

DIGITAL HEALTH ENTREPRENEURSHIP: WHICH BUSINESS MODEL FOR HUMAN WELLBEING?

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Abstract

Aims: Digital health is the use of digital technologies in health and healthcare systems to improve the performance of healthcare delivery by providing more customized and impeccable treatments. Thus, digital health entrepreneurs want to exploit information and communication technology to help solving health problems and challenges to ensure well-being among people in treatment. They contribute to create innovative digital health products or solutions and are promptly transforming the medical practices by shaping the relationship between health professionals and patients. This paper aims to outline the literature review regarding digital health entrepreneurship and to scrutinize different features of Digital Health Business Model. Digital health entrepreneurs conceive strong business models to exploit several ignored market opportunities. To be effective, the Digital Health Entrepreneur should deeply understand patients' needs and wants for the potential expected value that he could create develop and control. The value proposition have to be attractive enough for each customer segment in the healthcare system in order to sustain the digital health business. Thus, to create a strong value proposition, the digital health entrepreneurs have to recognize their targeted customers' traits, needs, expectations and wants. Therefore, patients have to be their own-doctor by being experts on their own health and they should find digital channels to be up to date. By being up-to-date on the appropriate use of technology as patients do, digital health entrepreneurs contribute in the establishment of a participatory medicine based on patient centric strategies to make life patients more easily and comfortable.

Keywords: Digital Health, Digital Entrepreneurship, Business Model, Value Proposition Model.

1. INTRODUCTION

Entrepreneurship and Medicine have been developed in parallel and in an integrated manner (Rivas and Wak, 2017). Health entrepreneurship is an emerging research area making the linkage between entrepreneurship, clinical psychology (Wiklund et al., 2020), biology (Nicolaou et al., 2020), mental health (Overall, 2020; Stephan, 2018), neuroscience (De Holan, 2014) and health sciences (Torrès and Thurik, 2019). Moreover, since the spread of novel coronavirus (SARSCoV-2), health entrepreneurship has become a priority for many countries (Patel and Rietveld, 2020).

The main research currents in health entrepreneurship explores how the entrepreneurial action influences health systems and how health could instigate the detection and the exploitation of the entrepreneurial opportunities. While there is recent research that emphasizes the relationship between many health problems and entrepreneurial behavior (Freeman et al., 2019), there is still a lack of studies discussing the association between health and different facets of entrepreneurial behavior, like social entrepreneurship, corporate entrepreneurship, family entrepreneurship. It seems interesting to understand entrepreneurship from a health perspective since humanities strongly need a new horizon of sustainable human well-being.

Since, the emergence of information and communication technology (ICT) that contribute to develop digital medicine by sharing biomedical and clinical information, many higher education students are conceiving and developing digital health solution from a healthy consumer viewpoint (Palfrey & Gasser, 2008). However, complex health systems and many of their stakeholders could cause obstacles for entrepreneurship (Zajicek and Meyers, 2018).

A healthcare issue requiring a solution is not difficult to detect and to be transformed to an entrepreneurial opportunity. It is exceedingly difficult to develop a sound, practical solution that is a market success and has a practical business model. As for other stakeholders, the main challenge of digital entrepreneurs is to adapt to the central provider, service charges, high quality, specialty-oriented facilities, and different outcomes in a patient-centered approach. A value-based health system reduces health outcome gaps through geography, race and gender variables, insurance, and many others.

Nowadays, digital health required the involvement of both medical staff and patients as healthcare customers. It includes many digital health technologies and apps (Zajicek and Meyers, 2018). The concern of cost-effective delivery of healthcare services has led to the emergence of various digital health services including telemedicine, electronic health records, data analytics, healthcare platform, tele monitoring, telecare bioinformatics instruments and patient portals (Mistry 2012; Chen et al. 2013).

The main question must be who will bear the burden and responsibility to look after the person's welfare, rather than the individual? In United States, Accountable Care Organizations (ACOs) move forward, but the best balance between best care and best affordable care is when organizations are in charge. Digital health enables individuals, although it also offers several protections to differentiate between "compliance" of people with their health systems by health care providers. Controversies here are inevitable.

Increased digital health checks allow us to track our health early and interfere and create new models for some diseases entirely. Big data are of fundamental importance for identifying population trends, and genome data may allow patients to decide. As a result, most health-conscious countries are aware of the need to encourage digital entrepreneurship in health and healthcare context. Thus, digital entrepreneurship is deemed as a crucial engine for the innovation systems in general and healthcare systems in particular (Wulfovich and Meyers, 2020).

It contributes via networking tools to boost the whole business system and affect positively the national innovation system (Satalkina, Steiner, 2020). As a result, digital technologies could offer new entrepreneurial opportunities leading to incremental (Leminen and Westerlund, 2017), disruptive (Christiansen et al., 2017; Herrmann et al, 2018) or open innovations (Westerlund and Leminen, 2011). Several of these disruptive innovations were run by large health and healthcare provider given their good financing capacity, talent human resource management and expertise management (Dafny & Mohta, 2017).

2. FROM DIGITAL ENTREPRENEURSHIP TO DIGITAL HEALTH ENTREPRENEURSHIP

2.1. Who is the digital entrepreneur?

Hull et al. (2007, p: 293) defined digital entrepreneurship as “*a subcategory of entrepreneurship in which some or all of what would be physical in a traditional organization has been digitized*”. According to Davidson and Vaast (2010) digital entrepreneurship is simply the exploitation of digital opportunities related to the usage of digital media and ICT. This phenomenon covered the development of novel digital technologies by the creation of new ventures and transformation of existing businesses (Zhao and Collier, 2016; Bican and Brem, 2020)).

Moreover Le Dinh et al., (2018, p. 1) argued that digital entrepreneurship is “*the reconciliation of traditional entrepreneurship with the new way of creating and doing business in the digital era*”. Succinctly, digital entrepreneurship includes “*the sale of digital products or services across electronic networks*” (Guthrie, 2014, p. 115). Therefore, Hair et al. (2012) presented the different facets of business models associated to digital entrepreneurship as “*products, distribution, the workplace – any of these and more could take digital form in an entrepreneurial venture*”. Thus, Giones and Brem (2017, p: 45) argued that digital entrepreneurship is focus on “*New products and services based on the internet Services running only in the cloud; using big data or artificial intelligence*”.

We consider digital entrepreneurs as Kirznerian entrepreneur insofar as he instigates change by exploiting new opportunities that resulted from prior market ignorance. The digital entrepreneur controls digital technology, detects and exploits digital opportunities within marketplace. Consequently, he acts to move the economy close to the equilibrium by increasing efficiency of the technology. On the other side, we can consider digital entrepreneur as a Schumpeterian entrepreneur who acts to disturb an existing equilibrium in the market. In addition, he generate incremental or radical innovation and boost the economic growth through creative destruction and disequilibrating markets. That’s why, the digital entrepreneur intensifies competition landscape and attempts to exploit digital opportunities by accelerating the creative destruction process of the digital economy (Davidson and Vaast, 2010, p. 2; Topol; 2012).

The European Commission (2013) recognized five ‘pillars’ to analyze digital entrepreneurship especially: (1) digital knowledge base and ICT market, (2) digital business environment, (3) access to finance, (4) digital skills and e-leadership and finally (5) entrepreneurial culture. We outline that the literature revue on digital entrepreneurship show some specific dimensions associated with this phenomenon. For example, Xiao et al., (2020) and Nambisan (2017) highlighted the perception’s transformation of uncertainty associated with digital entrepreneurship, because entrepreneurial opportunities, process and outcomes are unconstrained in the digital word, also the relationship agency in a digital entrepreneurial business is ambiguous especially in case of “open source” framework. Moreover, the alternative definitions of the digital entrepreneurship phenomenon do not use in the same way

the term of “digital entrepreneurship”, but, they use other closed concepts such as “digital innovation”, “digital enterprise”, “digital business” or “digital venture” (Kraus and Palmer, 2018). Table 1 summarizes various definitions of digital entrepreneurship.

Table 1: An overview of different definitions of digital entrepreneurship

| Author | Definition |
|---|--|
| Le Dinh et al. (2018, p.1) | <i>“The reconciliation of traditional entrepreneurship with the new way of creating and doing business in the digital era”.</i> |
| Kraus & Palmer (2018) | <i>“digital innovation”, “digital enterprise”, “digital business” or “digital venture”</i> |
| Richter et al. (2017, p. 300) | <i>“occupying niches, monetizing business opportunities, as well as being innovative, radical and risk-taking”</i> |
| Giones & Brem (2017, p.45) | <i>“New products and services based on the internet. Services running only in the cloud; using big data or artificial intelligence”</i> |
| Sussan and Acs (2017, p. 66) | <i>“(…) includes any agent that is engaged in any sort of venture be it commercial, social, government, or corporate that uses digital technologies. (...) In other words, they are performing activities that need digital engagement but may not in themselves be digital, for example, an Uber taxi driver”</i> |
| Zhao & Collier (2016) | <i>“Creating new ventures and transforming existing businesses by developing novel digital technologies (...) digital entrepreneurship as a distinct field of academic scholarship in its own right based on its social and economic importance”</i> |
| European Commission (2015) | <i>“Digital entrepreneurship embraces all new ventures and the transformation of existing businesses that drive economic and/or social value by creating and using novel digital technologies”</i> |
| Australian Innovation System Report (2015, p. 46) | <i>“(…) entrepreneurs and the organizations they create are uniquely positioned to exploit new opportunities, adopt new production methods and technologies, and reshape competition by penetrating new markets”.</i> |
| Guthrie (2014, p. 115) | <i>“the sale of digital products or services across electronic networks”</i> |
| Hair et al. (2012) | <i>“products, distribution, the workplace – any of these and more could take digital form in an entrepreneurial venture”</i> |
| Davidson & Vaast (2010) | <i>“the pursuit of opportunities based on the use of digital media and other information and communication technologies”</i> |
| Hull et al. (2007, p: 293) | <i>“a subcategory of entrepreneurship in which some or all of what would be physical in a traditional organization has been digitized”.</i> |

2.2. Who is the digital health entrepreneur?

Nowadays, digital health is closely related to all dimensions associated to the dialogical interaction between physician and patient as a healthcare consumer (Zajicek and Meyers, 2018). The concept of health entrepreneur is designed under the viewpoint of new public health (Salter & Dickson, 2020). The health entrepreneur is able to gather accurate informations to satisfy consumer needs and desires while taking a risk in a specific marketplace (Op. Cit.). Moreover, digital entrepreneurship as a research field embraces larger public policy implications. For instance, big data analysis in public health sector has assisted both populations and nonprofit organizations to realize social problems that generate entrepreneurial opportunities (Nambisan & Nambisan, 2013).

Wulfovich and Meyers (2020) defined digital health entrepreneurs as *“those who pursue opportunity under conditions of uncertainty with the goal of creating healthcare stakeholder value through the deployment of digital health innovation, are at the forefront of creating these new platforms and models”*.

Digital health entrepreneurs offers various advantages to both patients and healthcare market by providing new services, promoting preventative medicine and rising access to healthcare services. Digital health entrepreneurship is not only a kind of healthcare provision; but also is an opportunity of collaboration and partnership with other industries.

According to Ronquillo et al. (2021), there are several business activities of digital health entrepreneurship. They propose 11 subcategories of digital health products (DHP) and services namely:

1. Remote sensing and wearables
2. Telemedicine and health information
3. Data analytics and intelligence, predictive modeling
4. Health and wellness behavior modification tools
5. Bioinformatics tools (-omics)
6. Medical social media
7. Digitized health record platforms
8. Patient -physician-patient portals
9. DIY diagnostics, compliance, and treatments
10. Decision support systems
11. Imaging

Many digital health technologies are better addressed from a customer viewpoint, often where the pain lies. Another way of dealing with this issue is simply to believe that customers should move forward and contribute to innovation. Health customers could be very dominant and influential that they will instigate the change laws and rules. In a patient-centric perspective, the health customer would exercise sufficient pressure to transform regulations. If a nascent entrepreneur decides to start a digital health start-up, one should remain within the various health laws and regulations (Zajicek and Meyers, 2018).

Digital health entrepreneur must frequently have a healthcare background and have to take into consideration all legal issues for a number of reasons, including the considerable financial support that the digital health start-up receives. The fact that many successful health digital entrepreneurial team have at least one member having a healthcare background, they are able to overcome all technical challenges related to consumer needs and to respect all regulatory requirements. It emerges from the above arguments that DHE is at the crossroads of entrepreneurship, healthcare and technology. According to the Startup Health 2020 midyear

report on health innovation, the total health innovation funding by health moonshot is shown in Table 2.

Table 2: The total health innovation funding by health specialty in 2020

| Health innovation sector | Total funding (Billion Dollar) |
|-------------------------------------|--------------------------------|
| Access to care | 3.9 |
| Cost to zero | 2.4 |
| Disease prevention & cures | 1.3 |
| End cancer | 0.773 |
| Health longevity | 0.758 |
| Mental health & happiness | 0.631 |
| Brain health | 0.231 |
| Women's health | 0.212 |
| Children's health | 0.037 |
| Addiction mitigation and prevention | 0.017 |

Source: *Startup Health Insights*, <https://www.startuphealth.com/2020-year-end-insights-report>

During the first semester of 2020, there is a prominent change in funding priorities toward some healthcare innovation specialties especially innovations increasing access to care. These priorities include investment oriented to addiction prevention and improvement of women's and children's health. At the end of 2020, the sum of health funding innovation reached \$21.6B exceeding 2019 by 55.

3. DIGITAL ENTREPRENEUR AND HEALTH INNOVATION

Bio-scientists, health professionals, engineers and many entrepreneurs are creating a wide range of health and healthcare enterprises in different fields such as bio-pharmaceutical, paramedical products and social health services. Digital health can be the source of several entrepreneurial opportunities. As noted previously, the application of ICTs to the sharing of medical information is a facet of digital health. Bio-health technologies entrepreneurs invest in digital health sector to generate value for patients and all stakeholders through digital health product and services design.

Gonçalves et al, (2020) argued that both the structural capital and the relational capital are the most important IC's dimensions for the success of the bio health entrepreneurial ecosystems. However, human capital is considered as the essential requirement for promoting the entrepreneurial ecosystem's effectiveness.

Digital health services or products can be offered independently through apps, medical or paramedical equipment (Zajicek and Meyers, 2018). For example, mobile app-based services and home healthcare services have been developed and are available at the fingertips of potential health customers. The app-based house calls model includes telemedicine-based services (Ensign et al, 2019).

Digital health entrepreneurs establish creative businesses in the health sector by providing consumers with required informations related to inter-face communication that are not subject to regulatory requirements. On the other side, some DHP could be a new constituent of a drug such as wireless sensors for smart orthopedic implants or a smart pill helping doctors to pinpoint the disease causes. Digital health entrepreneurs struggle to conceive and create a viable digital business model through digital health innovation (Marvel et al., 2018; Guo et al, 2020). Digital health innovation process includes many steps:

1. Health and healthcare consumer identification: it is better to use the term ‘health customer’ or ‘healthcare customer’ rather than ‘patients’. Firstly, because the customer is disposed to be involved in health care decision-making while the patient have a tendency to get care without essentially taking part in decision making. Moreover, many health programs and healthcare services use the term clients instead of patient and sometimes use the term ‘residents’ referring to those living in healthcare facilities.
2. Health and healthcare product development: it begins with research and development programs, concretization of early-stage prototype and the validation of digital business model components.
3. Technical validation and verification of the digital health product or e-services: the DHE have to use a proven quality system checks. For example, in software engineering, two types of analysis are broadly used; ‘verification’ and ‘validation’. Validation helps to know if the system fits with end-user wants while verification try to check if the system is smart and error-free.
4. Protection of intellectual property if required (Capron and Wells, 2016).
5. Obtain the regulatory and legal approval to introduce the digital health product or service to healthcare market.

4. TOWARD A DIGITAL HEALTH BUSINESS MODELS (DHBM)

Developing sustainable business models for human well-being lies on the fact that all stakeholders of healthcare systems are highly sensitive to the efficiency and effectiveness of healthcare services (Porzsolt and Stengel 2006). Thus, the DHE have to develop a viable business model by carrying entrepreneurial opportunities to healthcare market.

4.1. The Digital Business Models

Steve Blank (2003) and Eric Ries (2011) found that successful entrepreneurs are those who create a viable and scalable business model. The business model can be defined as an entrepreneurial tool describing the way to create, deliver and capture value (Osterwalder and Pigneur, 2010).

In healthcare business, like other business branches, the business model proposes value to healthcare customers. While the overall healthcare demand is inelastic (Qian et al., 2017), capturing value can be particularly difficult in healthcare owing to the long sales periods, sluggish payments and complex pricing process due to the existence of a third party payer.

Consequently, it seems difficult to a digital health entrepreneur to carry out a business model analysis due to the ambiguity relating to the identity and profile of the end customer capturing value as well as the final payer of the services. A business model is an entrepreneurial plan ensuring company's business strategy for revenue generation to maximize profit. Osterwalder and Pigneur (2010) argued that the business model canvas (BMC) contains nine blocs going from the creation process of the proposed value (left canvas); to the process of value delivery (left Canvas).

Osterwalder and Pigneur (2010) have conceived and proposed a graphical canvas for drawing a strong business model (Figure 2). The Business Model Canvas (BMC) includes nine basic blocks divided into two sides: right and left canvas. By analogy with the BMC we try to build the digital health business model canvas (DHBMC). The middle canvas contains the digital health value propositions.

The left canvas highlights how to create the digital health value? It encompasses four components: key activities, key resources, key partners and cost structure. The right canvas highlights how to deliver value to digital health customer? It encompasses digital health customer segments, channels, DH customer relationship management and revenue streams. The DHBMC encompass the following nine blocks (Figure 1):

1. Digital Health Value Propositions: As we have explained before, a DHVP is a strong statement of why should digital health customer purchase a digital health product/solution. This block explain how the DHP will fit digital health customer needs. It comprises a summary of explicit benefits and value-added provided by the digital health product/solution.
2. Digital Health Customer Segments: As debated previously, digital health customer profiles describes the characteristics of different targeted health customer groups. This clustering is based on health customer wants and the best suitability between these needs and the company's value proposition.
3. Digital Health Customer Relationships: This section encompasses the different marketing tools used to ensure the durability and sustainability of the relationship between the digital health entrepreneur and its targeted customers.
4. Revenue Streams: Sometimes described as lines of business, revenue streams refer to all the various sources of financial support attributable to a company through its products, services, and investments. Product purchase prices, licensing
5. Key Partners: This section help to determine the most important business strategic alliances that are indispensable to attain entrepreneurial effectiveness. The digital health entrepreneur have to build strategic partnership with his suppliers, collaborators and competitors.
6. Key Activities: This block include all tasks and duties that have to be done to run correctly the digital health business such as health data collect, storage and analysis.

7. Key Resources: These are all the required assets to ensure digital health operations when creating digital health value. These key resources include tangible assets like digital equipment, intangible assets like intellectual property related to health solutions, personnel and financial resources.
8. Channels: this section refers to all marketing tools used by the digital health entrepreneur when communicating with DHC. Channels may be used for disseminating information, distributing products, sales to support and everything in between.
9. Cost Structure: This section encompasses all costs related to all digital health activities and resources such as production costs, human resources costs and all corporate elements contributing to run the digital health business.

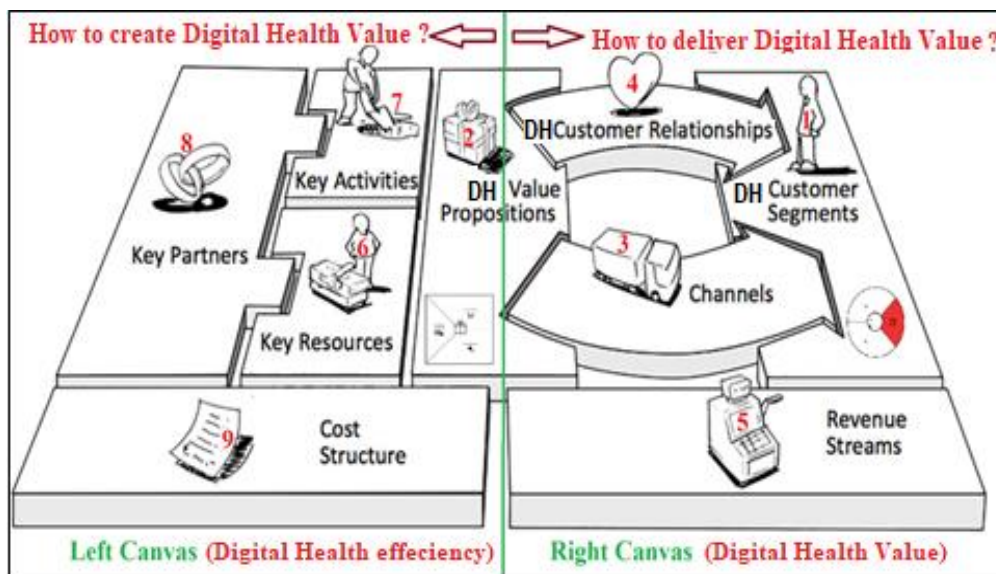


Figure 1: The nine blocks of digital health BMC

Source: Adopted and modified from Osterwalder et al. (2010)

The Digital Business Model Canvas components explain the cost structure of the investment and the way to generate revenues. Zajicek and Meyers (2018) argued that, when conceiving his BMC, the digital health entrepreneur have to use the VAST parameters: validity, automaticity, scalability, Time and Traction. The DHE have to finalize the VAST business model through a successful Digital health value proposition.

4.2. The digital health customer Profile

It is essential to outline the different facets and characteristics of the digital health customer (DHC). Moreover, the digital health innovation success need to determine the customer profile in order to design a higher value proposition through the digital health value map (DHVM). The digital health entrepreneur have to better understand the potential customer who similarly will assess the quality of value offered by the entrepreneur. Furthermore, the purchasing

decision of the potential consumer of the digital health product or services depend not only on the strengthens of the value proposition but also on its sustainability and viability. It does no matter if the DHP is bad or rapidly becoming non profitable when the business becomes obsolete. The digital health entrepreneur have to use a well-conceived business model as an essential step to validate a viable digital health solutions. A DHBM is a designed plan to ensure the profitability of the entrepreneurial health project including the core customer segments, main required resources, key activities and partnership. It includes also the cost structure of the project as well as the revenue streams from each targeted customer segment. The DHBM elucidates the way the digital health solutions could generate return on investment from the healthcare market. A good DHBM serve as a roadmap for building a strong business plan. Moreover, it is considered as a managerial tool of strategic planning, customer relationship management and business growth.

A digital health customer profile is an exhaustive description of all customer segments in the digital health business model in designed and meticulous way. The digital health entrepreneur have to determine customers' demographic characteristics and psychological traits. Moreover, he have to analyze their purchasing behavior through their jobs, pains, and wants (Figure 2):

- DHC jobs: the digital health entrepreneur try to answer the following question: what are customer segments want to be done? The answer tries to explain what each customer segment are trying to accomplish in their job and lives. If the digital health customers fail their job, they will feel more pains and they will loss potential gains. The pains should be tangible and must be unsolved and the gains unattained.
- DHC pains: the DHE have to answer the question: What things upsets each customer segment when getting the job done? These pains describes annoying consequences associated with DHC jobs that they want to be resolved. Moreover, they could be some frustrating problems and many other risks related to some features of the digital health product/solution such as functional and emotional risks.
- DHC gains: the DHC have to answer the question: What results and benefits that digital health customers are waiting for? This describes the outcomes that DHC need to attain or the tangible value they want to capture. There are many types of gains such as the required gain or functional gains, the desired gains, the expected and unexpected gains.

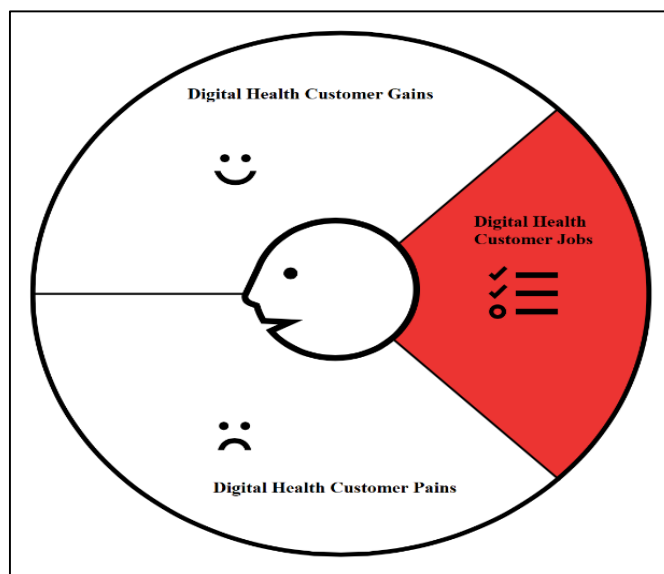


Figure 2: The digital health customer profile

Source: Adopted and modified from Osterwalder et al. (2014)

There are a lot of questions and issues that healthcare customers could ask when evaluating digital health solutions. Thus, the detailed Digital Health Business Model could help to answer the following questions:

- What is the effect of the digital health product or solution on the current workflows?
- Does the digital health product/solution require technical integration?
- How to make a practical training related to digital health product/solution? How much time it take? and how much does it cost?
- What personnel are required for product implementation and use?
- How is the product deployed? Are there access control, device management, security, and upgrade considerations that need to be cooperatively managed?
- What does available product inventory look like? What are the lead times for ordering, development, and delivery?
- What surety exists that the company will still be around in five years?

5. THE DIGITAL HEALTH VALUE PROPOSITION DESIGN

The healthcare value proposition using a digital solution is significantly different to the one proposed by a classical health device. In fact, the intellectual right is less likely to be dealt with and as well as it is less time-consuming for regulatory approval and clinical validation. The digital healthcare solutions contribute to reduce costs, gain time and fewer entry barriers to healthcare market. Moreover, the digital healthcare entrepreneur have to fulfill required skills

related to health systems like data analysis and workflow. To differentiate their digital health products or services from those of competitors, digital health entrepreneur have to establish a durable value proposition by building a strong partnership with different health system stakeholders.

5.1. The Digital Health Value Map

The concept of customer value mapping (CVM) is deemed as polyphonic and have a several meanings. Many health entrepreneurs fail with improperly conception of customer value mapping. The conception and development of CVM focus completely on specific aspects of digital health operations like digital solutions, health services' value proposition and pricing. Even though all these aspects are appreciated, they slightly contribute to outline and determine health customers' satisfaction. In fact, the digital health products and solutions have to deliver pain relievers and gain creators fitting with the customer priority jobs, pains, and gains (Figure 3):

- The digital health product (DHP): the digital value proposition have to be constructed around a set of all health products and solutions. To determine this set the digital health entrepreneur must attempt to answer the following questions:
 - What are the range of health products and solutions that aid customers to get their practical common job done and satisfying their needs and wants?
 - What are the auxiliary services that support digital health customers to perform their job?
- The Pain Reliever: it describes how the digital health products and solutions relieve health customers' pains. The DHE should determine the way that digital health products and solutions will remove or decrease bad emotions, costs and risks for the DHC. The DHE have to attempt to find a specific answers to the following questions:
 - Did the DHP contribute to cost reduction and savings?
 - Did the DHP give a better feeling of DHC?
 - Did the DHP overcome the difficulties experienced by DHC?
 - Did the DHP remove risks and fear encountering the DHC?
 - Did the DHP reduce or eliminate common usage errors made by the DHC?
 - Did the DHP contribute to overcome obstacles that inhibit to adopt proposed solutions by the DHC?
- The Gain Creator: it describes how DHP and solutions generate gains for DHC. The DHE have to identify the way DHP and solutions satisfy the expectations and wants of DHC. The DHE must answers the following questions:
 - Did the outcomes of DHP respond to all DHC expectations?
 - Did the DHP really surpass the existing solutions and contribute to delight the DHC?
 - Did the DHP facilitate customer's job and life?

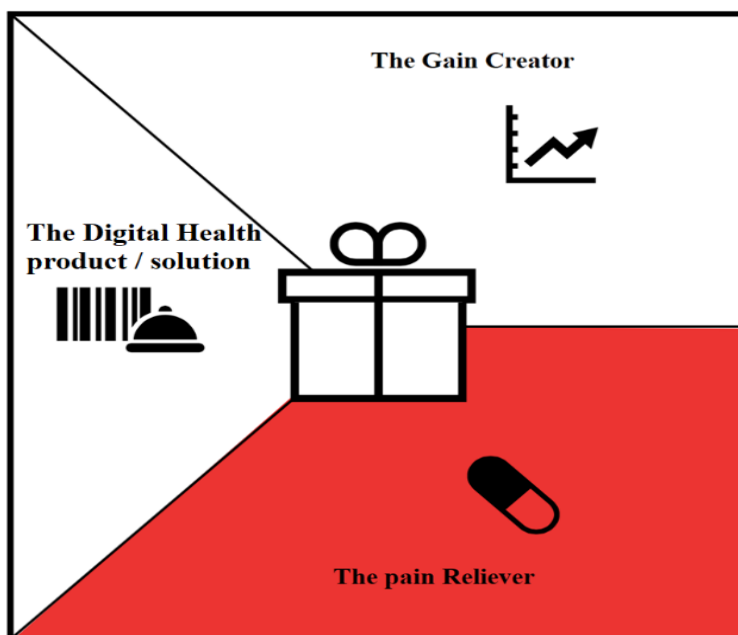


Figure 3: The Digital Health Value Map

Source: Adopted and modified from Osterwalder et al. (2014)

5.2. The Digital Health Value Proposition Canvas

Osterwalder et al. (2014) argued that the Value Proposition Canvas (VPC) is the fundamental background of the designed proposed value to different customer segments. As a result, in the context of Digital health entrepreneurship, we use the tow tools of customer profile (CP) and value map (VM) as specific instruments for conceiving VPC. During COVID-19 pandemic, these two web-oriented tools may be of great help to DHE to design the canvas of Digital Health Value Proposition. These tools allowed the DHE to outline a digital illustration of health customer profiles using digital sticky notes and to fit it with the digital health value map.

The digital health value proposition should be consistent and reflect a succinct statement that elucidates the reasons why a DHC must purchase and consume a digital health product or solutions. The digital health entrepreneur could propose various digital health values based on the number of targeted customer segments. The digital health value proposition defines benefits and solutions for health customer problems to satisfy their needs, wants and expectations. Laja (2019) argued that a precise value proposition must ensure three key factors:

- Relevancy: refers to the suitability of the DHP to fit with customer's expectations and wants to solve DHC problems.
- Quantified value: refers to the explicit benefits provided by the DHP to the DHC.
- Unique differentiation: refers to the set of recognizable dimensions that permit the DHP to be differentiated from other similar health solutions in the healthcare market.

Osterwalder et al. (2014) have created the Value Proposition Canvas as a visual tool that could be used by the DHE to outline and improve their DHP and offerings. This canvas help the DHE to outline the best fit between the profile of targeted customer and the value map (Figure 4).

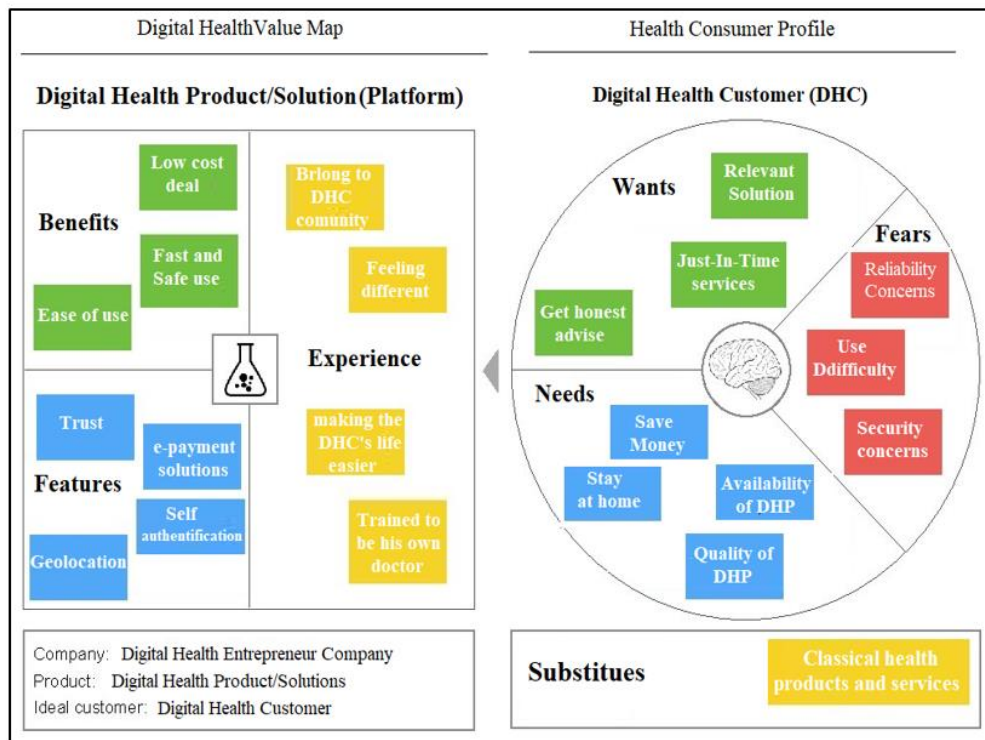


Figure 4: The Digital Health Value Proposition Canvas

Source: Adopted and modified from Osterwalder et al. (2014)

The left side of the canvas represents the digital health value map. This latter define the different innovative features of the entrepreneurial health solution. When this definition is more accurate, it will help both the digital health entrepreneur and targeted customer segments to avoid ambiguity and uncertainty. The right side of the Canvas outlines the profile of Digital Health Customer. It describes meticulously the different characteristics of the health customer. This permits the DHE to simplify the customer's jobs, problems that he faces, and the benefits from the entrepreneur's solution. It is better to create various distinct profiles for each DHC segment, instead of using a single profile for all customers. This permits to customize different specific values to different customer segments in the healthcare systems especially patients and health professionals (Figure 3).

Kazgan (2020) argued that there are many regulatory factors influencing patient and clinician behaviors in the healthcare market. The DHE must work harder to convince healthcare community (patients, physicians, clinicians, nurses...) and all healthcare systems stakeholders (government health bodies and agencies, health and healthcare providers, pharmacies, health associations...) about the greater expected outcome-value of his solutions. Moreover, public

and private healthcare organizations have unbearably procurement procedures and they need various digital solutions that could be proposed by DHE such as:

1. Make patients' life easier
2. Improve patients' quality of life
3. Provide customized healthcare services
4. Saving costs to patients and time to clinicians
5. Ensure security and privacy of health data

The value proposition in general and solutions in particular should be attractive enough for each customer segment in the healthcare system in order to sustain the digital health business. Thus, to create a strong value proposition, the digital health entrepreneurs have to recognize their targeted customers' traits, needs, expectations and wants. This comprises the required jobs to be done and obstacles or problems to be overcome and solved by the digital health products or solutions. Therefore, patients have to be their own-doctor by being experts on their own health and they should find digital channels to be up to date. The digital health entrepreneurs have to build a strong business model based on consistent healthcare values, cost efficiency and communication channels. Hoppe et al (2022) found that key performance indicators (KPIs), individualization, efficiency and communication channels have a significant effect on the potential of digital health business models.

The figure 5 summarizes the nine blocks of the digital health business model.

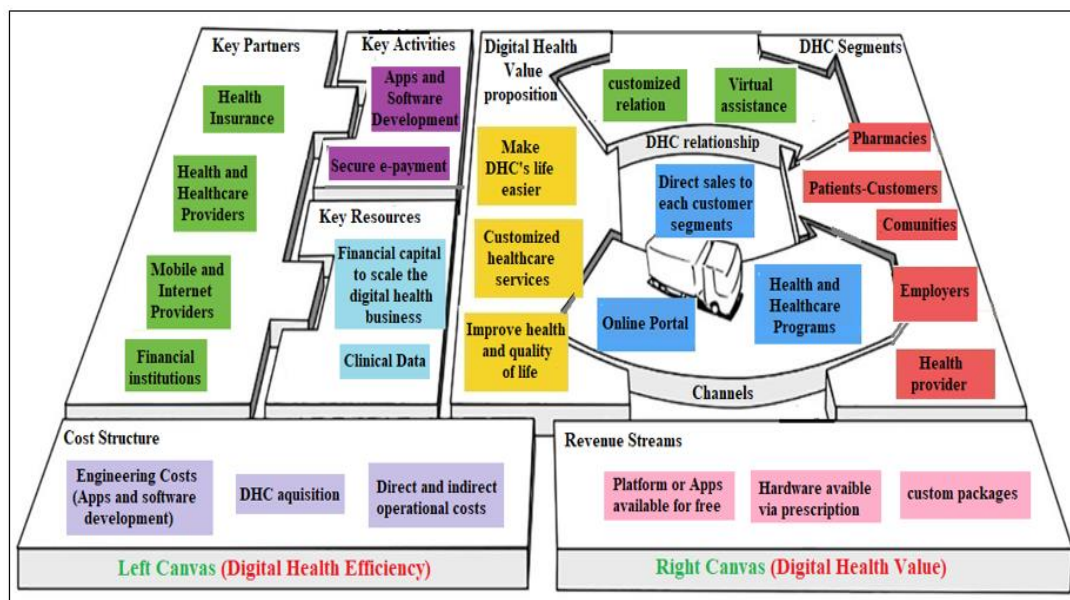


Figure 5: The Digital Health Business Model Canvas

Source: Adopted and modified from Osterwalder et al. (2010)

CONCLUSION

Digital health entrepreneurship as an emergent research field is promptly developing and refers to a highly competitive market. Both technological progress and new regulations continue to reshape the future of healthcare market. Healthcare stakeholders are overwhelmed by many responsibilities and constraints in an exploding healthcare market. It is essential that the digital health entrepreneur have to understand needs and wants of each customer segments by using two indispensable tools: value proposition canvas and business model canvas.

It seems to be evident that the purpose of the digital health is to ameliorate the quality of patient's life by improving their health outcomes in a digitally interconnected world. Based on their personal experiences and know-how, patients contribute in designing innovative digital health technologies. As stakeholders of healthcare systems are becoming more and more integrated and connected, healthcare entrepreneurs must be up-to-date on the appropriate use of technology as patients do. By doing so, digital health entrepreneurs contribute in the establishment of a participatory medicine based on patient centric strategies to make life patients more easily and comfortable.

As the digital health entrepreneurial environment maintains a steady development trend, the digital health entrepreneur should be reactive and proactive when responding to market and competitors constraints (Mintz, 2020). Nevertheless, he encounters many ongoing unresolved risks related to digital health product liability, unethical digital business practices, copyright and brand infringement.

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