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THE FEMTECH DIRECTORY: HOW FEMTECH VENTURES CAN UNLEASH THE
FULL POTENTIAL TO ADVANCE WOMEN'S HEALTH

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Abstract

Although half of the world's population is female, the women's health market is considered niche. To fill this blank spot, the Femtech industry has emerged, yet remains vastly under-researched. Thus, this study leverages findings along the Femtech building blocks women's health, technology, and female entrepreneurship to propose a Strategic Directory and actionable imperatives for Femtech ventures. Concluding, for the aspirational industry promise to be fulfilled, research and practice require substantially more attention. Yet, an encouraging outlook prevails, as there are plentiful compelling business opportunities offering to be seized and a growing number of ventures with the ambition to do so.

Keywords: femtech, women's health, gender data gap, digital health, health technology, female entrepreneurship, strategic directory

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1 Introduction

“Half the population is women; they spend more on health care than men – why the hell is nobody serving them?!” (Expert interviews)

Why is it Essential to Address Women’s Health? Half of the world’s population is female. Yet, women’s rights and female-specific health concerns are still understood as interests of a minority. Historically, women have been treated as “little men in society, but with less importance” (Criado-Perez 2020, 1). In this regard, numerous discrimination cases against women could be listed. The case with the most severe outcomes however is the medical field. On the one side, females have been underrepresented in clinical trials, thus leading to poorer health of women compared to men (OECD and European Union 2018). On the other side, female-specific health concerns such as the menstrual cycle, menopause, and fertility are largely overlooked. Consequently, the subject of female health has been treated with taboos and stigma in society for many decades.

What Progress has been Made? Only in the 1960s, with the introduction of the contraception pill and the fight for women’s rights, first general awareness has been brought to the inadequate treatment of women’s health (Mishra and Suresh 2021). However, 60 years later, still little is known about female bodies despite an overall increase in medical research (WHO 2022d). Only this century, the call for inclusion of women in medical research increased. Enabled by a societal change, women started to address their conditions themselves, thereby raising awareness. As a reaction, players in the health care and pharmaceutical branch, as well as in the technology field, have started looking into topics related to women’s health. Although they have recognized the blank spot in the market, they are not primarily targeting it (Frost & Sullivan 2018). Yet, within this blank spot, an upcoming industry called Femtech originates as small ventures have started responding to a long-neglected need to advance women’s health.

What is Femtech? The term Femtech was first coined by Ida Tin in 2016, a Danish entrepreneur and co-founder of the period and fertility-tracking app Clue. It describes the “new and huge category addressing female health needs through technology” (Tin 2016) and, thus, captures an emerging industry developing innovative solutions for the benefit of women (Frost & Sullivan 2019). According to Tin (2016), the relevance of establishing a distinct term for the industry stems from the need to legitimize the female health tech market, thereby normalizing conversations about women’s bodies. Topics such as menstruation were – and often still are – taboo topics that suffer from stigmatization (Chrisler 2011). Hence, coining the term laid the foundation for Femtech by growing public awareness, business creation, and investment.

Why is this Work Relevant? As Femtech is at an initial stage of its development, little research has been addressed to it so far. Nevertheless, first analyses seem to find considerable potential in the new market (e.g., Frost & Sullivan 2020). This is due to growing health awareness, especially among women, rapid advancements in technology, and growing ambitions among ventures, primarily driven by female entrepreneurs. Notwithstanding, the industry’s promise is yet to be fulfilled. Thereby, it is uncertain how the industry will develop, which disciplines are relevant for growth, and how industry potential can be realized. For this reason, this study aims to answer the following research question:

How can Femtech ventures unleash the full potential to advance women’s health?

Based on this, three building blocks for this work were derived: (1) chances for women’s health, (2) the role of technology, (3) the role of female entrepreneurship. While in academia isolated studies on each of the fields can be found, only little is known about their individual and joint relevance for Femtech. Thus, reviewing the topics individually in the context of Femtech as well as with regard to their synthesized potential provides meaningful implications for theory and practice.

How is this Work Structured? This thesis is organized in six chapters. After introducing the topic, chapter 2 provides the practical and academic background for the following parts. Thereafter, in chapter 3, the underlying methodology is covered in detail, laying the foundation for credibility, transferability, dependability, and confirmability of this work. The next part (chapter 4) is divided into three subparts, each discussing the findings of one building block identified previously. Afterwards, findings are synthesized, tested for their usefulness in practice using a case study and leveraged to derive practical implications in chapter 5. Ultimately, this work wraps up with a final discussion and conclusion, overarching all sections.

2 Background

Since the term Femtech has only recently been established and the respective industry is commonly considered niche, the field has not yet gained broad attention in theory and practice. Hence, the following chapter aims to provide the context for the remainder of this work, first from an industry perspective and second, from an academic angle.

2.1 Industry Research

Although developing at rapid pace, the Femtech industry is still in its infancy (FemTech Analytics 2021). Consequently, available information is scarce and varies strongly dependent on the source. To still assure coherence throughout the report, industry information is primarily drawn from a frequently cited source. In the following, market size and segments as well as industry players are presented, aiming to provide a holistic understanding of the industry.

What is the Size and Trend of the Market? The global Femtech industry reached revenues of \$648M in 2020 and is expected to grow steadily with an annual growth rate of 12.2% to approximately \$1,150M by 2025 (Frost & Sullivan 2021). Comparing this to the \$407B Medtech industry (Ernst & Young 2022), Femtech only represents a petite fraction. Measured by the number of ventures, North America represents the most relevant market,

followed by Europe and Asia Pacific (FemTech Analytics 2021). However, the global market is expected to leverage an immense growth potential going forward (e.g., Frost & Sullivan 2022). Thereby, the relevance of the global Femtech industry increased not only from a patient perspective but further from a company and investor side. The numbers for founded ventures, funding amount, and published articles all touching on the topic increased significantly over the past years (Grand View Research 2022). Likewise, google search terms for “Femtech” and “female health” experienced a boost, especially within the last three years (Appendix 1). Considering this, Femtech is on the way to experience a substantial rise in size and significance.

Noticeably, the increase in relevance can be linked to rising health and wellness awareness among women, an increased likeliness of digital health adoption among tech-savvy younger generations, and a growing female workforce, thereby amplifying purchasing power (Frost & Sullivan 2021). Yet, barriers to the industry evolve. Focal market restraints include cultural barriers due to stigma and taboo, limited provision of infrastructure access, lack of focus by existing health care players, such as pharma and Medtech companies, and low awareness among potential users and medical partners (Frost & Sullivan 2020).

How can the Market be Segmented? Most commonly the Femtech market is segmented from an application-based perspective (e.g., McKinsey 2022). Thereby, various levels of detail can be leveraged, encompassing different care needs or product types. The following draws on Frost & Sullivan (2021), suggesting a segmentation along four female life cycle stages: *pre-adolescence care*, *pre-menopausal care*, *menopausal care*, and *post-menopausal care*. All segments comprise similar solutions but tailored to the needs characteristic to a woman’s development stage, mostly in the form of apps, wearable devices, or services. *Pre-adolescence care* addresses all female health needs ahead of the first period. *Pre-menopausal care* relates to all aspects starting with the first period and ending with the last period before menopause, thereby covering various subsegments, namely menstrual care, fertility solutions, pregnancy

care, postpartum care, and pelvic health. *Menopausal care* comprises perimenopausal and menopausal care, focusing on related symptoms, such as the change in hormonal composition. Representing the final stage of a women's life cycle, *post-menopausal care* can be described as the segment addressing all needs after the menopause ends. Aiming to find completeness over the female health cycle, two overarching segments must further be considered when addressing female specific health concerns: *cancer and chronic diseases* and *general health and wellness*. Across all application segments, innovative solutions are required to satisfy unmet needs.

Who are Industry Players? Investigating industry players serving the above discussed segments, the market incorporated around 160 companies in 2020, mainly start-ups (Frost & Sullivan 2021). Thereby, the largest share of ventures caters to the pre-menopausal care segment, leading to an extensive offering of fertility solutions, pregnancy care and menstrual care, while menopause care has only recently started to catch entrepreneurs' attention. Thus, while this segment currently captures fewer ventures, it is expected to gain extensive traction with new services and solutions over the next years (Frost & Sullivan 2021). Analyzing the operating companies, studies indicate that the vast majority of these ventures are founded or led by women (Frost & Sullivan 2020; McKinsey 2022). However, it can be observed that large players of the health care industry, such as pharmaceutical companies find their way in the sector, partly via venture acquisition and partly via direct operations (FemTech Analytics 2021).

2.2 Academic Research

Despite growing relevance in practice, Femtech-designated literature is still scarce. Most publications date to recent years and employ theory-based methodologies. The following examines these existing bodies of literature and derives common perspectives.

What Existing Literature Emphasizes: Most of the attention has been devoted to two types of challenges pertinent to the industry's development. Firstly, and predominantly, literature examines the necessity of data protection and system regulation. Even though

Femtech tackles a long-overdue discrimination in health studies and data, scholars posit that the industry operates largely unregulated, particularly considering data privacy and safety (Mehrnezhad et al. 2022). As a result, the technologies employed are in many cases not yet fulfilling sufficient security standards (Almeida et al. 2022). Therefore, Rosas (2019) demands that Femtech ventures are held to the same standards as other medical stakeholders and should be accountable for protecting consumer's privacy. Equally, attention should be dedicated to regulatory oversight via FDA approvals or comparable certificates, as users must be able to rely on solutions with verified efficacy (Taylor 2021). While scholars stress the need for industry regulation, they also recognize that emerging solutions must include data collection methods that nevertheless allow filling the critical gap in women's health research (Scatterday 2022).

A second body of research elaborates on the relevance of diversity and inclusion to ensure female empowerment among a broad spectrum of society. While scholars acknowledge Femtech as promising instrument to advance women's health, they claim the "solutions are often geared towards health-literate and socioeconomically privileged women" (Krishnamurti et al. 2022, 1) and based on standardized notions of female sexuality (Hendl and Jansky 2022). This poses the threat to drive a marginalization of a subset of the population (Corbin 2020). To counteract, scholars propose the integration of consumers in the solution design and the gearing of objectives towards health equity (Hendl and Jansky 2022; Krishnamurti et al. 2022). Concluding, research suggests that Femtech offers even larger untapped potential if regulatory systems are established, and inclusive solution design is made a priority.

What Scholars Agree on, yet Neglect: Although the existing Femtech literature is driven by diverse motivations, a few common themes are identified. Firstly, all scholars touch upon the necessity to advance women's health. Within the medical field, women's health has long been de-emphasized, leading to bias and discrimination in health studies and solutions (Corbin 2020). Thus, literature emphasizes the importance of more publications that highlight this

problem, thereby bringing it into wider public consciousness (e.g., Mehrnezhad et al. 2022). Secondly, the relevance of technology for health care outcomes is recognized within all papers. For example, McMillan (2022, 411) acknowledges that “health tracking technologies play an increasingly vital role” and Almeida et al. (2022, 1) stress that digital health has “contributed deeply to widening knowledge around intimate health care issues that were neglected or stigmatized”. Thirdly, scholars recurringly mention entrepreneurship as critical factor within the industry’s development. While some researchers reference the large base of women founded health tech ventures driving market growth (McMillan 2022), others comment on the VC dynamics in the female-led Femtech industry (Corbin 2020; Scatterday 2022).

Hence, despite different underlying theories and motivations, three building blocks pertinent to the development of Femtech can be derived: women’s health, technology, and female entrepreneurship (Figure 1). The three topics are renowned subjects of research in their individual nature and count extensive bodies of literature. However, they have not been studied meticulously in the context of Femtech, leaving a gap in theory and practice. Particularly, considering that the industry lacks best practices, a closer examination of their relationship is needed to unleash the industry’s full potential.

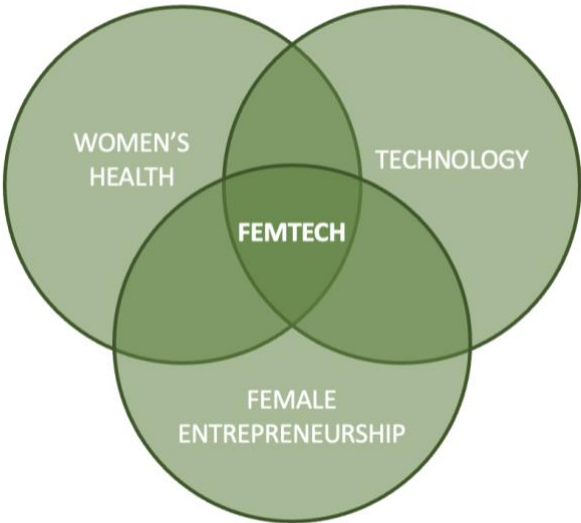


Figure 1: Femtech as Intersection of Three Building Blocks

To lay the foundation for the remainder of the work, the definitions and relevance of the three topics are reviewed subsequently.

Women's Health: The WHO (2022a) defines health as “a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity”. Although this definition is often referred to in literature, it is at the same time frequently discussed for being imprecise as well as incomplete. Thereby aiming to find more concreteness, numerous scholars established further clarifications for health (e.g. Wylie 1970; Bircher and Wehkamp 2011; Oleribe et al. 2018). The high number of definitions circulating, yet not finding common consensus, implies the complex nature of the simple term. Therefore, health often is examined from different angles and divided into several sub-groups, thus simplifying its nature as well as specifying its scope (Hurrelmann and Franzkowiak 2015).

Focusing on one of the most general classifications, human gender can be determined. Especially in terms of its medical approach, research provides evidence that women and men do not have identical needs and requirements (e.g. Soldin and Mattison 2009; Mauvais-Jarvis et al. 2020; van Hagen, Muntinga, and Appelman 2021). Based on this, the definition of women's health does not only reduce the scope of human beings to women and corresponding needs but additionally emphasizes all female-specific health concerns, such as gynecological health and reproductive health matters. Yet, comparably little is known about women's health (Schiebinger and Schraudner 2011).

Technology: Whereas the application of technology in health is evolving at rapid pace, literature contains a variety of definitions that differ in their scope (Fatehi, Samadbeik, and Kazemi 2020). In recent works, scholars frequently use the term digital health, as the term attracts considerable attention in academia and practice. For this reason and to account for the comprehensive perspective of this work, a broad understanding of digital health as an umbrella term for tech-enabled advancements in the context of health is assumed. Thereby, this paper

draws from the integrated definition of Fatehi, Samadbeik, and Kazemi (2020, 71) who conceptualize digital health as “the proper use of technology for improving the health and wellbeing of people at individual and population levels, as well as enhancing the care of patients“. This definition vastly expands on early notions by including the broad spectrum of digital technologies, advanced health technologies and disruptive innovations, from mobile applications, wearable and connected devices, telemedicine to the use of data science and artificial intelligence (e.g., Blumenberg et al. 2022; Mathews et al. 2019). Moreover, this concept also includes tech-enabled business models that facilitate a larger transformation of health care beyond new products (e.g., Lehoux et al. 2014). Thereby, all means by which technology directly or indirectly impacts health outcomes are encompassed.

Furthermore, the academic world and the WHO (e.g., 2022b) commonly depict the great potential of digital health technology to enhance health outcomes based on tech-enabled improvements along diagnosis, treatment decisions, therapeutics, clinical trials, and self-managed care. However, scholars also agree that although the potential is expanding with the opportunities in this space, it also vastly remains untapped due to several challenges that need to be addressed (e.g., Buntin et al. 2011; Shaw et al. 2018; Kellermann and Jones 2013).

Female Entrepreneurship: As extensively examined field of research, scholars have traced the origin of entrepreneurship back to the French economist Richard Cantillon in 1755 (Thornton 2020). He is commonly perceived to be the first scholar coining the term in a similar manner as it is perceived today. Due to the speculative nature of serving an unknown demand, Cantillon described entrepreneurs as risk takers who pay costs despite uncertain incomes (Ahmad and Seymour 2008). Subsequently, various scholars built upon Cantillon’s contribution, including Adam Smith and Joseph Schumpeter (Thornton 2020).

Although academia today still lacks consensus about the precise definition of entrepreneurship, it is commonly associated with expressions “such as innovation, change, risk

taking, opportunity recognition, driving force, and economic growth” (Ahl 2006, 601). While Ahl further states that “it is constructed as something positive, leading to improvement” (2006, 602), she also suggests that the opportunity to become a successful entrepreneur is severely limited to a certain part of society. Especially a discrepancy between male and female founders remains, thus, driving a gender gap in entrepreneurship (Shahriar 2018). Thereby, this gap exists despite pronounced advantages of female entrepreneurship for the economy (Hechavarria et al. 2019). Consequently, research acknowledges that women founders constitute one of the largest untapped potentials in entrepreneurial activities, particularly within the tech sector (e.g., Jennings and Brush 2013; Markussen and Røed 2017; Kamberidou 2020).

3 Methodology

The following section elucidates on the methodology, its rationale and the underlying methodological assumptions applied to conduct this research. It further describes the measures taken to ensure the study’s trustworthiness.

Methodological Assumptions: The objective of this research was to provide a comprehensive view on the under-researched field of Femtech and to address the research question: *How can Femtech ventures unleash the full potential to advance women’s health?* Thereby, women’s health, technology, and female entrepreneurship were explored in-depth and examined for their role as building blocks for Femtech, supported by evidence from practice and theory. Due to the topic’s practical nature, thereby accounting for the complexity of this social matter, inductive qualitative research was chosen as the most effective form of research.

Out of the two widely acknowledged approaches in social sciences, the research is based on the interpretive paradigm emphasizing the subjective perspectives and interpretations of individuals above more generalist findings from quantitative research. Assuming that reality is socially constructed, gaining a deep understanding of individual perspectives and experiences allows to derive valuable advice for Femtech ventures. Accordingly, semi-structured in-depth

interviews with informants, that act as “knowledgeable agents”, constitute the foundation of our research (Gioia, Corley, and Hamilton 2013).

Moreover, performing an analysis of the informants’ experiences and interpretations early in the research process, created “rich opportunities for discovery of new concepts rather than affirmation of existing concepts” (Gioia, Corley, and Hamilton 2013, 17). Therewith, the interviews were designed to explore the understanding and sensemaking of the informants and fuel the subsequent grounded theory development, rather than imposing predefined terminology and theory on interviewees.

Methodological Approach: Based on the methodological assumptions, this work draws from primary and secondary data to inform research on Femtech as expansively as possible. Thereby, the research was conducted through five phases and corresponding methods.

Phase 1: Definition of the research topic, using past knowledge and experience as well as an initial literature review to better understand the context, problems, and research gaps. The literature review included academic and industry sources relating to Femtech in general or to relevant keywords in the fields of women’s health, technology, and female entrepreneurship.

Phase 2: Design of an interview protocol that led the exploration of the research topic in the form of semi-structured interviews with open-ended questions, guided by the principles of Gioia et al. (2013). Open-ended questions were a critical element to allow for in-depth insights into the subjective perceptions of the informants and the contexts shaping their perspective. While the semi-structured approach helped to cover the same general areas in all interviews, it also preserved flexibility and allowed for iterative revision of the protocol throughout the data collection process leveraging emerging concepts (Jackson, Drummond, and Camara 2007).

Phase 3: Collection of primary data through expert interviews with multiple stakeholders. All interviews followed the interview protocol aiming to identify key themes across the interviews, yet differed to some extent across the stakeholders to allow for individual questions

and a more targeted data collection. In total across all three parts, ten expert interviews were conducted, including nine founders and/or CEOs of Femtech companies and one health care expert. To ensure relevance of the interviewees for the work's findings, the following criteria were taken into consideration when selecting the venture experts for the interviews: (1) founder and/or C-level in a Femtech venture with no more than 200 employees or relevant practical experience in the health care system; (2) location in Europe; (3) established industry relevance as promoted by Femtech reports, accelerators or summits; (4) no distinction between years of experience, job positions, professional background, gender, and market segments.

The interviewees were reached through proactive approach via email, professional social networks, recommendations, and industry conferences. Interviews were geographically focused on Europe due to enhanced availability and response of experts and less significant market differences (i.e., development stage, players) as opposed to, for example, the US market. Respective ventures were founded between 1986 and 2022 with an application focus on the pre-adolescence or pre-menopausal segment. The interviews were conducted virtually in either German or English language, lasted 30-60 minutes and took place between October 12 and November 19, 2022. Based on the participant's approval, interviews were recorded, and all related data was meticulously stored and managed thereafter. An anonymized overview of the interviewee's job titles, company locations and sizes is provided in Appendix 2.

Phase 4: Data analysis following Gioia methodology to allow for a close and structured analysis and interpretation of the interviewees' words (Gioia, Corley, and Hamilton 2013). The methodology emphasizes on our interpretive role as researchers to identify patterns in the data and to formulate relevant concepts and theories. Throughout the iterative data analysis process, the data was incrementally unpacked, from informant-centric first order codes to theory-centric second order codes, and finally to aggregate dimensions. This process was conducted per Femtech building block, yielding three grounded data models (Figure 2, Figure 3, Figure 4).

Phase 5: Production of the report by including existing theories from literature to discuss and refine the inductive studies from the qualitative research. Thereby, existing terminology and models were integrated to find additional evidence for the findings, explain each dimension, and provide a comprehensive perspective with high academic rigor and practical relevance.

Ensuring Trustworthiness: Qualitative grounded theory research is often criticized for lacking academic rigor or trustworthiness (e.g., Gioia, Corley, and Hamilton 2013; Nowell et al. 2017). For this reason, great meticulousness was exercised to meet the high standards of scientific research. During each phase of the research, measures were taken to establish trustworthiness based on the criteria from Lincoln and Guba (1985): credibility, transferability, dependability, and confirmability. Thereby, the appropriate measures have been selected based on their effectiveness considering the nature and limited scope of this work. The critical measures applied in this study include member checking of results (credibility), thick context descriptions (transferability), and clearly traceable process description (dependability). Most importantly, member checking, often considered as a required validity check or “gold standard” in qualitative research (Motulsky 2021), was implemented after the primary interview process. This allowed to review findings and interpretations with eight participants as well as four additional experts (Appendix 2). By fulfilling reasonable measures for the other three criteria and providing a rationale for research choices, confirmability as a fourth and last criteria was simultaneously achieved.

4.3 Female Entrepreneurship as Enabling Element in Femtech (Dongus)

“In a space as underserved as women’s health, we have a unique opportunity to make a huge difference in women’s lives, while building incredibly successful companies.” (Kathrin Folkendt, Founder and CEO of Femtech Insider)

As illustrated in chapter 2.1, the Femtech industry is coined by a great degree of female founders, thereby emphasizing a particular role of women entrepreneurs in Femtech. In academia, the subject of female entrepreneurship has received extensive attention over the last decades (e.g., N. Carter et al. 2003; Markussen and Røed 2017; Kanze et al. 2020). The relevance of exploring the topic as a separate stream of research stems from the considerable impact that women-led businesses offer. Literature highlights a positive effect in terms of higher economic development (Hechavarria et al. 2019), a more innovative environment (Cunningham et al. 2017), and increased entrepreneurial activity (Noguera, Alvarez, and Urbano 2013).

Yet, and in contrast to the Femtech industry, a prevailing dominance of male entrepreneurs is apparent across most markets. According to the Global Entrepreneurship Monitor (2020), only 25% of global entrepreneurial activities are led by women, with gender discrepancies being even more significant in technology-intense industries (OECD 2020). Researchers systematically investigated this gender gap in entrepreneurship (e.g., Brush et al. 2019) and amongst other reasons revealed women’s lower likelihood to found their own business (Jennings and Brush 2013). Since half of the global population is female (The World Bank 2021), the considerable participation differences in entrepreneurship have severe adverse moral, social, and economic consequences (McKinsey 2020).

As the Femtech industry counters the usual male-domination of entrepreneurial activities, investigating the rise of female entrepreneurship deems highly valuable. Similarly, Menking (2020) posits that due to the still scarce amount of research, Femtech founders depict an

intriguing subject of investigation. Thus, understanding what role female entrepreneurship plays in the advancement of Femtech provides valuable learnings for practice and meaningful insights for literature on Femtech and female entrepreneurship. Thereby, this section aims to contrast interview perspectives with focal aspects of academic research to lay the foundation for the subsequent discussion.

The chapter first presents the data analysis according to Gioia’s method (2013), as depicted in Figure 4. Thereby, distinct, first-order concepts derived from the interviews are grouped into second-order themes and ultimately clustered into aggregate dimensions. This approach allows turning concrete findings into implications on a more abstract level.

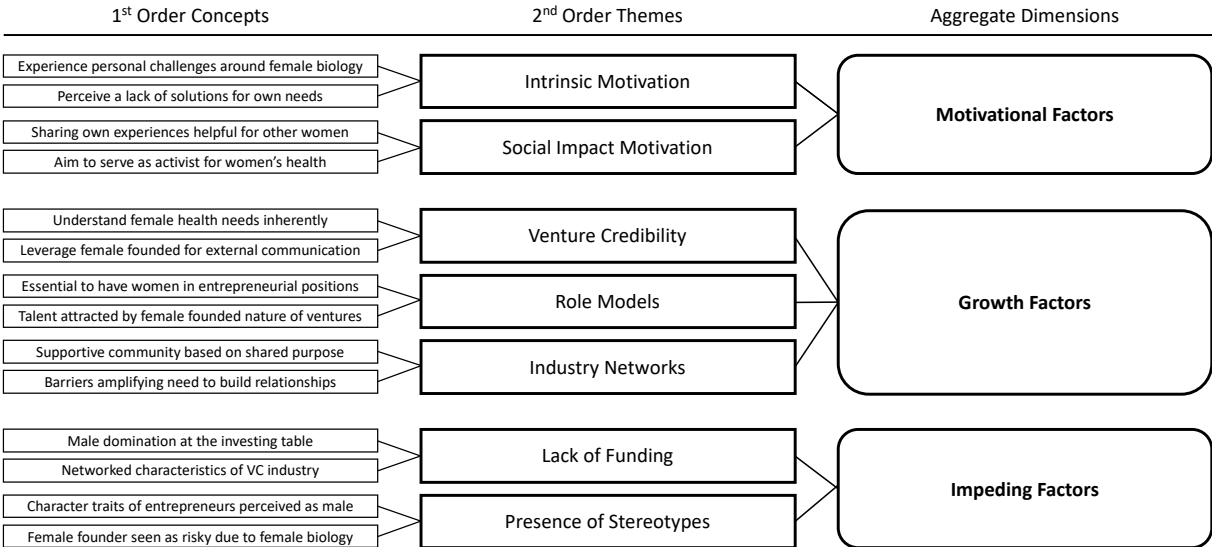


Figure 4: Female Entrepreneurship Model based on Gioia’s Method (2013)

The section is structured along the three identified aggregate dimensions motivational factors, growth factors, and impeding factors. Each theme is subsequently paralleled with pertinent research. Since only little scholarly attention has been dedicated to Femtech so far, related entrepreneurial literature is used instead. Nevertheless, the presented literature does not claim to be exhaustive.

4.3.1 Motivational Factors Building the Femtech Basis

“I felt like turning my own pregnancy experience into data would be very helpful for many other women.” (Expert interviews)

When assessing how Femtech ventures emerge, the first aggregate dimension identified is motivational factors. These are the underlying drivers that motivate female founders or executives to found or join a Femtech venture. Thereby, motivation is characterized as (1) intrinsic motivation complemented by (2) a desire for social impact.

Intrinsic Motivation as Industry Foundation: While all interviewees have diverse backgrounds, a common theme is depicted within the intrinsic motivation to found or enter the venture. As the questioned experts are exclusively women, they are all confronted with the lack of literacy around female biology, stemming from the historical stigmatization of women’s health. Thus, all questioned entrepreneurs state that a personal experience or angle motivated them to tackle the respective problem. One interviewee elucidates on her own fertility issues as the rationale behind her reproductive health focused company: “With my husband, we had difficulties having children. That's when I got in touch with challenges around fertility and it is definitely the reason why I founded [the venture].” Similarly, another interviewee elaborates on the inadequacy of existing resources for her personal needs as motivational driver: “I very often felt unwell due to my cycle. When I asked myself what I can do, my gynecologist provided me with generic advice only while the information online was not scientific enough. Therefore, I started to search for a solution myself.” From a broader perspective, it emerges that “normally founders have gone through the pain of what they created” which in the context of Femtech leads to the case that “women realize a business idea because [they] experience the need for it [themselves].” Thus, amplified by the lack of pertinent solutions, the underlying drivers to build a venture in this space are extensively driven by personal experiences related to female biology.

Theoretical evidence: Drawing upon literature examining motivation in the context of entrepreneurship, a high degree of concordance with the practical findings is evident. Entrepreneurial motivation has been widely researched using push and pull factors (e.g., Segal, Borgia, and Schoenfeld 2005; McClelland et al. 2005). Jennings and Bush (2013) define push factors as external factors which oftentimes have negative connotations and, hence, describe necessity-driven entrepreneurship. In contrast, pull factors are elements that encourage individuals to build a venture and, thus, relate to opportunity-driven entrepreneurship. Thereby, opportunity entrepreneurs are likely to pursue a business opportunity out of personal interest (van der Zwan et al. 2016). As the testimonials reveal that Femtech founders are not acting out of necessity, but rather reacting to a perceived market gap, they are responding to pull factors of motivation. Hence, literature characterizes Femtech founders as opportunity entrepreneurs. Likewise, these business opportunities emerge out of a personal interest in advancing women's health, additionally confirming academic assumptions on pull motivations.

Social Impact Complementing Founders' Motivation: A similarly prominent aspect among the interviews is social impact further driving entrepreneurial motivation. Thereby, the objective of Femtech venturing lies not only within the business idea itself but follows a bigger purpose, targeted at female empowerment. Founders "aim to improve the primary care of women's health", as research has long neglected this as central aspect of wellbeing. One interviewee highlights the lack of safe spaces for women to independently inform themselves about health-related topics. Educating women and society is a critical part of her entrepreneurial mission. Hence, she intends "to empower women to a healthier lifestyle by building a space where they can voice their concerns, doubts, and questions." The mission of one interviewee is even more ambitious, as she elaborates that "all generated profits are directly funneled back into more research about menstrual health. We are truthfully trying to better women's health." Thus, she expresses a need for prioritizing the development of scientific solutions for women's

health over traditional measures of venture success. Concluding, one entrepreneur summarizes the motivational drive of Femtech founders by stating that they are “activists for women's health while also trying to be businesspeople”, thereby indicating that impact and profit are not mutually exclusive. Hence, female entrepreneurs’ motivation enhances beyond conventional measures of venture success.

Theoretical evidence: Leveraging further research on entrepreneurship establishes more parallels between theory and practice. Literature extensively examines motivation differences between genders. Thereby, social impact proves to be a critical element. While female founders are commonly underrepresented, the gap decreases in the case of social ventures (Nicolás and Rubio 2016). Solesvik, Iakovleva, and Trifilova (2019) manifest that for female pull entrepreneurs, their business opportunities frequently emerge from societal needs while further literature implies that women are more likely to emphasize social outcomes over economic goals (Hechavarría et al. 2017). Yamini, Soloveva, and Peng (2022) link their research on social entrepreneurship to the previous chapter, by indicating that females are more likely influenced by a combination of intrinsic and social entrepreneurial intentions. Hence, and in line with literature, Femtech opportunities commonly emerge not only from the founder’s personal needs but moreover from the demand for social value creation.

Concluding, the motivational themes explored in the interviews are equally depicted in academia, thereby defining Femtech founders as mission-driven opportunity entrepreneurs tackling a market deficiency that concerns their own as well as other women’s health.

4.3.2 Growth Factors Amplifying Femtech Development

“I believe female founders play a critical role in driving the advancement of the Femtech industry.” (Expert interviews)

The second aggregate dimension identified examines how entrepreneurs achieve to

advance their ventures. These growth factors play a vital role in sustainably evolving the Femtech industry. Thereby, female founders are of pronounced relevance due to their ability to (1) generate venture credibility, (2) serve as role models, and (3) establish synergetic networks.

Venture Credibility Generating a Competitive Advantage: As all questioned experts are women, the relevance of being a female Femtech entrepreneur depicts a frequent discussion topic throughout the interviews. Due to a woman entrepreneur's inherent understanding of female biology, all interviewees emphasize the importance of solutions developed by women. Thereby, a common reasoning includes that men have "failed to innovate the female health care market for the past decades". Hence, interviewees claim that they and their customers "do not need another man to educate them on how to manage their pregnancy". A different founder expresses her lack of trust in men's decision-making in regard to female health: "If I am going to give my most intimate data to somebody, I want them to have the same skin in the game as I do because I don't quite believe that they are going to make the right decision if they don't."

Furthermore, the interviews reveal that most ventures "leverage the female-founded aspect as part of the marketing communication." By acting as a spokesperson for their products, customer trust is amplified. One female entrepreneur even claims that it is a prerequisite for success: "As our product is only relevant for women, it is essential that the marketing of it is authentic, that there is a woman at the top of the company." Similarly, some founders perceive a female entrepreneur as relevant for investors. The founder of a fertility tracker company explains: "It helps to voice that I have two kids by IVF, it achieves credibility. It is something I always share to investors." She posits that it provides investors with the necessary credibility to trust in her product and user-understanding. A further expert agrees by stating that "in terms of the venture story, I believe it is important for investors" to have a female as the face of the company. Concluding, one founder characterizes female entrepreneurship as the "secret sauce" in Femtech and, thus, attributes women a competitive advantage in the industry.

Theoretical evidence: Drawing on academic perspectives of female entrepreneurship, diverse streams of research provide meaningful contributions to the theme. First described by Heilman (1983), extensive attention has been dedicated to the “lack of fit effect” since. Scholars find that women are penalized when there is a mismatch between feminine-stereotyped traits and those believed to be essential for success in male-characterized settings (e.g., Tak, Correll, and Soule 2019). Further researching the effect in the context of entrepreneurship, Kanze et al. (2020) establish that female-led ventures receive more funding when supplying female-typed industries with which they are perceived a strong fit as opposed to male industries. The study links this to investors’ perceived degree of fit and resulting assumptions about the founders’ executive capabilities. Consistent with evidence from practice, stakeholders likely attribute founders a strong fit with the Femtech industry, thus positively influencing perceptions about the entrepreneur. Contrasting, a different body of research examining the gender-stereotyped context of entrepreneurship, posits that due to gender biases, female founders encounter lower degrees of trustworthiness (e.g., Brush et al. 2019). Yet, being a woman in the context of Femtech is a critical instrument for establishing trust. As female founders commonly take on an end-consumer role themselves, they act as a spokesperson for their products. Thus, and contrasting this literature stream, women entrepreneurs serve as vehicle for venture credibility.

Role Models Attracting Talent: A further theme repeatedly raised by interviewees is the value of role models for motivational purposes. Thereby, the presence of role models that the founder identifies with is of particular relevance. One expert discusses a historical, industry-overarching lack thereof as a market failure: “For me as a young woman, there were never any role models; it was only men. So, I never considered that it was possible to found and lead a company as a woman. Only once I saw other women succeed, that's when I dared to believe it was possible for me too.” Thus, the rise of female founders is vital for Femtech establishment. But it is not only a critical factor for the entrepreneurs themselves. They are of equal importance

in attracting supporting talent. One interviewee who shares the venture's executive position with another woman elucidates on the positive effect it has on recruitment: "A lot of people apply because they like the fact that we are two female Co-CEOs." Similarly, a different venture reveals its female founder as the reason for the "approximately 70% share of female employees in the company, even in the tech department". She believes that "this shows how essential it is to have some sort of role model in higher positions, somebody who is also female". This perception is shared among founders as one expert describes "a double purpose: improve women's health and be a role model for future female entrepreneurs". Concluding, the interviews assign "role models a critical role in driving the rise of Femtech" as they amplify the founding of new ventures and the advancement of existing ones through talent attraction.

Theoretical evidence: Reviewing entrepreneurial literature, research attributes role models an equally pronounced relevance for pursuing entrepreneurial intentions. Academia finds that approximately 30% of founders would not have started their businesses without a guiding role model (Bosma et al. 2012). The presence of role models is thereby especially relevant to underrepresented groups, such as women (Kofoed and McGovney 2019). Evidence suggests that women's entrepreneurial career intentions are positively influenced by the presence of role models (BarNir, Watson, and Hutchins 2011) and that female-led businesses survive longer in regions including numerous other women-owned ventures (Kalnins and Williams 2021). Likewise, literature is consistent with the prevalence of gender-homogenous role models within Femtech. Markussen and Røed (2017) find that gendered peer influences play a critical role. This suggests that "while men are more influenced by other men, women are more influenced by other women" (2017, 1). Yet, the interviews further reveal that female role models are increasingly present in the industry. Thus, while literature commonly describes a lack of role models for women entrepreneurs, Femtech thrives on the increasing presence of role models, thereby, substantially contributing to the advancement of the industry.

Networks Advancing the Common Purpose: An equally frequent topic of discussion is the relevance of networks for the entrepreneurial experience. Thereby, the presence of social ties among relevant market players is regarded as a highly beneficial industry characteristic. One interviewee elucidates on the encouragement received by other founders: “The Femtech industry in itself is a very supportive community. I see many women empowering other women, as in the end, we all try to accomplish the same thing. Therefore, it is less about who does it first, but more about achieving something.” A different entrepreneur agrees, highlighting that “within the industry, a very strong support system is established.” She perceives the collaborative environment, based on a common purpose, as inspiration for further development. It is thereby apparent that the importance of these networks stems from the presence of barriers to female entrepreneurship. One interviewee explains: “The entrepreneurship and VC world is so hard on us women. That is why we need to work together, create synergies, and build relationships.” Thus, while barriers to entrepreneurship exist, founders perceive the ability to leverage a collaborative network within the industry as vital for Femtech growth.

Theoretical evidence: In line with evidence from practice, literature stresses the importance of social networks for entrepreneurial activity (e.g., Greve and Salaff 2003; Spigel 2017). Thereby, some scholars posit that the success of entire businesses is dependent on the presence or absence of social ties (Greene et al. 2001). Further academic consistency is established within the examination of social network characteristics. Research illustrates women’s preferred work environment as collaborative and supportive, hence, highlighting their concern for relationship building and support offering (e.g., Kossek, Su, and Wu 2017). Despite the recognized relevance of networks, literature extensively describes female entrepreneurs lacking access thereof. McGuire (2000) proposes that this is partially driven by the tendency of women to hold lower-ranked positions. Further studies highlight that so called “old boy networks” avoid interconnectedness with women to uphold their powerful positions, thereby

limiting females' potential to benefit from contacts (Oakley 2000). Although theory describes lacking access as barrier to female entrepreneurship, practice partially contradicts this perspective. While certain networks, such as the VC world, are perceived as difficult to enter, the industry internal network is found to be an enabler for Femtech entrepreneurship.

Overall, the themes unveiled by the interviews receive a similar amount of attention within academia. Yet, while literature rather elucidates on female entrepreneurs' lack of encountered trustworthiness, role models, and networks, the themes prove to be extensively visible in Femtech, thereby advancing the industry.

4.3.3 Impeding Factors Limiting Femtech Potential

“For us, it is twice as hard: we are women and we drive a women’s topic.” (Expert interviews)

Despite the identification of enabling factors, a third aggregate dimension emerged implying impeding factors. These are factors that thwart the advancement of Femtech due to the female-founded nature of the ventures. Thereby, (1) restricted access to capital and (2) adverse gender biases limit the industry’s growth potential.

Fundraising Constraining the Potential: The most recurrently mentioned challenge throughout the interviews is fundraising. Although funding is one of the most critical success factors in entrepreneurship, all experts perceive the acquisition of financial resources as the most challenging aspect, thereby preventing the industry from attaining its projected potential. This is highlighted by one entrepreneur who expresses that “everybody says Femtech is great, Femtech has a huge potential. But we also need the money for it to grow.” The focal reason driving this challenge is the male domination of the VC industry, resulting in a lack of female representation at the investing table. This underrepresentation implies that Femtech entrepreneurs are required to pitch to male investors who “lack problem awareness” and, thus,

struggle to understand the value propositions and market drivers. A similar perspective is provided by one founder claiming that “investors are always much more comfortable investing in football than in periods.” Additionally, the interviews reveal that “it is difficult to set foot in the VC world as young female entrepreneur”, highlighting the closely networked characteristics of the investing community. Concluding, it emerges that “more women in decision-making positions would generate a higher likelihood that other women are promoted.”

To counteract, some of the interviewed ventures specifically search for female investors, as they “would not lose time to go to VCs where there are only men. They are not going to be the ones that invest.” Naturally, the scarcity of females in the investor landscape aggravates this strategy, the founder further elaborates. A different interviewee elucidates that they recruited a male CFO, immediately seeing differences in fundraising success. She claims that “it was a clear advantage to have a male counterpart endorsing that he believes in the business idea”. Nevertheless, one interviewee reports the recent surge of diversity initiatives as beneficial to her fundraising activities. Investors are increasingly focused on promoting female-founded ventures in their portfolios. She shares that “more VCs want to become ESG compliant. In this matter, I have a great response rate. However, we are still far from achieving satisfying numbers.” Hence, while to some extent Femtech founders benefit from rising diversity attention in the entrepreneurial world, the development is not yet sufficient to satisfy industry potential.

Theoretical evidence: Literature supports the interview perspectives by extensively discussing barriers to female entrepreneurship not encountered by their male counterparts, with the most prominent obstacle being the lack of access to VC, commonly referred to as gender funding gap (e.g., Wu, Li, and Zhang 2019). Thereby, Brush et al. (2018) outline three theoretical perspectives aimed at explaining the gap. By elucidating on social networks in the VC industry, the first theoretical perspective confirms the established industry angle that considers the underrepresentation of women at the investing table. Academic evidence

highlights a male-dominated industry that thrives on interconnectedness among its participants (D. A. Carter, Simkins, and Simpson 2003). As female entrepreneurs tend to be part of different networks than their male counterparts (Davis, Renzulli, and Aldrich 2006), the male homogeneity of the VC industry makes forming connections difficult for women. Likewise, Balachandra (2020, 1) suggests that due to gender biases, the “93% male context of the VC industry is in itself a significant cause of the gender gap in funding. If there were more women VCs, more women entrepreneurs would be funded.” Within the second perspective, Brush et al. (2018) indicate structural barriers, further substantiating interview testimonials. Research finds that due to its male domination, the industry rules, beliefs, and practices have been shaped by men. Thus, female entrepreneurs have difficulties succeeding at the activities that are “male in nature” (Heilman 2001). The last theoretical perspective examines homophily which refers to the tendency to engage with demographically similar people. Brush et al. (2018) find that as the VC industry is predominately male, investors have a higher preference to fund male ventures opposed to all-female or mixed teams. This is similarly evident in practice, since investors perceive female health as an unfamiliar topic, thereby unveiling aversion to fund Femtech ventures. Hence, practice and literature equally highlight several obstacles to the funding process encountered as a female entrepreneur in the context of Femtech.

Stereotypes Characterizing the Context: A second challenge frequently mentioned within the interviews is the confrontation with stereotypes. Due to entrepreneurial venturing commonly being perceived as a male activity, many entrepreneurs report the presence of gender biases. Thereby, it is revealed that “the character traits a picture-book entrepreneur should have, are all very masculine. Therefore, people immediately believe women are not made for the entrepreneurial world.” Similarly, one founder discusses the discrimination experienced in settings including her male co-founder: “Whenever we were in a meeting, he was the one being approached. It was always assumed he is the one responsible for important matters, such as

contracts or financing.” A different form of stereotype captures assumptions about women’s biology. Oftentimes female founders are “perceived as risk as it is expected that [they] will drop out soon anyways”, due to pregnancy or motherhood. Therefore, one interviewee elucidates: “As a 31-year-old woman, I purposely do not tell my age to investors. They immediately think, about whether I will be pregnant in the next two years.” A different interviewee already made this experience as she was treated differently when she got pregnant. “Some of them even advised me to keep my pregnancy a secret”, she further elaborates. Hence, female entrepreneurs’ confrontation with deeply rooted stereotypes contributes to impeding the realization of the full industry potential.

Theoretical evidence: Within entrepreneurship literature, a large body of research investigates the social, cultural, and institutional context entrepreneurial activities are embedded in (e.g., Autio et al. 2014). The norms, rules, and beliefs rooted in this context are often characterized by gender stereotypes – to the disadvantage of women (Brush et al. 2019). Equal to evidence from practice, Balachandra et al. (2017, 117) find that entrepreneurship is commonly associated with masculine behaviors, such as “assertiveness and dominance”. Hence, successful entrepreneurs are perceived to be male. Nevertheless, the scholars also acknowledge that gender biases are not necessarily directed against women, but rather against the display of feminine-stereotyped behaviors. Literature thereby suggests that these gender stereotypes do not only affect female founders’ aspiration to start a business but further negatively influence their self-efficacy (BarNir 2021).

Concluding, theory and practice substantially elucidate on the restricted access to capital, the confrontation with stereotypes and the consequential impact on the industry potential. Yet, none of the interviewees allowed their entrepreneurial aspirations to be thwarted by the presence of barriers to Femtech entrepreneurship.

4.3.4 Summary and Discussion

This section leverages the findings of the previous analysis as a basis for an integrated discussion, thus, enabling a comprehensive perspective. By contrasting interview perceptions with focal aspects of academic research, female entrepreneurs were identified as enabling element in Femtech. This understanding was established based on several pertinent themes.

Firstly, interview testimonials and academic research equally conveyed that intrinsic and social impact motivation are critical drivers for entering female entrepreneurship. As Femtech responds particularly well to both motivational factors, it appears evident that female entrepreneurs are extensively motivated to pursue ventures in this space. Therefore, enhanced motivation serves as foundation for venture establishment in Femtech. Secondly, venture credibility, role models, and industry networks were revealed as critical to market products, captivate investors, and attract talent in Femtech, thus, ensuring industry advancement. Thereby, deviations between theory and practice were discovered since academia generally elucidates on female entrepreneurs' lower degrees of trustworthiness encountered as well as their restrained access to role models and networks. Hence, surprisingly, what is described as limiting factors for women's entrepreneurial activities by literature, prevails in this space and thereby contributes to explaining its prevalence of female entrepreneurs.

Yet, it was further established that several barriers impede Femtech ventures from attaining the projected growth potential. Despite female founders' credibility advantage and an increase in diversity initiatives, the ability to secure funding, amplified by the presence of stereotypes, was determined as one of the most essential, yet challenging tasks in building a Femtech venture. Both, theory and practice acknowledge this. Female entrepreneurs receiving a disproportionately small amount of total funding is thereby not a Femtech specific phenomenon: In Europe, all-male founding teams received 93%, mixed teams 5% and all-female teams only 2% of capital invested in 2020 (Credite Suisse 2022). Nevertheless, the

barrier to fundraising is substantially amplified in the context of Femtech. The lack of awareness and historical stigmatization of women's health topics generates investor discomfort and VC aversion to engage with the respective ventures. This augments the investment landscape's unfamiliarity with Femtech, resulting in an evaluation as niche market and an underestimation of the market potential.

Consequently, to allow for sustainable industry development, female founders should foremost acknowledge the stigmatization and lack of literacy concerning women's health while relying on education to counteract. Educating about female biology will contribute to breaking stigmas and reducing aversion towards female health and its entrepreneurs, thereby potentially improving fundraising success and advancing the Femtech market potential. In this matter, it is critical to engage stakeholders such as the investment landscape, the broader health care sector, and politics in the debate to gain a wider reach. Likewise, the approach should emphasize industry internal collaboration between ventures to amplify reaching the common objective. Additionally, despite the establishment of female entrepreneurs' indispensable role in Femtech, a more gender-inclusive approach in entrepreneurial activities could further aid the purpose on a society-wide level.

Concluding, female entrepreneurs serve as "secret sauce" in Femtech. While commonly underrepresented in entrepreneurial activities, topic aversion by their male counterparts and pertinent motivational drivers create an industry coined by women, in which they operate with a substantial competitive advantage. To overcome barriers hindering the potential, stakeholder education, industry collaboration, and gender inclusiveness are imperative. By doing so, female Femtech entrepreneurs will extensively contribute to advancing women's health outcomes, while likewise amplifying progress in the gender gap of entrepreneurship.

5 Synthesis

The previous sections revealed several pertinent perspectives on Femtech along the building blocks of women's health, technology, and female entrepreneurship, which can be summarized within eight aggregate dimensions (Figure 5).

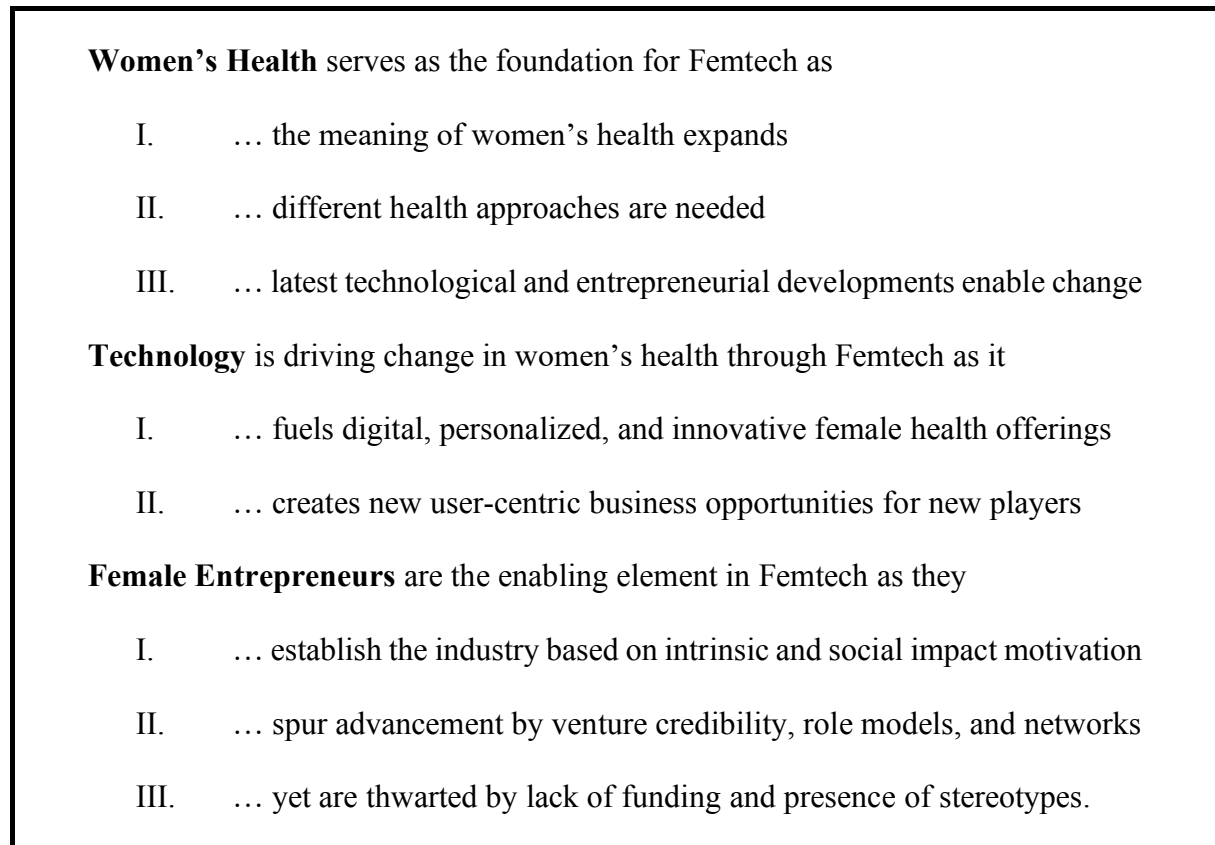


Figure 5: Summary of Aggregate Dimensions

What thereby is most striking across all sections is that the industry potential is far from being fully realized. Several barriers limit the industry from attaining its projected growth potential. Moreover, due to its infancy, Femtech lacks best practices which exacerbates the establishment of strategic focus for active and aspiring entrepreneurs.

“To some extent, it is learning by doing since the market is constantly changing, requiring you to adapt like a chameleon.” (Expert interviews)

Therefore, guidance for unleashing the full potential and establishing best practices is required. Hence, the following chapter aims to integrate and expand on the three previously considered sections by synthesizing the individual perspectives, thus, proposing the Strategic Directory for Femtech ventures. By deducting resulting insights, the second part further provides overarching implications and a practical case study example.

5.1 The Strategic Directory – A Framework for Femtech Ventures

To help realize the industry potential, the Strategic Directory was developed and proposed, describing Femtech ventures’ possible market approaches and allowing for actionable imperatives (Figure 6). The framework differentiates approaches along two axes, by asking: *Which market do you aim to cater to?* and *How innovative is your proposed solution?*

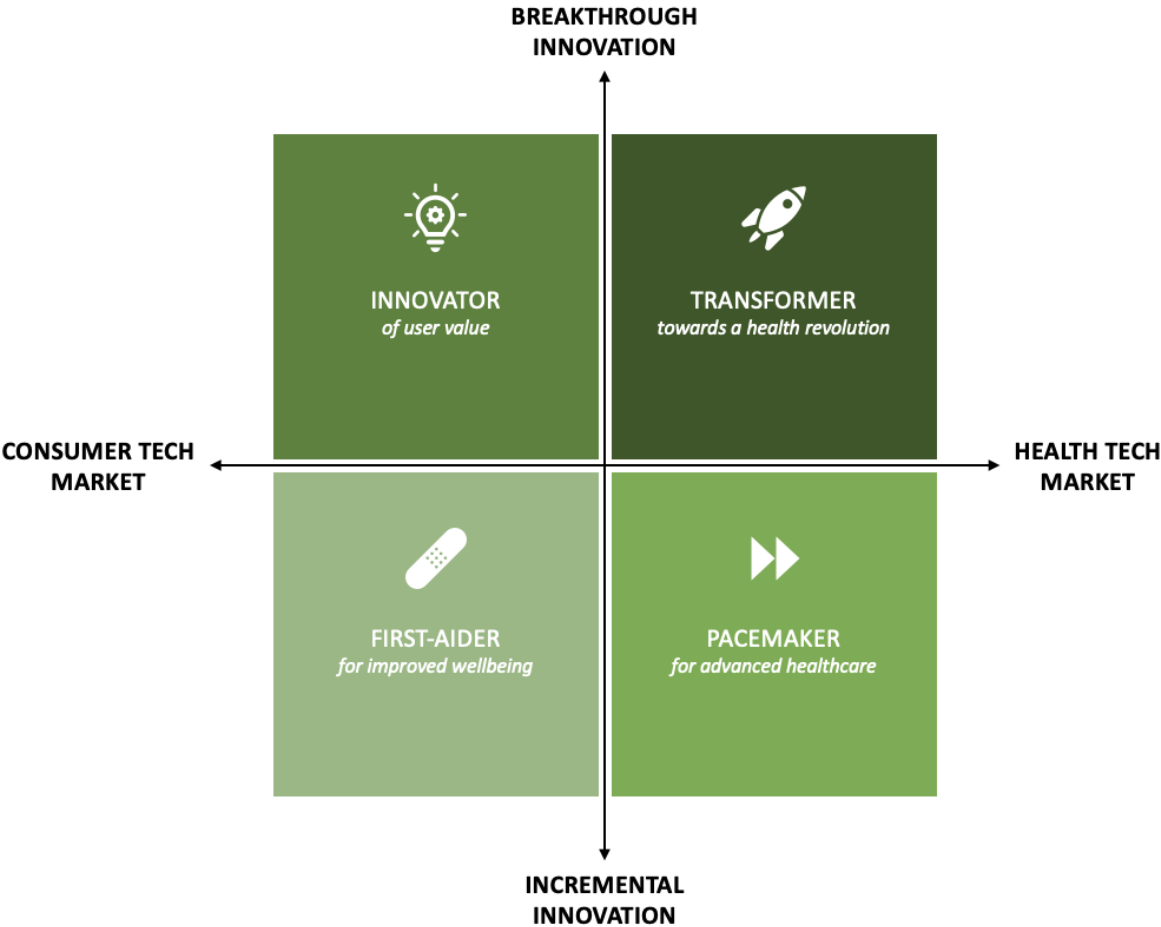


Figure 6: A Femtech Venture’s Strategic Directory

Which market do you aim to cater to? The horizontal axis differentiates market approaches based on their interconnectedness with the health care system. Thereby, a market-based segmentation arises, that establishes two categories of markets to serve. On the one end of the spectrum, the consumer tech market emerges as a new ecosystem with health offerings yet acting independent of the health care systems. Due to the detachment, the ventures in this category are targeting a lifestyle-oriented approach. Hence, the consumer tech market emphasizes accessible wellbeing solutions over regulated medical offerings. On the other end, rather than acting independently, the health tech market leverages an integrative approach. Thus, it is coined by proximity to the health care system and Medtech market landscape, which requires relationship building with pertinent stakeholders. Thereby, the integration is most constituted by medical certifications or insurance coverage. Concluding, moving from the left end of the spectrum to the right, the axis implies an increasing degree of medical capabilities and a tradeoff between speed of innovation and medical quality.

How innovative is your proposed solution? The vertical axis distinguishes the approaches to Femtech from an innovation perspective. Dependent on a venture's offering, two possible classifications arise. First, incremental innovation describes modest changes of existing technologies to make them applicable to the context of Femtech. Thus, ventures in this space create value without requiring disruptive innovations. Second, breakthrough innovation depicts vastly advanced solutions with the ability to significantly alter markets and set new standards. These solutions provide substantial improvements in performance compared with existing offerings and have a radical impact on women's health. Overall, the axis emphasizes an increasing degree of innovation capabilities. Hence, the further upwards a venture advances, the greater the need for respective innovation and management resources. Additionally, it is vital to note that not only ventures with breakthrough innovations can be pioneers, denoting that first-movers can cluster along the entire spectrum.

The resulting framework comprises four approaches relevant for Femtech ventures, which are in the following described with regard to their key advantages, challenges, and paths for development.

First-aider: In the relatively young Femtech market, many of the ventures to date have entered the market following a so-called *First-aider* approach. They leverage existing knowledge and technology to build an offering for the improvement of female wellbeing that is generally offered D2C to mainstream consumers less concerned with medical standards. By focusing on incremental innovation in the field of Femtech and fostering solutions outside of existing health care systems, ventures following this approach benefit from comparably low market entry barriers to the consumer tech market (e.g., less regulation) and quick time to market after short R&D cycles. Additionally, user adoption – once aware of the novel offering – is generally favorable, as consumers are familiar with comparable product types. Hence, the approach is particularly promising for Femtech ventures to swiftly get a foot in the game, realize short-term revenues, and achieve rapid growth.

What is most challenging? Because market entry barriers are relatively low and innovation is incremental, there is a high risk of imitation and competition due to low differentiation with this approach. Second movers, such as tech players, are likely to follow into profitable market spaces. Additionally, monetization is a major hurdle for many ventures as consumers are reluctant to pay or subscribe to providers when awareness is low and quality hard to assess. Therefore, it is particularly challenging for *First-aiders* to prove investors the feasibility and unique value proposition of their business case, likewise not qualifying for official health-related funds.

How to unleash the potential? *First-aiders* can maximize potential with a high marketing invest to boost awareness, thereby focusing mainly on speed and a strong positioning independent of medical markets. Furthermore, it is critical for ventures to find monetization

models attractive and feasible for all stakeholders involved. For the road ahead, *First-aiders* can focus on scaling and expanding their product portfolio through technology spillovers from the growing digital health market. Alternatively, Femtech ventures can consider a strategic evolution towards a higher degree of innovativeness or transition into health tech, leveraging the market knowledge acquired through the initial *First-aider* approach.

Example: Apryl is an employer platform offering fertility and family planning benefits, including consultation, access to clinics, treatments such as IVF and egg-freezing (Apryl 2022)

Pacemaker: Another frequently applied approach to Femtech is depicted as *Pacemaker* since respective ventures early on pave the way for others to follow. *Pacemakers* benefit from technology spillovers and do not require breakthrough innovations, similar to *First-aiders*. Yet, contrary to the latter, a *Pacemaker* approach generally entails new business models in health care or – at minimum – the compliance with existing Medtech standards (e.g., medical device classifications). The upside is a substantially increased signal of quality and trust towards health consumers and other potential stakeholders (e.g., medical professionals), thereby facilitating opportunities for partnerships and B2B monetization models. While benefitting from connections to existing players for eased market entry and product implementation, *Pacemakers* contribute significantly to the initiation of change in health.

What is most challenging? The biggest challenge for *Pacemakers* is the integration with the health system due to compliance with health regulation and medical device standards. As both are subject to changes, timing is critical in seizing opportunities. Hence, approaches within the health tech market are more complex in their implementation and dependent on typically slow health systems reluctant to change. While differentiation can be achieved in the short-term based on superb compatibility and integrability with the respective systems, it might be difficult for incumbents to defend against second movers following their example.

How to unleash the potential? To realize the full potential with this approach, *Pacemakers* need to acquire medical capabilities as early as possible and invest in health system relations for deepened market knowledge and eased access to health customers. *Pacemakers* should aim for an iterative medical integration to provide proof-of-concept for health consumers and stakeholders, thereby pacing sustainable change in female health care. Going forward, ventures can consider advancing towards approaches emphasizing higher degrees of innovation, by increasing their R&D spend to allow for advanced research and innovation capabilities.

Example: EsterCare is a platform providing women access to certified digital health services via directly employed gynecologists, midwives, and sexologists (EsterCare 2022)

Innovator: The *Innovator* approach is opposite to the *Pacemaker* approach as it focuses on breakthrough innovations offering high value creation for the user, while remaining detached from the health system and health tech market landscape. The independence of the health system allows for fast R&D and implementation, creating a competitive edge over health tech competitors. Additionally, proximity to end-users facilitates a better understanding of specific needs, which, in turn, translates into advanced product innovation. Thereby the *Innovator* approach promises to explore unknown knowledge and foster vast technological advances in the form of new patents, devices, or technologies that are used by mainstream consumers.

What is most challenging? A key challenge is the development of breakthrough innovations that are demanded by the market. Thereby, a common pitfall is an overengineered solution that does not serve the actual user need. Once achieved, there is a relevant risk of imitation from competitors if the venture does not own IP rights for the breakthrough innovation. Additionally, signaling quality and finding the right monetization are further key challenges for *Innovators*. As it generally takes time for new-to-the-market innovations to gain broad adoption among mainstream users, user adoption depicts another obstacle.

How to unleash the potential? Like *First-aiders*, *Innovators* should invest heavily in marketing for broad awareness and a strong market positioning in consumer minds. Additionally, *Innovator* ventures should aim to participate in innovation programs and government funds to access world-class research, whereas innovating in close interaction with female users helps avoid overengineering. When opportunities arise, Femtech ventures can consider a strategic transition into health tech if there is potential to realize synergies with the help of medical players or signal scientific trust towards health-concerned consumers.

Example: Emm offers a patent-pending consumer health tool that tracks women's periods through a smart menstrual cup and provides self-managed insights through an app (Emm 2022)

Transformer: The *Transformer* approach is currently less prevalent in the emerging Femtech market as it combines characteristics from the *Innovator* and *Pacemaker* approaches, making it difficult to implement on a macro-level and challenging to build an attractive business case. While many Femtech ventures demonstrate a transformative nature as they are a first mover in their space, they are not per se classified as *Transformers* in the proposed taxonomy. Instead, the *Transformer* approach refers to ventures that aim to be game changers for users, the health system and society by means of breakthrough innovations with high value creation potential based on new research, solutions, and business models. Thereby, *Transformers* show high levels of differentiation not only due to innovative solutions, but additionally due to either unprecedented way to change health care understanding and delivery. When implemented, the *Transformer* approach can ensure long-term success for a venture based on a unique value proposition for health consumers, potential partners, and investors.

What is most challenging? By introducing breakthrough innovations in a change-averse health system, *Transformers* face a generally high risk of failure due to extensive challenges on both, a macro-level and micro-level with users. On a macro-level, these ventures face regulatory

uncertainty towards new innovations and need to combat low speed and reluctance of system change. Equally, on a user-level, the approach entails high uncertainty among consumers as they are unfamiliar with new workings of the health systems.

How to unleash the potential? To realize the promising potential of this approach, *Transformers* need to acquire innovation and medical capabilities early. Furthermore, they need to establish strong connections and market knowledge within the field to tackle the challenge on a system level. On a user-level, close co-innovation with consumers and significant marketing invest is needed to accommodate them with changes in female health care delivery. Overall, this approach requires the acquisition of extensive financial and managerial resources.

Example: LEVY provides a SaaS offering that enables certified fertility diagnostics and holistic treatment by leveraging partner labs and digital health assessment (LEVY Health 2022)

Across all four approaches, ventures position dynamically, implying they can shift focus along the spectrum over time. While each approach is designed to accomplish specific objectives, the Femtech industry requires a mix of all approaches to comprehensively advance women's health in the short and long-term.

5.2 Application of the Femtech Directory – A Case Study

By plotting the path of one interviewed venture, the following visualizes the application of the Femtech Directory to test its validity and usefulness in practice. The venture is currently transitioning from *First-aider* to *Pacemaker*, with long-term advancements to *Transformer* targeted (Appendix 3).

Phase 1 – Setting Foot in the Market: The venture entered the market as *First-aider* by leveraging existing technology to offer a cycle tracking app that “allows to turn what is a very intimate experience into externalizable and communicable data”, as elucidated by the CEO. Targeted at the broader mainstream, they initially operated detached from the health care

system, thus, profiting from quick time to market based on a short development phase. Through quickly growing user numbers, they continuously enriched their offering by providing scientific content, such as a publicly available medical encyclopedia. Yet, due low imitation barriers, “lots of people realized it was lucrative and built similar apps.”

Phase 2 – Advancing by Building Medical Trust: To counteract increasing competition, the venture now aims to “help people understand what a high-quality and what a low-quality device is” by increasing their medical capabilities. A first step for shifting towards the *Pacemaker* approach was the recent FDA clearance for their contraception feature. While still building upon an app-based incremental innovation, the venture now benefits from an enhanced signal of trust towards its users. To strengthen their position as *Pacemaker*, the venture is focused on further driving their service “towards the quality of a medical device”.

Phase 3 – Bringing about Fundamental Change: Going forward, the venture shows ambition to advance towards the *Transformer* approach, thereby changing the user experience and health care system at large to ensure long-term success in the menstrual and reproductive health market. The CEO expresses: “Ultimately, we should do both: be primarily a D2C business that serves our customers who are the women who use it, but also for sure have insurance coverage and cooperation with doctors and so on.” Yet, this requires extensive investments into innovation and medical capabilities. She thereby elaborates on the necessity to accelerate innovation speed through D2C revenue to finance the capability increase, while likewise stressing: “We need to add more medical capabilities that will integrate with the health care system in ways that fundamentally change the female reproductive health care experience.”

Concluding, the case study illustrates a positive example for the application of the Femtech Directory in practice. By focusing on the strategic opportunities and challenges of the approaches one at the time, the venture managed to gradually advance its position in the industry while becoming well equipped to unleash its full potential going forward.

5.3 Practical Implications for Femtech Ventures

The framework proposed and presented in the previous part aims to provide orientation for new and established players to the Femtech market. Hence, three overarching practical implications for Femtech ventures are derived in the following.

Establish a Strategic Focus: The importance of understanding a venture's position in the framework stems from the required knowledge about opportunities and challenges associated with the approach deployed. Thereby, strategic objectives need to be aligned with a venture's approach, whereas the Strategic Directory provides orientation on how to reach them. Hence, to define the current or aspiring position in the framework, it is crucial to critically reflect upon a venture's classification along the axes. Once established, the position is not a guaranteed static point but needs continuous effort to be maintained and similarly might shift dependent on market developments. When aiming to enhance potential in the future, the Strategic Directory can further help identify and assess different routes to reach the targeted position. Similarly, the framework should be consulted when a venture is locked in an unfavorable approach to help identify a more promising path in the industry.

Consider Partnership Opportunities: Especially regarding long-term objectives, ventures should consider the value of B2B partnerships. Depending on the path chosen, but simultaneously influencing the decision on which path to take, different partnership approaches should be deliberated. Especially for paths towards the integration into the health care system, cooperation with insurance providers, public health entities and medical professionals should be assessed. On the other hand, aiming to find a way towards increased innovation capabilities, joining forces with innovation leaders should be contemplated. Concisely, partnering with a complementor can offer potential benefits by leveraging synergies.

Acknowledge the Importance of Education: Education can serve as the foundation for realizing Femtech potential, thereby contributing to society. First, recalling previous findings,

women's health is associated with a lack of knowledge, thus, resulting in limited awareness and stigmatization. Second, women are often unaware of existing products and services that meet their needs. Third, medical professionals tend to remain ignorant about emerging (technological) solutions to female health conditions due to unawareness about their existence and efficacy. To counteract the resulting deficiencies in health outcomes, extensive education is required and can potentially benefit from joint forces for a large-scale Femtech campaign. Likewise, education can mitigate the lack of medical certifications and reimbursement policies by providing enhanced understanding of the product value. In a like manner, fostering education facilitates investments in Femtech ventures since their value proposition becomes evident among investors. Overall, Femtech education does not only provide advantages for female end-users but further for society at large.

Concluding, to translate the proposed implications into practice, the established research indicates the need for strong female leaders in the three dimensions women's health, technology, and entrepreneurship.

6 Discussion and Conclusion

The following chapter aims to discuss the previously synthesized findings while further elucidating on implications for theory and practice as well as limitations of the study. It subsequently concludes the work by summarizing focal aspects.

6.1 Final Discussion

The three building blocks women's health, technology, and female entrepreneurship served as pertinent themes throughout this work and allowed to answer the research question in an adequate manner. Nevertheless, they should not be understood as single possible taxonomy for future research conducted on Femtech, due to twofold reasoning: First, additional building blocks could emerge in the field, thereby constituting a valuable addition to the three

proposed ones. Second, studies with other research objectives could leverage a classification depicting entirely different building blocks that better serves their research question.

When member checking the synthesized findings and its implications with previously interviewed and newly approached experts, it appeared that the relevance of the Femtech Directory varies depending on the user and a venture's maturity stage. Due to its purpose to provide industry direction, a pronounced relevance is derived for aspiring and young ventures to assess different go-to-market approaches. Their inherent need for strategic orientation can be met through the framework. Especially the deductible opportunities and challenges can contribute substantially within the early stages of Femtech entrepreneurship. In contrast, for the case of established ventures, go-to-market is already achieved, and individual market knowledge gained. Nevertheless, considering that the industry is anticipated to become increasingly consolidated, additional use cases for the collective industry can be derived. Due to the rapidly changing dynamics, it is essential to ensure comprehensive understanding of the venture's fields of actions, competitors' orientation, and industry best practices, which is enabled by the framework. Concluding, the need for the Strategic Directory is greatest for aspiring and young ventures by defining fields of action while it provides further value when considering long-term industry dynamics.

Likewise, since access to capital serves as critical theme within the industry, the framework could be valuable for fundraising purposes. It can aid ventures to critically reflect upon their strategic approach, thereby supporting in business model design and investor pitch preparation. Nevertheless, the framework provides limited relevance for the external communications themselves, as it serves as internal tool, rather than providing the inspiring venture narrative required in a pitch. Yet, the Femtech Directory could assist as a strategic tool for VCs, as they aim to classify ventures along these dimensions and identify strategic sweet spots. Hence, it potentially contributes to ensuring valuable portfolio development.

6.2 Implications for Theory and Practice

This work has laid important foundations towards enhancing the understanding of the Femtech industry. It provides a sophisticated contribution to the so far scarce academic research on the topic by reviewing existing literature and conducting a qualitative, inductive study. From a theoretical point, it is recommended to further investigate the market and its development, while considering additional empirical methods (e.g., quantitative, longitudinal, and larger scale studies). Similarly, more research is recommended on a global scale.

Moreover, by considering Femtech based on its three building blocks, implications for each theme were derived. Regarding women's health, for the data gap to be reduced and, ultimately, eliminated, more extensive research is required. In the field of technology, especially more research into technological advancements (e.g., big data and broader deep tech application) in the field of women's health are needed to foster knowledge generation for society as a whole. Additionally, for potential players aiming to advance women's health through tech-enabled Femtech solutions, new insights into women's health are critical. For the case of female entrepreneurs, academia should further investigate how entrepreneurial activities evolve as the industry matures. For instance, future research avenues could emphasize on how network dynamics develop as the market grows or how the rise of Femtech entrepreneurs impacts other industries.

A special focus of this work has been set on developing and proposing the Strategic Directory for Femtech ventures to unleash their full potential. Hence, for practitioners, it is recommended to test the implications provided in chapter 5.3, document the process, and review if the framework is of essential help in its existing form since adjustments might be necessary in practice. Despite member checking with twelve experts, it is to be established how the Femtech Directory finds applicability among a broader number of ventures. Notwithstanding, markets change rapidly, potentially leading to the need for adjustments in the current

framework. Moreover, the applicability and value creation potential of the Femtech Directory should be studied in the context of the investment landscape, as discussed in the previous chapter. Overarchingly, to allow meaningful advancements in practice, the empowerment of female leaders in the three dimensions women's health, technology, and entrepreneurship is of utmost relevance. Nonetheless, the implications are neither limited nor exclusive.

6.3 Limitations

Despite the derivation of several valuable implications, certain limitations must be taken into consideration when interpreting the work. First, as the Femtech industry is still in its infancy, data availability and access are restricted. Thus, the analysis partially relies on online sources, including publicly available reports and webpages. As these are oftentimes published by community members, they might be subject to biases and subjective perceptions. To nevertheless maintain a high degree of trustworthiness, it was emphasized to leverage extensive research and diverse source.

Second, the scope of the interviews, in terms of number and geography, must be critically reflected upon. The number of interviews conducted was affected by the availability and responsiveness of potential interviewees as well as the thesis's scope. Although there is no academic consensus on the minimum number of interviews needed, ten tends to be a lower limit quantity for attaining saturation in qualitative studies. Likewise, while the findings from literature suggest that the interview perspectives are typical and representative for Femtech ventures, the focus on interviewees from Europe limits the applicability of implications within other geographies and sectors. Moreover, the work depicts the interviewees' perspectives at a particular point in time. In combination with the rapidly changing industry dynamics, their sensemaking might differ at a later point in time.

Lastly, due to the qualitative, inductive nature of Gioia's (2013) methodology, the study's results are based on the subjective perceptions of the interviewees and a respective

interpretation of those. Despite numerous measures taken to assure trustworthiness and transparency, a subjective bias naturally remains. The implications of the study are therefore to be applied with caution to any other settings.

6.4 Conclusion

As the Femtech industry is rapidly growing in public awareness and market size, yet remains vastly under-researched from a theoretical perspective, the aim of this work was to provide a comprehensive view on the topic and address the research question: *How can Femtech ventures unleash the full potential to advance women's health?* Thereby, women's health, technology, and female entrepreneurship were identified as three fundamental building blocks of the industry and guided the practical and theoretical exploration of the topic. Due to scarce Femtech literature and to account for the topic's practical nature, inductive qualitative research was chosen as the most effective form of research. Accordingly, findings were derived from ten semi-structured expert interviews enriched by theoretical evidence to provide a holistic perspective with high academic rigor and practical relevance.

As a result, individual findings along the three industry building blocks were reached. First, **women's health** serves as the field for Femtech as the meaning of women's health is expanding, allowing different health approaches and enabling change based on recent technological and entrepreneurial developments. Second, **technology** is driving change for women's health through Femtech as it advances female health offerings through digital, personalized, and innovative solutions, while, at the same time, creating new business opportunities that foster user-centricity and ease entry barriers for new players. Third, **female entrepreneurs** pose as the enabling element in Femtech as they establish the industry based on their intrinsic and social impact motivation, while likewise spurring advancement through venture credibility, role models, and networks. Yet, their potential is thwarted by a lack of funding and the presence of gender stereotypes.

Overarching the three Femtech building blocks, findings highlight promising approaches. Yet, they also imply that the industry is far from realizing its full potential and lacks best practices due to its emergent stage of development. For this reason, and as a practical response to the research question, the **Strategic Directory** was developed and proposed, encompassing four possible market approaches and actionable imperatives for Femtech ventures: *First-aiders*, *Pacemakers*, *Innovators*, and *Transformers*. Beyond providing a strategic tool, three practical implications overarching all market approaches were derived: the need to establish a strategic focus using the framework, the value of considering partnership opportunities particularly in the long-term, and the necessity to acknowledge the importance of education as a baseline for Femtech success and meaningful contributions to society. First and foremost, to unleash the full potential to advance women's health, findings point out that strong female leaders in the three dimensions women's health, technology, and entrepreneurship are urgently needed.

Concluding, this work has laid important theoretical foundations towards an enhanced and comprehensive understanding of Femtech. Although constituting a necessary starting point, the findings stress that many pertinent aspects in this context are still under-researched, thereby, demanding further exploration. In practice, ventures can leverage the framework as a strategic tool aiding the assessment of go-to-market endeavors and the response to long-term industry dynamics. Potentially, the Strategic Directory provides further value when adopted by the Femtech investment landscape. Ultimately, for the aspirational industry promise to be fulfilled, research and practice require substantially more attention. Yet, an encouraging outlook prevails, as there are plentiful compelling business opportunities offering to be seized and a growing number of ventures with the ambition to do so.

I. Disclaimer

Within this work the terms Femtech, female, women, and women's health are used. However, it is important to acknowledge that these are used to universally address the health needs of all individuals who identify as women, have female biology, or relate to female-specific health needs. Furthermore, the terms gender and sex are used as synonyms referring to sex to align with existing literature.

II. List of Abbreviations

B2B	Business to business
B2C	Business to consumer
CEO	Chief Executive Officer
D2C	Direct-to-consumer
FDA	Food and Drug Administration
IP	Intellectual property
IVF	In vitro fertilization
NIH	National Institutes of Health
OECD	Organization for Economic Cooperation and Development
R&D	Research and development
SaaS	Software-as-a-Service
VC	Venture capital
WHO	World Health Organization

III. Appendices

Appendix 1: Google Analytics – Keyword Statistics on Femtech (by search volume)

Keyword										Oct 18	Nov 18	Dec 18
female health										880	720	720
femtech										4400	4400	3600
women's health										201000	165000	165000
	Jan 19	Feb 19	Mar 19	Apr 19	May 19	Jun 19	Jul 19	Aug 19	Sep 19	Oct 19	Nov 19	Dec 19
female health	880	720	880	720	720	720	880	880	880	880	880	720
femtech	5400	4400	5400	6600	6600	5400	5400	6600	6600	9900	9900	8100
women's health	201000	165000	201000	165000	165000	165000	165000	201000	165000	165000	165000	165000
	Jan 20	Feb 20	Mar 20	Apr 20	May 20	Jun 20	Jul 20	Aug 20	Sep 20	Oct 20	Nov 20	Dec 20
female health	1000	1000	880	1000	1000	1000	1000	1000	1000	1300	1000	1000
femtech	8100	8100	8100	8100	9900	9900	9900	14800	12100	12100	9900	12100
women's health	201000	165000	201000	201000	201000	165000	201000	165000	165000	165000	165000	165000
	Jan 21	Feb 21	Mar 21	Apr 21	May 21	Jun 21	Jul 21	Aug 21	Sep 21	Oct 21	Nov 21	Dec 21
female health	1300	1300	1300	1000	1000	1000	1000	1000	1000	1000	1000	1000
femtech	12100	12100	14800	12100	12100	12100	14800	12100	14800	18100	14800	12100
women's health	165000	165000	165000	165000	165000	135000	135000	165000	135000	135000	135000	135000
	Jan 22	Feb 22	Mar 22	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Sep 22			
female health	1300	1300	1300	1300	1000	1000	1000	1300	1000			
femtech	14800	14800	18100	14800	14800	14800	14800	14800	14800			
women's health	165000	135000	165000	135000	246000	201000	201000	201000	201000			

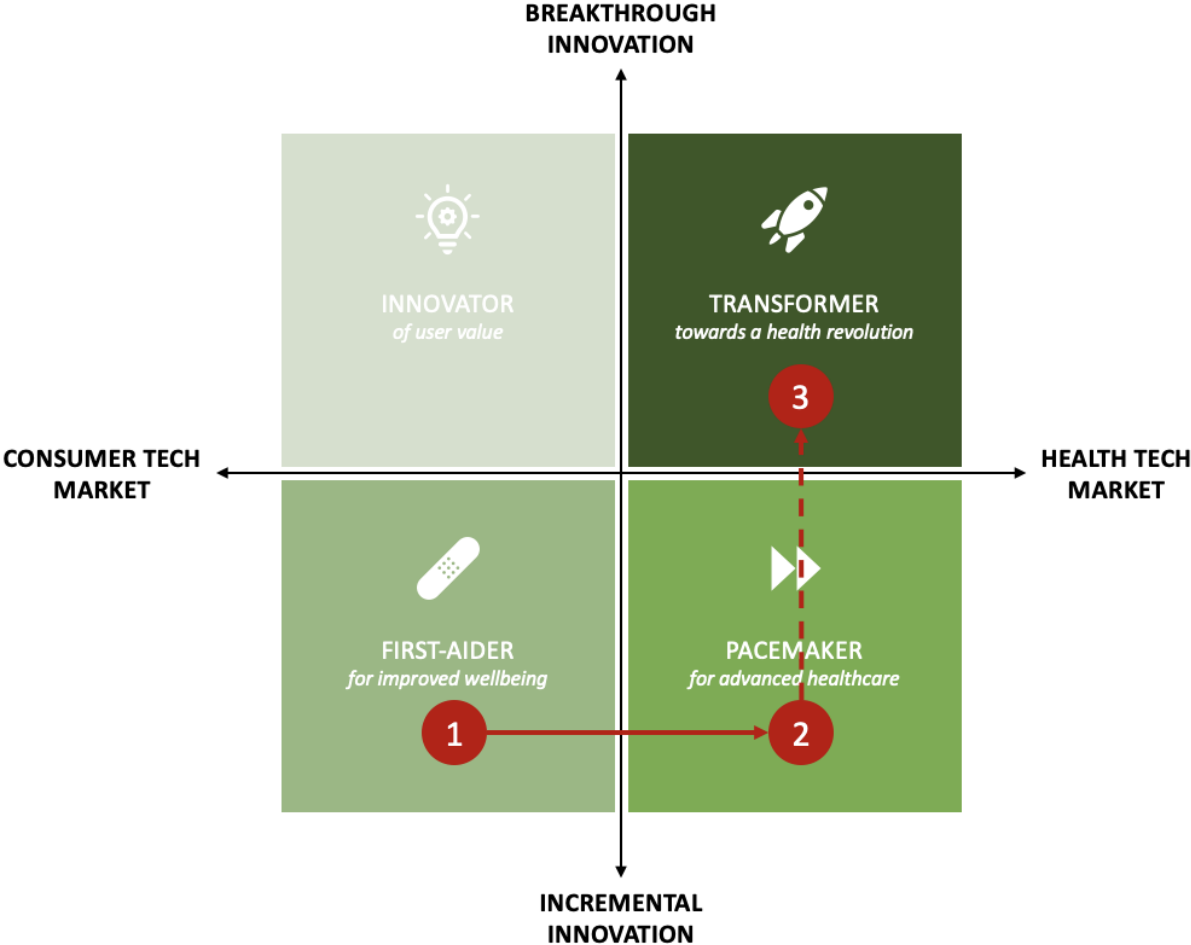
Source: Own figure

Appendix 2: Femtech Expert Record

#	Source of Expertise	(Founding) Country	Number of Employees	Expert Interview	Member Checking
1	CEO	GER	<200	x	x
2	Founder/CEO	ES	<20	x	
3	Founder/CEO	AT	<20	x	x
4	Founder/CEO	GER	<20	x	x
5	Founder/CEO	AT	<10	x	x
6	CEO	CH	<100	x	x
7	Founder/CEO	GER	<10	x	
8	Founder/CEO	GER	<10	x	x
9	Founder/CEO	GER	<10	x	x
10	Health Care Consultant	AT		x	x
11	Impact VC	GER			x
12	Founder/CEO	UK	<50		x
13	Founder/COO	GER	<10		x
14	Go-to-Market Expert	UK			x

Source: Own figure

Appendix 3: Case Study Example – Venture’s Advancement along the Directory



Source: Own figure

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