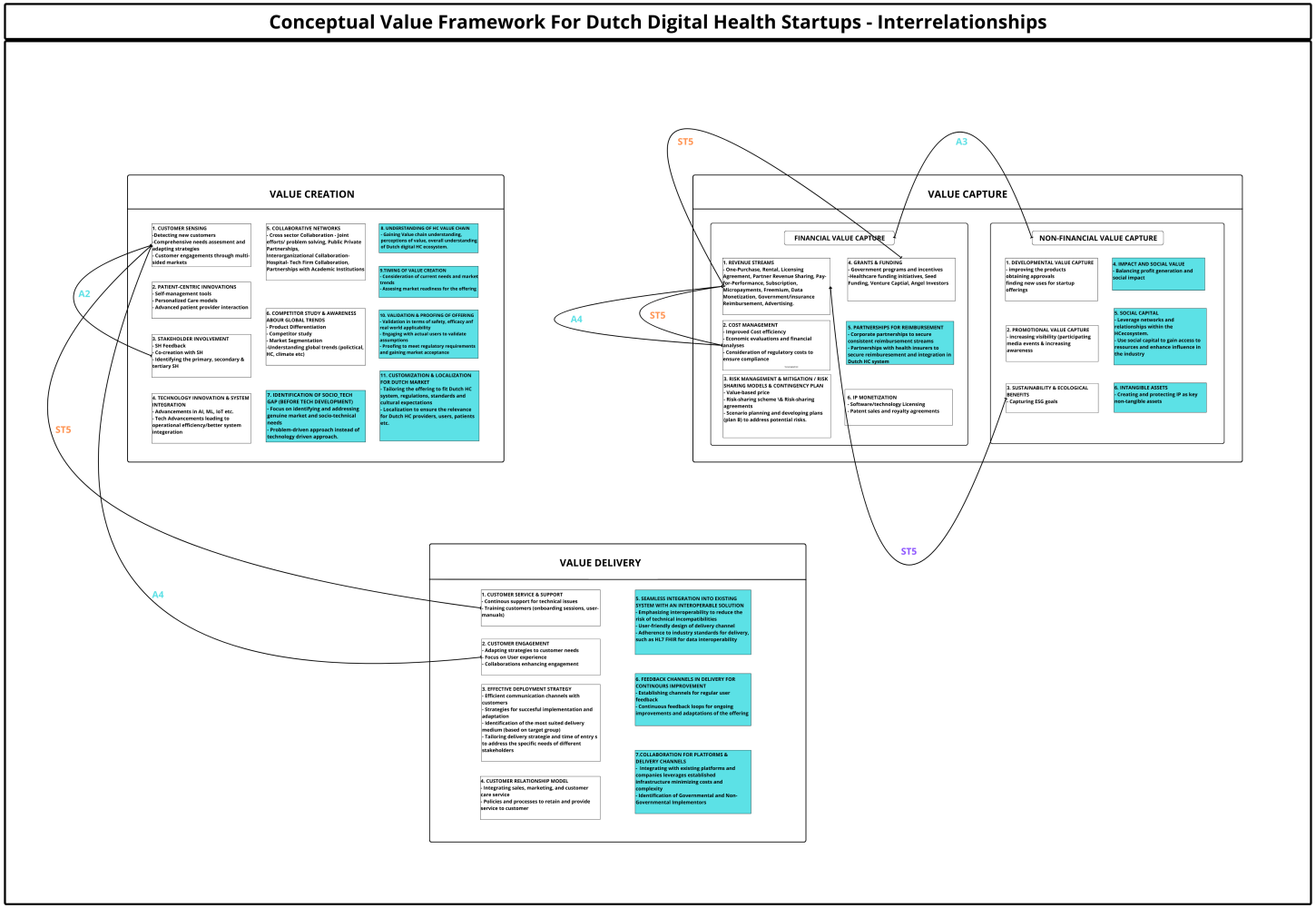

Figure 5.15: Conceptual Value Framework - Interrelationships

5.5. Conclusion

In conclusion this chapter not only presents a holistic view of the Dutch Digital health startups through the Conceptual Value Framework, but also touches upon the dynamicity aspect for BM framework in turn answering the main RQ. The verification of the elements identified through literature under value creation, value capture, and value delivery, along with the addition of new elements derived from semi-structured interviews with practitioners and academics in the field, provides a deeper understanding of the perspectives of Dutch digital health startups. This directly contributes to addressing SQ3. The final version of the Conceptual Value Framework for Dutch Digital Health startups is the main outcome of the research giving a holistic understanding of value creation, capture and delivery and nature of their interaction along with external influences. This chapter also briefly discusses the dynamicity aspect of BM Frameworks portraying the how participants viewed the interrelationships in the elements.

Thus final Conceptual Value Framework for Dutch Digital Health Startups, was also reviewed and validated by participants ST3, SM1 & SM2. This addresses the SQ3 and in turn the main research question as well representing a holistic view of the Dutch digital health startups. In conclusion, this chapter combined with chapter 3 and 4 successfully addresses all the research questions.

6
Discussion

This chapter does a comprehensive analysis of the research findings, contextualizing them within the broader framework of existing literature and the specific environment of Dutch digital health startups. The chapter begins with a reflection on the key findings, where we critically examine the data and explore the deeper meanings and implications of the results. Following this, the chapter delves into the practical and theoretical implications, highlighting how the research contributes to both academic knowledge and real-world applications. The limitations of the study are then discussed, including a critical reflection on the methodology used, which provides transparency and acknowledges any potential constraints. Finally, the chapter concludes with suggestions for future research, offering pathways for further exploration and refinement of the conceptual value framework developed in this study.

6.1. Revisiting the Research Questions

The main research question for this thesis was ”What conceptual framework would demonstrate a holistic view of the Dutch digital health startups?”. The main research question was answered through three sub-questions. The first one was about the key elements involved in the process of value creation, capture & delivery in the digital health domain. This question was answered based on the themes emerging from the literature review and the themes from the semi-structured interviews with the practitioners and academics in the field as seen in the section 3.2.5 and section 5.2 respectively.

In case of the second Sub-question, the main frameworks used to study business models of the Dutch digital health startups, along with how they align or diverge from the unique requirements of Dutch digital health startups, were adequately discussed in the literature and is stated in the section 4.2. The frameworks that the participants mentioned they used to formulate their BM matched with the ones discussed in the literature. As Business Model Canvas was the most mentioned tools as seen by a representative quote by SM3, *” I think most of them use the business model canvas because it’s so widely spread and everybody knows how to use it.”*. Although the rest of the frameworks were used to elucidate the Digital Health BM in the literature widely, they were not as commonly mentioned in practical use by the participants.

Lastly in case of the third sub-question, which was about the key elements involved in value creation, capture and delivery in the digital health domain based on the perception of the Dutch Digital Health startups was addressed through the validation of existing elements in section 5.1 and additional elements in the section 5.2 in each of the three as discussed in Chapter 5. Thus, SQ1 and SQ3 in turn helps in answering the main RQ presenting the conceptual framework as seen in the figure 5.14 which is based on the insights from the literature study validated and built upon through the practical insights from the interviews with practitioners and academics.

SQ2 helps in giving a practical insight about the frameworks being used in practice.

6.2. Reflection on the Findings

This section discusses the findings from participants and also contrast it with the literature, delving into each of these aspects into upcoming section. On a higher level, there no striking contrasts in literature about most of the elements of value creation, capture and delivery or the categories in which the elements belonged to. There was a overall understanding about the usefulness of the conceptual value framework as well. However there were contrasting views about the internal iterations in value creation, capture and delivery each. There were also some contrasting opinions about the placement of value proposition in the light of the conceptual value framework.

6.2.1. Reflection on findings: Value creation

All the six elements retrieved from the literature as seen in figure 3.3 were considered important and relevant by practitioners. Quite unanimously, customer sensing was refereed as the most important step, and the importance of testing your offering with the end users was emphasized as is also stated in the literature by (Rose et al. (2017)). Given the healthcare context, having patients central to the innovation was also given the due importance as stated in the literature by (Bartels et al. (2022)) and (Sprenger (2016)). As is stated widely in the literature, (Latuapon et al. (2023)), (van Limburg et al. (2015)) and others as mentioned in figure 3.1, stakeholder involvement and co-creation right from the early stages of the startup was stressed upon by the startup founders in digital health domain. The rest of the three elements, namely collaborative network, competitor study and tech-innovation were validated and referred to as important elements as well.

From the interviews, the most repeating point to be taken into consideration for the startup founders, was identification of the socio-technical gap before getting deeper into tech development. It was stated strongly by participants from all the three subgroups namely, ST1, SM4, A3 that the technology could be a simple one but the solution it addressed should be recognized correctly by the startups. It was acknowledged in the literature that healthcare can have have complex value chains (Stanimirovic (2015)), participants stressed the importance of recognizing the value chain for the startup founders. In addition to the key points mentioned, the other elements were also given significant attention and were therefore incorporated into the framework. Each new insight provided by participants was cross-validated in subsequent interviews, ensuring the framework's robustness and reliability.

6.2.2. Reflection on findings: Value capture

For value capture the differentiation into financial and non-financial value received positive views from all the participants without any contrasting views about the differentiation. While the elements of the financial value capture were unanimously accepted, giving special emphasis on the revenue streams and costs management, followed by risk management and mitigation plan. However it was stated by A4 that for startups just starting out grants and funding could prove to be more important than that of the rest of them. About the additional element, a startup team member ST5 gave a real life example of partnerships for reimbursement through partnership with insurers or with corporate.

A point that was not quite straight-forward was the rest was the about the intellectual property.The placement of intellectual property and that of ESG goals within financial or non-financial value capture was somewhat challenging to determine.

Firstly, intellectual property can be considered part of financial value capture on one hand due to the potential for generating revenue through royalties or selling the IP. On the other hand, it also fits within non-financial value capture because it contributes to building intangible assets, which can enhance the overall value and strategic positioning of the company. Keeping this in mind, this point was also stated as 'IP monetization' in financial value capture and in non-financial value capture as 'intangible assets'.

Secondly, ESG (Environmental, Social, and Governance) goals sit at the intersection of financial and non-financial value capture. On one hand, ESG initiatives can drive financial value by appealing to investors, enhancing company reputation, and potentially leading to cost savings or new revenue streams. For instance, companies that prioritize ESG may attract impact investors and customers who value sustainability, thus influencing their bottom line. On the other hand, ESG efforts also contribute to non-financial value by fostering social responsibility, improving environmental impact, and building intangible assets such as trust and brand loyalty.

Given this, this research considers ESG goals to fall under non-financial value capture as because they primarily focus on creating long-term societal and environmental benefits that enhance a company's intangible assets, such as reputation, brand loyalty, and stakeholder trust. This view is also discussed in (Eccles et al. (2014)), how accounting for sustainable development (like ESG goals) focuses on creating long-term value beyond financial gains. Given how important capturing ESG goals is in the light of sustainable initiatives conducted by various companies, it has a separate box and is not a placed in the intangible assets box in the framework. It also discussed in (Serafeim (2020)) how companies are moving beyond viewing ESG as an intangible asset driver but viewing it as a core element of company strategy. Unlike financial value capture, which directly concerns measurable economic gains, ESG initiatives often prioritize ethical considerations and sustainability, which may not immediately translate into financial returns. By fostering a sustainable and socially responsible business model, companies build a more resilient foundation that can support long-term success, even though these benefits might not be directly quantifiable in financial terms. Therefore, while ESG can have indirect financial impacts, its core value lies in the non-financial realm of creating positive societal impact and enhancing corporate responsibility.

Another view about capturing ESG goals was that, although on paper companies want to place sustainability in high regard, when it comes to actual operations, it becomes difficult to place sustainability and ESG goals on a higher priority as was understood by the interviews. This being said, sustainability and ESG is a point important enough given the Paris treaty for all industries to consider. Although in case of digital health firms, the impact might not be as intense, it is still a good practice to consider it and hence include the point in the framework.

6.2.3. Reflection on findings: Value delivery

In case of Value delivery, customer support & service along with customer engagement were highly prioritised, followed by effective deployment strategy and followed by the customer relationship which talks about integrating marketing and sales to customer care service. There

was a consensus among all the participants about these existing elements.

In terms of the missing elements, it was rightly pointed out that feedback channels in value delivery were essential by multiple participants namely A1, A4, ST5 and SM5. It was mentioned that feedback channels played an important role in improving the startup offerings significantly. Another important point was seamless integration into existing healthcare system, especially keeping in mind the intricacies of Dutch healthcare and reimbursement system and complexities of stakeholders involved. By integration, the participants rightly pointed out the technological integration as well. In order to ensure smooth delivery a some startups prefer to collaborate with existing platforms and hence collaboration for platforms and delivery channels also becomes an important and hence takes a separate point in the framework. The missing points under deployment strategy identified through interviews was identification of a suitable delivery medium and tailoring delivery strategies and timing of entry of the offering.

Thus, overall there were no contradicting points in value delivery with a total of seven main elements in the final framework as part of value delivery.

6.2.4. Reflection on the Findings: Influencing factors and Iterative nature

The interviews introduced and gave a nuanced understanding of these external influences that might have not been directly mentioned in the literature as seen in the section 5.3. Economic & political influence was emphasized based on real-life experiences of the practitioners as Dutch economy would quite obviously play a big role in market dynamics for the startups and political factors would directly influence the governmental initiatives. As these two closely interact with each they are placed together in the framework. Similarly interviews pointed out that regulatory & legal influences also could be interrelated and thus they are placed together as well. Startup founders illustrated how healthcare culture of a region plays a role in how value creation, capture and delivery takes places and especially in the penetration of the startup offering and acceptance in the existing healthcare system also mentioned briefly by (Kijl et al. (2010)).The social influence captures how people of The Netherlands would accept the offering that the startup has to make. This could encompass cultural aspects of the region as well. As these two are closely related and discussed in cohesion by the participants, they are placed together. Lastly technological aspects were unanimously accepted to have a fair share of external influence and is hence placed individually.

All participants unanimously agreed that business models must undergo iterative cycles, where value creation, capture, and delivery are interconnected and continuously refined, as illustrated in the figure 5.14. It was also agreed upon that value creation is the starting point and then come value capture and value delivery and iterative cycles of growth. However, when it came to internal iterations within each of these phases—value creation, capture, and delivery—participants believed that such internal cycles were not present in each phase. Participant ST6 mentioned that sometimes individual process of value creation, capture and delivery happen in isolation sometimes but the optimal way to do it is having individual iterations as captured through the essence of interviews.

Another participant SM5, quite holistically captured the essence of the iterative nature between the triad and the internal iterative cycles between the three. This argument is evidently expressed in the following quote,

"I would do like circles of iteration in the three of them, and then the three of them when they come together..Looking at the three together is also an iterative process and But within each one of them there is a huge iterative process." -SM5

This being said, some interviewees, namely A4 and SM2 were against the view of internal individual iterations. However the experience of ST6 and SM5 in digital health domain in terms of years and position is higher than A4 and SM2 and hence this research went ahead taking views of participants ST6 and SM5 about the internal iteration within each boxes of value creation, capture and delivery.

In discussing how value creation, capture, and delivery are conceptualized within digital health startups, participants consistently endorsed the triad framework, highlighting its effectiveness in capturing the iterative and interconnected nature of these processes. For instance, participant SM4 emphasized the strength of this triadic approach, noting that it not only underscores the iterative nature of value processes but also ensures a comprehensive focus on the integration and interdependence of these elements. SM4's perspective illustrates how the triad framework effectively encapsulates the dynamic relationships between value creation, capture, and delivery, reinforcing its applicability in the digital health sector. This validation from participants suggests that the triad framework provides a robust and holistic tool for understanding and guiding the strategic processes within digital health startups, making it a valuable framework for both practitioners and researchers.

In conclusion, considering all the discussed arguments, the external influences and the iterative nature of the elements, the overall visualization was refined, leading to the development of the second version of the conceptual framework.

6.2.5. Placement of Value Proposition in the Conceptual Framework

The triad of value creation, capture and delivery is validated by the practitioners and academics through semi-structured interviews. They were also asked questions about placement of value proposition in the framework and there were varied responses for this as captured in this section.

A. Some participants believed that the value proposition emerged only after the iterative cycles of the triad—value creation, capture, and delivery—had been completed, as reflected in the quote from the practitioner ST5,

"You start with value creation, then you go to the capture You deliver it, you figure out a delivery mode mode, and then you decide on the value proposition." -ST5

B. Moving ahead, there was another stream of thought that saw value proposition as a subset of value creation as is captured by the quote by SM1 below.

"I would always start with the value creation and so the value proposition is something that needs to be part of the value creation process." -SM1

C. Lastly, the third stream of thought believed the value proposition to be at the centre of the all the three processes. This is in line with (Osterwalder et al. (2010)), where value proposition is seen central to the business models.

"Value Proposition is the centre of everything (framework)..I think I see proposition is really holistic. It's all of these points coming together that creates a proposition which should come

with the competitive advantage." -ST3

Having gone through these three streams of thoughts, this research would align better with the third stream of thought where value proposition is central to the three processes of value creation, capture and delivery as per the understanding of the researcher and also as described widely in the literature (Osterwalder et al. (2010)). Here value proposition is a way how a company differentiates its offering from its competitors and drives customer decisions. As was validated by two startup teammates ST4 and ST3, value proposition is central to the triad, however is not a part of the framework as, it is better visualized on another plane than that of value creation, capture and delivery.

6.3. Implications for practice & theory

This section shall deal with the practical and theoretical implications of the research based on the understanding of the practitioners and academics and the interpretation of the researcher. Right from the beginning of the research, the aim was to have a good combination of practical and theoretical applications and relevance of the research.

6.3.1. Practical Implication

When the participants were asked if they saw a practical relevance of the conceptual value framework for the Dutch digital health startups, there was a unanimous acceptance in varying amounts about usefulness of the framework. Nearly all practitioners highlighted that the conceptual value framework serves as a foundational tool for building every new digital health startup. The following points were discussed in relation to the practical relevance.

Starting Point for nascent Entrepreneurs in healthcare domain: The framework provides to those who are new to entrepreneurship, with clarity and direction, helping them navigate the complexities of starting a business in the already complex digital health domain as agreed by SM2, A3, SM4 and A1.

On similar lines, the framework is also relevant to guide and inspire people who are outside of the healthcare and entrepreneurial system who intend to contribute along with the ones who are already a part of this system.

Given that the entrepreneurs and startup teams involved in digital health have to take into consideration a lot of factors, right from regulation till technology till market penetration, framework acts as a good reminder to consider all the points especially for newcomers.

Thus, for the people new to the field, the framework can be highly relevant but for the ones who are already experienced in entrepreneurship and digital health it might not be as relevant as a starting point but can still aid in structuring their thoughts.

Structured approach for all: This conceptual value framework offers a structured approach to fostering innovation and guiding the development of startups. This systematic methodology helps entrepreneurs navigate the complexities of building a successful business as mentioned by participants SM1, ST5 and A1 based on their real-life experiences.

As further elucidated, this structured approach can help startups identify pivot points, that might prove to be useful and give a better outcome for the startup. Moreover, a startup founder ST3 confirmed that a framework of the sorts can help in managing risks better as startups would

have considered most of the relevant points if they refer to a framework.

Another participant, ST5, also emphasized this point, noting that frameworks provide a structured approach and makes it easier to periodically refer back to them, especially when juggling multiple tasks in day-to-day operations. Frameworks serve as a guide to streamline processes, allowing entrepreneurs to navigate their activities more efficiently, rather than being viewed as an inflexible set of rules.

Guiding Startups effectively: Moving ahead, the conceptual framework can be useful for startup mentors and consultants in guiding new digital health ventures effectively by offering a structured, objective approach to assessing and supporting startups. It allows mentors to pinpoint specific areas within the three key fields—value creation, capture, and delivery—that may require additional focus or development.

Thus, this framework would give a structured approach to mentoring and consulting the digital health startups.

Significance from investors perspective: Lastly, the conceptual value framework holds significant practical relevance, from an investor's perspective. When startups seek to raise funds, it becomes crucial for them to demonstrate that they have thoroughly considered all aspects of their business model. While investors might not necessarily want to see the framework or canvas itself, they expect entrepreneurs to have a deep understanding and strategic approach to value creation, capture, and delivery. This understanding reassures investors that the startup has a solid foundation and is well-prepared for growth and scalability.

Thus, after exploring the practical relevance, the next section will delve into the theoretical relevance.

6.3.2. Theoretical Implication

The theoretical relevance of this research apart from the contribution to existing knowledge within business models of digital health ventures, shall discussed in depth in this section.

Overarching theory: The literature review proved that a conceptual value framework for digital health startups was lacking, especially in the context of The Netherlands. Thus the framework contributes to the digital health literature holistically looking at the Business Model of digital health startups from a lens of value creation, capture and delivery. The contribution to theory can also eventually prove to be a link between academic theories and practice. This was elucidated by academic participant A3,

"what you're doing is great because people are struggling to in practice and and also in theory, there is no overarching theory to describe this venturing entrepreneurial process.it has many relevancies for startups, but also entrepreneurial people in the health system." - A3

Building Block for a functional Template: The conceptual value framework can act as the first step in formulating an easy to use template for entrepreneurs with digital health ventures. A participant SM5 also touched upon this as seen in the following quote,

" Most people who have more entrepreneurial minds is they have hard time to look at conceptual frameworks. This is very abstract for them, but it's just like, OK, give me a business model canvas with all of the orders, 5 columns and and two rows and you know and I can fill in things and just ask me questions." -SM5

Thus, having a usable tool would demand next step of academic research in building a robust and practically applicable tool through thorough theoretical research that shall be discussed as a part of future research.

6.4. Limitations

It is indeed necessary to acknowledge the limitations inherent in this research and the implications it might have on the interpretation of the findings and point the direction for further research and recommendations.

There were several limitations to this research. Starting with the literature study II: Integrative Review, as only empirical data, case studies, meta-analyses, bibliographic analyses, or systematic reviews were included based on the inclusion criteria there is a possibility missing some research work outside of this realm. There is also a slight chance of perceptual error in the inclusion and exclusion of articles in the review as a single reviewer was included. Engaging multiple reviewers could have made the inclusion and exclusion process more robust and minimized potential biases.

Secondly, there are potential limitations in terms of the choice of the sample. Although purposive sampling was employed to select participants to match their expertise in the field, there is a possibility of bias that individuals could bring in. Moreover, the sample size consisting of startup founders, teams, mentors and academics in the field of digital health and business models was considerably small. This small size could also be as digital health domain is not as much in vogue as general healthcare. With limited time and access to practitioners, only 15 semi-structured interviews could be conducted and only limited information was available through these interviews. Further on, interviews as a source of data in itself comes with limitations. There is possibility that the data retrieved could be in a distorted form (Korsgaard et al. (2021)). The fact that semi-interviews steer a conversation in a certain pre-defined way, this brings a possibility of inadvertently influencing the responses that the interviews give.

Moving forward, the number of participants involved in each of the three categories in the semi-structured interviews, namely startup founder/team (ST) , startup mentor/consultant(SM) and academic researchers (A) were unequal. There were 6 members in ST category, 5 in SM and 4 in A category, this leads to unequal weights on views leading to outcomes biased towards one category. In addition to that, for prioritization of elements in section 5.1 depicted by the radar graphs, the participants had a free will to select as many elements as they perceived had high importance. Thus for prioritization it means that people selected the more elements had a greater influence and the ones who select lesser elements had a lower influence on the prioritization.

Moving to the next point, in section 5.4.2 which explores the dynamics of business models, this research was unable to fully address the criteria of 'Interrelationships over time' and 'Framework changes' due to time limitations. The constrained time-frame of the study made it challenging to conduct a longitudinal analysis, which would have been necessary to thoroughly examine these aspects. Additionally, during the interviews, not all participants provided insights on the 'interrelationships,' resulting in incomplete input regarding this criterion of business model dynamics. Moreover, during the interviews, some participants did not provide insights on the 'interrelationships,' leading to incomplete data on this specific criterion of business model dynamics.

Lastly, the first version of the framework was validated through semi-structured interviews as seen in section 5.1 however the final version of the framework did not undergo the same level of validation, thus making this a limitation.

6.5. Recommendations for Future Research

This section is divided into two parts, where the first part addresses the limitations in a future study and the second part discusses how future research can build on this research.

6.5.1. Addressing Limitations for Future Research

While addressing the limitations, the future research should include wide spectrum of the practitioners and test the framework using multiple case study of digital health startups in The Netherlands, in order to make sure that robustness and external validity of the research is maintained. Moreover, The number of participants in all the three categories of the participants must be equal for future research to insure equal influence of all categories on the results. Furthermore, the interview questions can be set individually to cater the area of expertise the participants from each of the three categories of startup teams, mentors and academics, instead of having a same set of interview questions for all.

For a more detailed and nuanced analysis of the prioritization of the elements in value creation, capture, and delivery, participants should be asked to rank the elements by priority instead of just selecting the top ones. This approach would provide deeper insights into the relative importance of each element.

As a part of further research, steps should be taken to validate the final version of the framework presented as well. This could be done through a focus group meeting to fine tune and have a constructive criticism about the framework. While doing so level of expertise should be given a consideration, and the level of expertise should be comparable, especially in case of the focus group meetings.

Lastly, the future studies can address BM dynamics more comprehensively. Insights about the interrelationships criterion from the literature can be better incorporated in the Framework. IN addition to this longitudinal research can ensure validation based on all the four criteria by (Khodaei & Ortt (2019)) for ensuring that the BM framework is dynamic.

6.5.2. Building on the current research: Potential pathways for continued research

The Conceptual Value Framework presented in this study provides a comprehensive understanding of digital health startups in The Netherlands. However further research can contribute to fine tuning the for the sub-types of the digital health. This means to refine the holistic framework to suit sub-types of digital health like ehealth, mhealth, telehealth and telemedicine (Fatehi et al. (2020)) as is described in the section 3.2.2. This refinement could be achieved by examining cases within each sub-type, categorizing them, and then comparing and contrasting to identify both similarities and differences. This approach would help fine-tune the framework to meet the unique needs of each specific digital health category.

Another recommendation is to account for the various stages of startups and the dynamic nature of their development within the framework. It is important to distinguish between startups

that are building their offerings from the ground up and those that are more established, focusing on incremental improvements. Future research could explore the nuances and differences in business models for these distinct categories. In addition to that, there could be another distinction in terms of the Dutch startups who have their market in The Netherlands and the ones who have it globally or outside of The Netherlands.

In addition to the points discussed above, future research could benefit from incorporating the typology of healthcare entrepreneurs into the framework. According to (Janssen & Moors (2013)), Dutch healthcare entrepreneurs can be categorized into four distinct types: isolated, innovative, evolutionary, and revolutionary. These types differ in their perceptions of how individual entrepreneurs contribute to structural changes within the healthcare system. By integrating these entrepreneurial types into the framework, future tools could better accommodate the diverse strategies and beliefs of healthcare entrepreneurs, thereby enhancing their practical applicability and relevance to various entrepreneurial contexts.

Lastly as mentioned previously, the Conceptual Value Framework presented in this study is only a theoretical framework which cannot be used directly as a tool by entrepreneurs. For future research a usable tool can be developed from the conceptual framework that entrepreneurs can directly use by filling data and employ the insights that they can apply in practical life. Although a bit far fetched, this research can be furthered by complimenting the framework with a software wherein changes in the BM can be captured and represented in a visually appealing way and while capturing the dynamicity aspect of BM framework. The software can offer multiple functionalities, such as allowing digital health entrepreneurs to input various parameters. Based on these inputs, the software can then provide tailored recommendations on the actionable steps the entrepreneur should take, guided by the underlying framework upon which the software is built.

6.6. Conclusion

This chapter revisits the research questions to verify if they have been adequately answered through the research. There is a discussion about reflection on the findings that follows discussion about iterative nature and influencing factors, ESG goals serving dual roles, position of value proposition etc. Moreover, there is also a discussion about implications of having the conceptual value framework in practical life offering a structured approach to the practitioners in the field along with the theoretical implication, providing a foundation for future research for building a tool for Dutch digital health startups. The limitations of this research, a crucial aspect of any study, are thoroughly examined in this chapter followed by recommendations for future research divided into two parts. The first part addresses the limitations of this research and the second part discusses pathways for furthering this research. In summary, the discussion chapter provides a reflection on the findings, highlighting the practical and theoretical implications while addressing limitations and offering a pathways for future research in advancing digital health business model framework.

7
Conclusion

This research successfully addressed the main research question by presenting a Conceptual Value Framework for Dutch Digital Health Startups.The main research question was answered through three sub-questions, shedding light on the elements of value creation, capture, and delivery in the digital health domain, as well as how Dutch digital health startups perceive these elements. In doing so, key frameworks discussed in the digital health realm were also analyzed. By examining existing frameworks, the state of art for digital health business was understood. This study represents an initial step toward developing a practical tool that entrepreneurs can use to gain actionable insights. The conceptual framework developed here serves to conceptualize the core elements of value creation, capture, and delivery for Dutch digital health startups. However, it is not yet a fully functional tool for immediate application. At this stage, the framework can function as a guiding checklist, helping entrepreneurs ensure that key aspects of their business models are accounted for. Furthermore, it provides a structured approach to organizing their strategic thinking, offering a more comprehensive perspective on the interrelated components of their ventures.

In order to have holistic view of how Dutch digital health startups create, capture and deliver value, this study went through phase of a thorough literature review that gave the first version of the conceptual framework for the digital health startups. Going one step ahead, this framework was validated and built upon based on the practitioners and academics in the field from The Netherlands. The practitioners brought in a insights from the real world startups and academics brought in their expertise from years of research in the digital health field along with the tacit knowledge that they have gathered through their research. This in turn lead to developing a final version of the Conceptual Value Framework for the Dutch Digital Health startups. This has addressed the significant gap in understanding how digital health startups navigate the complex regulatory and market environment by answering the research question at hand about how Dutch digital health startups create, capture and deliver value. Thus emphasizing the importance of a robust business model tailored to the specific challenges of the Dutch healthcare landscape, ensuring that digital health ventures can effectively balance innovation with regulatory compliance and patient safety and multiple other factors identified through this study.

The conceptual framework developed here not only supports startups in structuring their business models but could also possibly provide a guideline for investors and academics to better understand and support the growth of digital health initiatives and research in the field. This research can be further expanded as mentioned in the Future Recommendations section, to develop a practical tool for entrepreneurs that provides actionable insights and helps reduce risks. This can go ahead to motivate entrepreneurs to build digital health startups, capable of serving a larger portion of the population, thus contributing to public health in a true sense. This effort

can make a small contribution towards achieving the UN's Sustainable Development Goals, particularly SDG 3: Good Health and well-being (UN (2015)) which aims to ensure healthy lives and promote well-being for all at all ages.

The study also adopted a critical approach to its research design, acknowledging the inherent limitations and exploring avenues for further research. Recommendations for future research included suggestions based on the limitations of this research along with potential pathways for a continued research.In the long run, development of a software application that allows entrepreneurs to input data and receive actionable insights, can further enhance the practical relevance and applicability of the framework.

In conclusion, this study contributes to both theoretical and practical knowledge by offering a framework that can go a long way with further research in terms being broadly applicable and contextually relevant. It serves as a foundation for future research and a guide for practitioners in the field, ultimately aiming to enhance the sustainability and success of digital health startups in The Netherlands.

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A
Appendix

A.1. Interview Process

The semi-structured interview was carried on using Miro Board in order to have to aid better communication between the interviewer and the interviewee and lasted for approximately 30 minutes.The general structure of the interview is as follows.

- The interview started with an open ended question in order to have a general understanding perceived the process of value creation, capture and delivery and any experiences that they would like to share about their experience with digital health startups in the Netherlands. Although the experts were given a high level definition of value creation, value capture and delivery in the research overview document (as mentioned further in this section) beforehand, the experts were free to perceive the in depth meaning of these relevant terms based on their experience and position in order to an unbiased understanding. After having a response to this open ended question, the participants were presented the visual aid for this question on Miro Board (Miro (2024)) is as seen in the following figure. - -SQ1

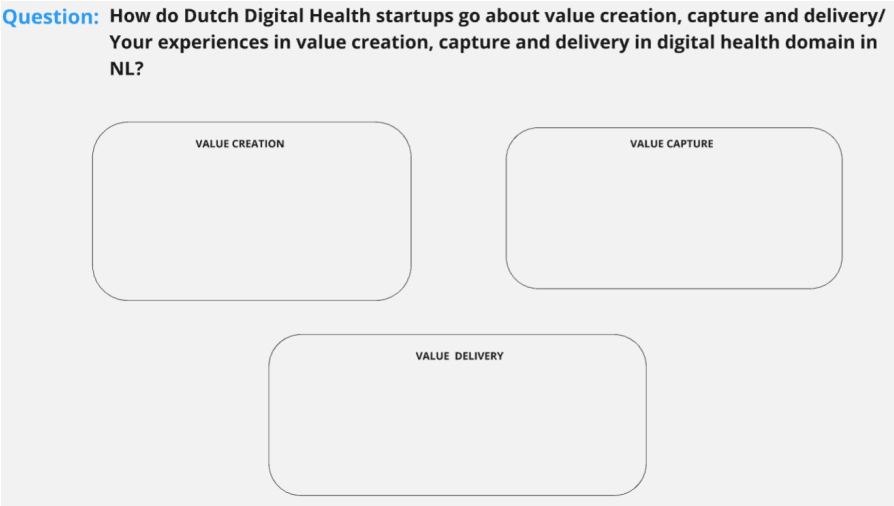

Figure A.1: Visual aid on Miro for question1 in the participant interviews

- In the next step, the participants were presented the version 1 of the conceptual value Framework for Dutch Digital Health Startups as seen in the figure 5.3 The interviewees had to go through each value creation, capture and delivery in the framework and comment on two aspects:

A. If the existing elements under value creation, capture and delivery are valid and are appropriately placed from the point of view Dutch digital health startups. B. If there are any additional elements under each of value creation, capture and delivery that need to be considered from their view. -SQ1 & SQ3

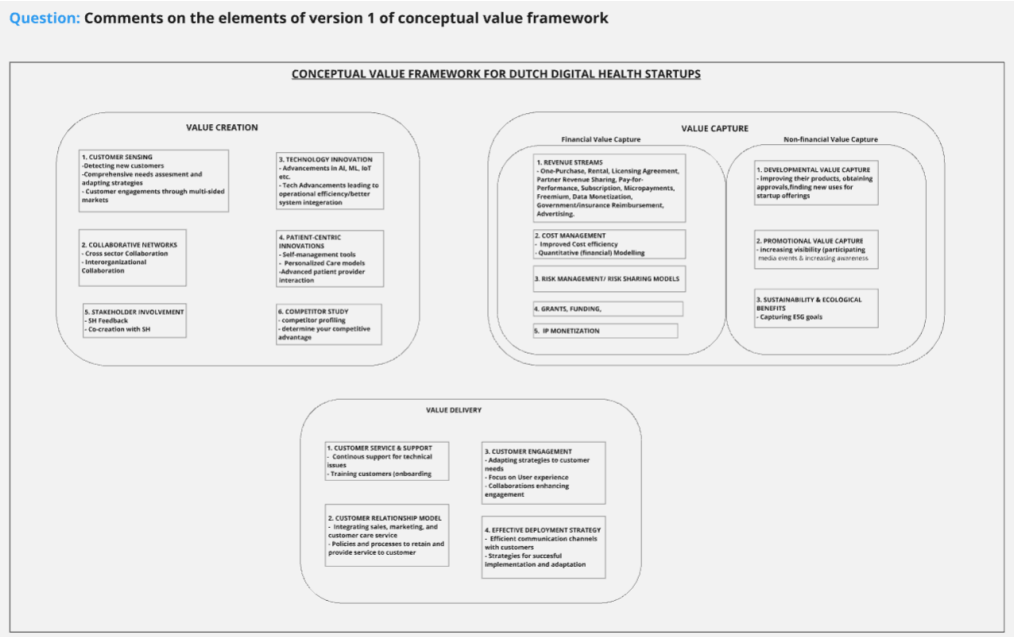

Figure A.2: Visual aid on Miro for question 2 in the participant interviews

- The next step in the interview included questions about the factors that externally influence the process of value creation, capture and delivery.They were also asked to draw from personal experiences about external influencing factors. This aided in understanding what are the external factors that play a role in influencing the value creation, capture and delivery. -SQ1 & SQ3

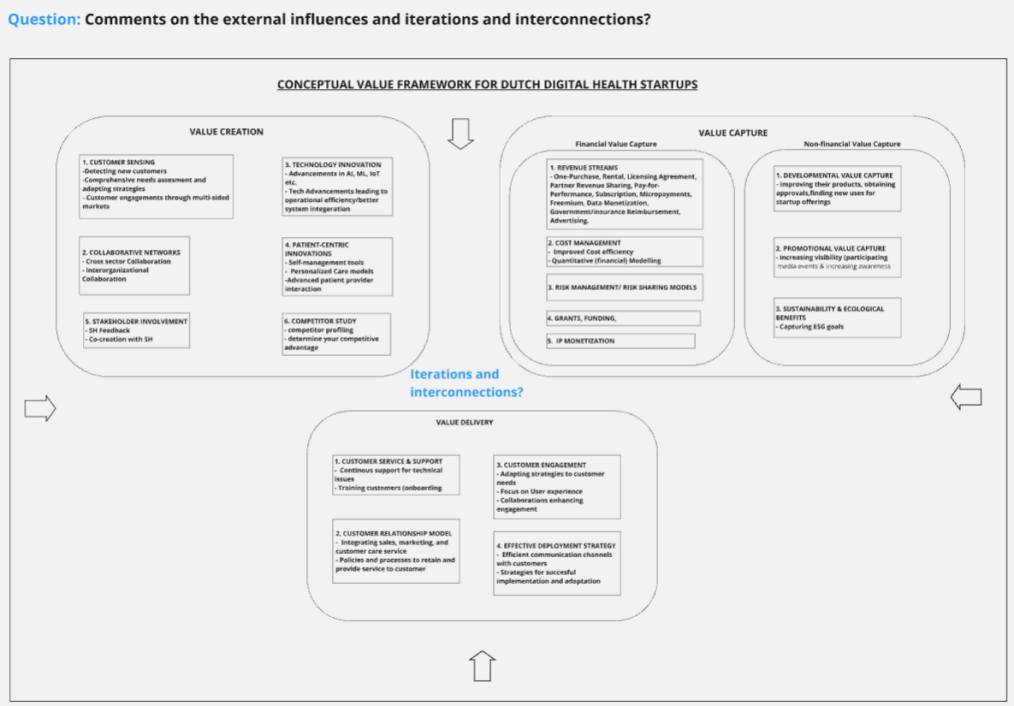

Figure A.3: Visual aid on Miro for question 2 in the participant interviews

- Moving ahead, the experts were interviewed about how they would visualize the processes of value creation, capture and delivery and place their comments they might have about interrelations and iterative nature in detail. They were also asked if they see any inter-relations within each elements. -Main RQ
- In this step the experts were asked the elements they deemed of high importance from each value creation, capture and delivery keeping in mind a perspective of Dutch digital health startups.The participants were free to select as many points they considered of a high importance. -SQ3
- In the last step, the experts were asked how they perceived the practical relevance of the framework. Secondly, they were asked what are the tools that they use in practice (similar to Business Model Canvas etc.)? This question was set to understand the practical relevance of the framework.

A.2. Participant Confirmation email

Dear [Participant],

Thank you for accepting my meeting invitation. I have attached the overview of research with this email that could help you give a holistic idea of the research.

Also, could you please take a moment to sign the informed consent form that I have attached with this email?

Thanks a lot. Your insights would surely contribute greatly.

Regards, Mrunmayee

A.2.1. Research overview document for participants

This document was attached with the participant confirmation email.

Dear Expert Interviewee,

Thank you for agreeing to participate in this research. This document provides an overview of the study and outlines what to expect in the interview.

Research Overview

This research focuses on the business models of digital health startups in the Netherlands. According to the commonly agreed definition by Osterwalder, a business model explains how an organization creates, delivers, and captures value. In line with this definition, the interview will explore these aspects in the context of Dutch digital health startups. The main question guiding this research is:

"How do Dutch digital health startups capture, create, and deliver value?"

Key Concepts

Value Creation: Value creation refers to the benefits that a firm's products or services provide to its customers, which can be economic, social, or functional.

Value Capture: Value capture involves strategies to ensure that a firm retains the value generated from its activities, preventing it from dissipating to competitors, customers, or other entities. This is crucial for the long-term sustainability and profitability of a business.

Value Delivery: In the digital health sector, value delivery involves the methods and processes through which the created value is provided to end-users, such as patients and healthcare providers.

This being said, the experts are encouraged to interpret value creation, capture, and delivery based on their experience, expertise and position in the field.

Interview Structure

The interview will be structured as follows:

1. **Identification of Business Model Elements:** Experts will state the how they see the business model elements for digital health startups in each category: value creation, capture, and delivery.
2. **Review of Conceptual Framework:** Experts will provide comments on a conceptual framework presented to them.
3. **Interconnections within the Business Model Framework:** Experts will comment on how business model elements in the framework are linked and how they visualize the overall framework.
4. **Selection of Key Elements:** Experts will select and discuss the elements they consider of high importance within the framework.
5. **Practical Relevance:** Experts will comment on the practical relevance of the framework and the tools they use in their professional lives (e.g., Business Model Canvas).

The interview would be conducted online on **Teams** and shall make use of **Miro Board** for better visualization of the Business Model framework.

This document provides a brief overview of the upcoming interview. Thank you for taking the time to read this. Your contribution is invaluable to advancing research in the digital health field. Looking forward to our interaction.

Thank you once again!

Warm regards,

Mrunmayee

Figure A.4: Research Overview - attached with participant confirmation email

A.3. Participant Consent Form - Template

You are being invited to participate in a research study titled “Investigating Business Models of Digital Health Startups in the Netherlands” This study is being conducted by Mrunmayee Londhe an MSC candidate, Thesis researcher from TU Delft.

The purpose of this research study is to explore the business models of digital health startups. The aspects of business models investigated are value creation, capture and delivery. Your participation will involve answering interview questions related to how relevant startups go about value creation, capture & delivery while managing the relevant stakeholders. It is estimated to take approximately 25-30 minutes to complete. The data collected will be used for academic research purposes, including publication and informing policy decisions. During the study, you will be asked to answer questions about your Business model attributes specific to digital health.

Given that this study involves online activity, it is important to acknowledge the potential risk of a breach. We assure you that all your responses will be treated confidentially to the best of our ability. Measures will be taken to minimize risks, including ensuring anonymity and secure storage of data.

Participation in this study is voluntary, and you may withdraw at any time without penalty. You are also free to skip any questions you prefer not to answer. Please note that data collected from you will be retained for a period of 2 years following the completion of the study, after which it will be securely deleted.

PLEASE TICK THE APPROPRIATE BOXES	Yes	No
A: GENERAL AGREEMENT – RESEARCH GOALS, PARTICPANT TASKS AND VOLUNTARY PARTICIPATION		
1. I have read and understood the study information above, or it has been read to me. I have been able to ask questions about the study and my questions have been answered to mysatisfaction.		
2. I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.	☐	☐
3. I understand that taking part in the study involves ensuring the confidentiality of your responses by securely storing and anonymizing thetranscripts.		
B: POTENTIAL RISKS OF PARTICIPATING (INCLUDING DATA PROTECTION)		
4. I understand that participating in the study also involves collecting specific personally identifiable information (PII) such as designation, organisation and associated personally identifiable research data (PIRD) with the potential risk of revealing my identity.		
5. I understand that the following steps will be taken to minimise the threat of a data breach and protect my identity in the event of such a breach, including anonymous data collection, pseudonymization, secure storage, limited access and transcription.	☐	☐
6. I understand that the (identifiable) personal data I provide will be destroyed after publishing relevant research papers and theses i.e after two years following the completion of study.		
C: RESEARCH PUBLICATION, DISSEMINATION AND APPLICATION		
7. I understand that after the research study, the de-identified information provided will be used for reports, publications, and potentially framework development related to digital health apps, with possible inclusion of anonymized quotes.	☐	☐
8. I agree that my responses, views or other input can be quoted anonymously in research outputs	☐	☐
9. I understand that anonymized summary of conversation will be produced. I have the opportunity to read through the summary before it is included in Master Thesis.	☐	☐
D: (LONGTERM) DATA STORAGE, ACCESS AND REUSE		
10. I give permission for the de-identified responses that I provide to be archived in TU Delft repository so it can be used for future research and learning.	☐	☐

Figure A.5: Informed Consent Form

Signatures

Name of participant [print] Signature Date

I, as researcher, have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.

Mrunmayee Londhe Signature Date

Study contact details for further information: Mrunmayee Londhe, M.S.Londhe@student.tudelft.nl

Figure A.6: Signatures- Informed consent form

B
Appendix

B.1. Coding the interview transcripts: an example

As outlined in the methodology chapter, all interview transcripts were anonymized prior to analysis. Following this, the transcripts were systematically coded, with each aggregate dimension carefully identified—illustrated here through the example of participant ST6 and SM1 as seen in the figure B.2 and figure B.1 respectively. For each interview, key quotes were extracted from the transcript, which were then used to develop second-order themes corresponding to the relevant aggregate dimensions. This process was repeated for all 15 interviews, ensuring consistency. The analysis then followed a structured approach, allowing themes to emerge by examining patterns and similarities across the interviews using analysis trees. These trees were made using Canva Pro. Using this simplified the analysis process and made the visual representation of the transcripts in Canva more readable.

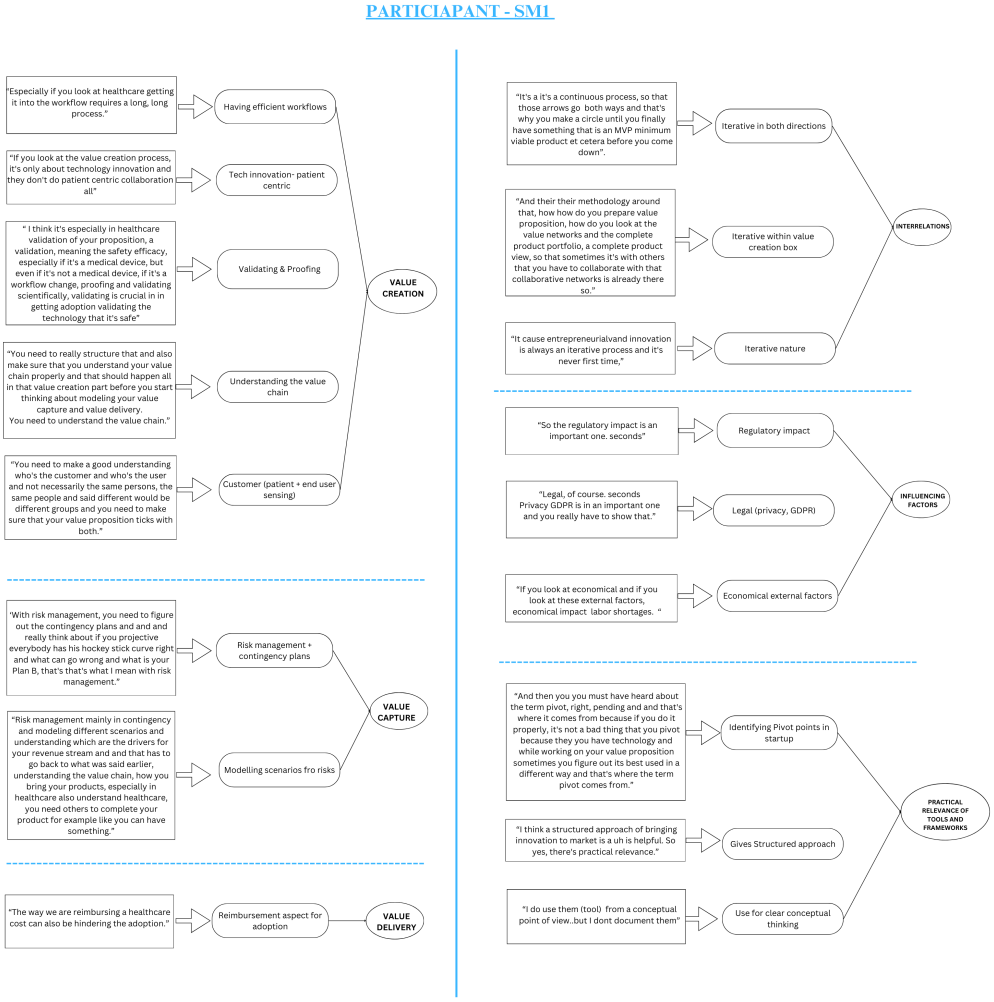

Figure B.1: Analysis of interview Transcripts example- participant SM1

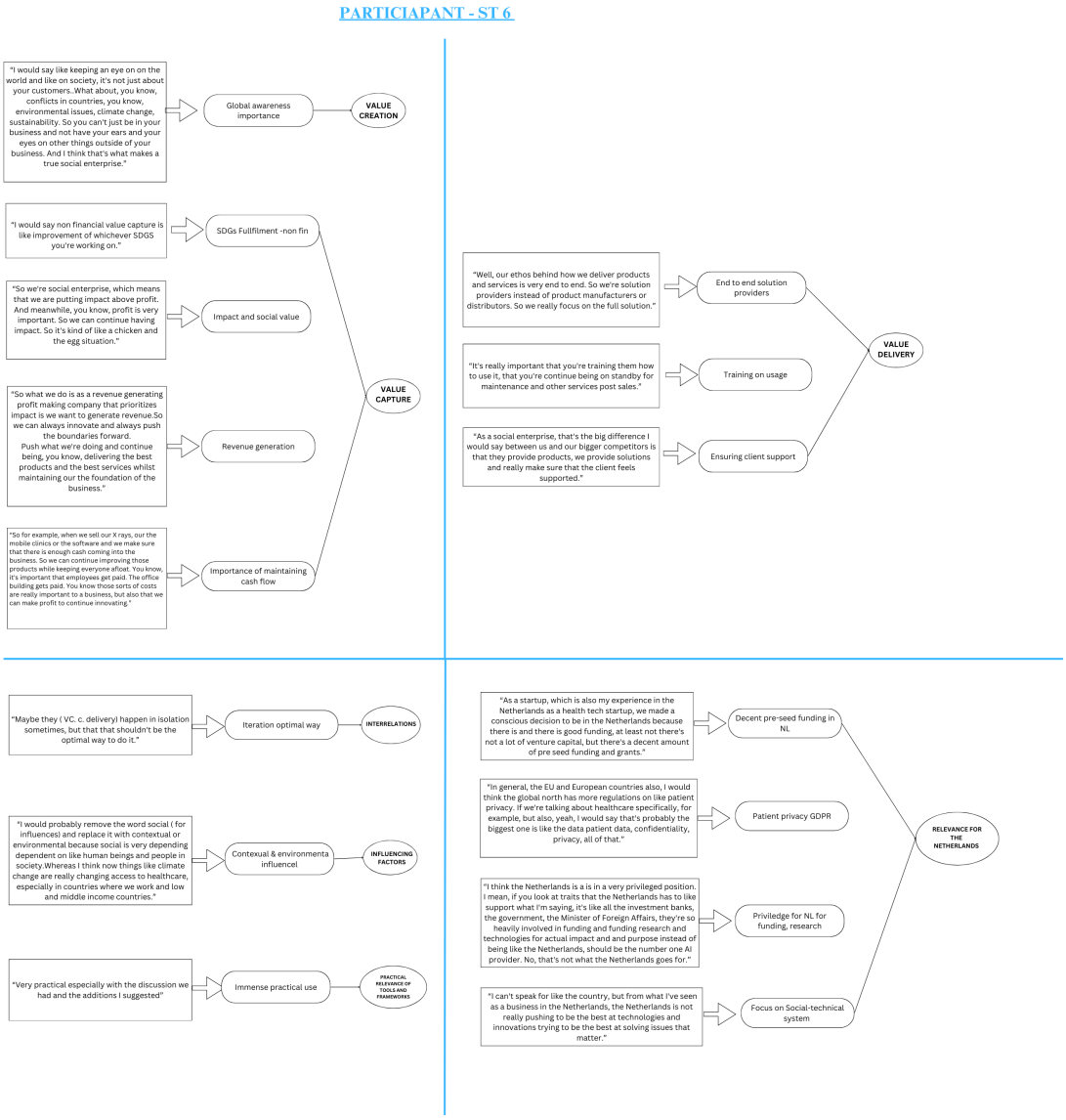

Figure B.2: Analysis of interview Transcripts example- participant ST6

B.2. Evidence for addition elements in the Framework identified through Interviews

The tables in this section give an evidence of all the quotes that lead to formation for themes for each value creation, capture and delivery.

Sr no.	Quotes (first order)	Participant reference	Second order themes
1	”You need to really make sure that you understand your value chain properly and that should happen all in that value creation part before you start thinking about modeling your value capture and value deliver.”	SM1	Understanding of the HC value chain
	”You have collaborative network, but it’s it’s not about having the network or using the network. What does the value chain look like. Who perceives it as urgent and who wants it to be fixed and what value can you create in that value chain? And this sounds like simple question, but in healthcare it’s very complex because there are so many people involved and so many different people think about what’s different value.”	A3	
2	”I think it’s the value part especially in healthcare is validation of your proposition that is missing. Validation, meaning the its safety efficacy, especially if it’s a medical device, but even if it’s not a medical device, if it’s a workflow change, proofing and validating scientifically (is important).”	SM1	Validation & proofing of the offering
	”One of the biggest problem in digital health startups in general, not necessarily in the Netherlands is that people will hypothetically assume a problem in healthcare delivery and then they will try to plan a certain product while in reality because they haven’t talked to the actual users.”	SM5	
3	”Why I wouldn’t put technological advancements (first) because I it gives the wrong kind of thinking. It gives the idea of thinking like ohh we have a I so we should do something with AI.”	ST3	Identification of socio-tech gap (before tech development)
	”What are you going to solve with your new development of your new technology? So it has to be and a question driven it you don’t want a technology push but you want really to invent or develop a solution which helps to solve problem an actual problem.”	SM3	
4	”Focus on end-user and patient and differences... Patient is the most important here.”	SM2	Identification of the distinction between end-user, patient, buyer and other SHs involved.

Sr no.	Quotes (first order)	Participant reference	Second order themes
	”And when I speak of customers, I mean paying customers, so not pilot partners or somebody or some organization where you can try it for free or but really who are your paying customers and what’s value for them.”	SM3	
	”We have focused a lot on the customers of our solution, but really on the end users of our solution, I think that’s a very important thing in health and digital health. That the customer might be hospital or hospital directly director or in our case, sometimes even an NGO”	ST2	
5	”I would say like keeping an eye on on the world and like on society, it’s not just about your customers...What about, you know, conflicts in countries, you know, environmental issues, climate change, sustainability. So you can’t just be in your business and not have your ears and your eyes on other things outside of your business.”	ST6	Awareness about global trends
6	”But the other aspect is also about whether my customers actually need it now at this moment, because you have certain elements that keep changing within time and there are certain trends.”	A4	Timing of value creation
7	”The solution was created by doctors and then we brought it into you know you can say into the Dutch market where we used the customized solution… and localized content”	ST5	Customization and localization for Dutch market

Table B.1: New elements for value creation (using methodology by (Gioia (2021)))

Value Capture - additional elements identified through interviews

Sr no.	Quotes (first order)	Participant reference	Second order themes	Financial/ Non-Financial
1	”With risk management, you need to figure out the contingency plans and really think about if you project it everybody has his hockey stick curve right and what can go wrong and what is your Plan B, that’s that’s what I mean with risk management.”	SM1	Contingency plan & scenarios modelling for risk management	Financial
2	”In the financial I would add some regulatory costs just to remind if you are going that way”	A1	Regulatory costs	Financial
3	”We also have corporate partnerships it’s like you know, you’re part of a health cast plan which is paid by your company rather than you”	ST5	Corporate partnerships for reimbursement	Financial
4	”We created partnerships with, say, health insurance companies, we are part of a law part of a lot of insurance companies based out of the Netherlands, Belgium, UK, even Germany who capture that value for us.”	ST5	Partnerships (with Health insurers)	Financial
5	”And I think for maybe non financial, you could also say intellectual property and you have patent..then patent becomes your non tangible assets.”	A4	Building Intangible assets	Non-financial
6	”So we’re social enterprise, which means that we are putting impact above profit. And meanwhile profit is very important so we can continue having impact. So it’s kind of like a chicken and the egg situation.”	ST6	Impact and social value	Non-financial
7	”I would highly advise to look in the non financial value capture for social capital.”	SM4	Social Capital	Non-financial

Table B.2: New elements for value capture (using methodology by (Gioia (2021)))

Value Delivery - additional elements identified through interviews

Sr no.	Quotes (first order)	Participant reference	Second order themes
1	“On the value delivery sides, we worked a lot together with the NGO’s and implementers to really make sure that we can implement well within the local context”	ST2	Identification of Governmental and Non-Governmental implementors
2	”They (startups) really look at it on the from a software point of view and then more of integrating with you know, existing other companies and platforms in terms of delivery rather than rebuilding their own things from scratch.”	ST3	Collaboration for platforms and delivery channels
3	”So (for value delivery) how is your new product called to change the regular way of working at the moment?.Do you have to skip first things? Is the process changed and that’s really very important when it’s about the use of your new product, service or whatever.”	SM3	Seamless integration into existing systems with an interoperable solution.
	”You want to understand how I can integrate an app with the existing system at the hospital and that it’s a huge milestone step when you develop app because sometimes you develop app thinking that they’re gonna work and they’re gonna be integrated properly, but the they’re not because of many reasons. So you want to understand how you can integrate technology in an existing healthcare IT systems.”	A2	
	”We can have a good product, but you cannot know how you deliver your value because it’s very hard for you to integrate into the existing systems...Because now (post standardization) your solution will be interoperable easily, hopefully, and they could integrate with the existing infrastructure.”	SM5	
4	”Maybe for customer engagement or customer service, you still need to consider a feedback..And that feedback needs to be there needs to be a channel for feedback or there needs to be an avenue where they can give you a feedback.”	A4	Feedback channels in delivery for continuous improvement

Sr no.	Quotes (first order)	Participant reference	Second order themes
	”Actively collecting information from the user to understand, first, what problems do they have and from the, regulatory standpoint of view, that can be an issue, what problems do they have or where could they see an improvement there? Where could there there use even usability or their workflow being proved?”	A1	
	”We having stability test running right we have, you know, continuous improvement pipelines where we actually get feedback from. The ground or from the production and local support services and we integrate that. if you are localizing your content, you also have to have support services in that language.”	ST5	
	”They (digital health startups) keep improving the solution itself from the feedback of the people So that’s also part of how you deliver value to your customers as a as a startup owner or as a product owner.”	SM5	
5	”Never forget to do not only look at the healthcare facilitators, but also the patients point of view, because that’s also very important to get patients on board have willingly to work with the digital technology.”	ST4	Delivery for each SH category
	”Think you need to look at the wording (about customers) with a more holistic picture here, because they’re not, there are many more people than customers (children, family, informal, caregivers, nurses.)”	A3	
6	”User friendly design, we have almost all the things (to make the offerring user-friendly) that is, you know, tested and proved in production.”	ST5	User-friendly design of delivery channel
7	”What is the medium that you’re gonna deliver at? is it an app or a web? or is it a call based...?..So there are a lot of complex concepts coming in where you have you decide on the media because old if you target older age groups, website is always a good thing because they see on the biggest screen they use laptops. If you’re target the younger generation, you go for phones.”	ST5	Identification of the most suited delivery medium (based on target group)

Sr no.	Quotes (first order)	Participant reference	Second order themes
8	”So I think one of the key practices that people use is like first to be aware of the type of delivery. You had service delivery that they are trying to integrate with and try to make their products standard based. For example, if your product create a lot of data and and so forth, this data has to be standardized using HL 7 FHIR or something like that.”	SM5	Standards compliance for the delivery method

Table B.3: New elements for value delivery (using methodology by (Gioia (2021)))