

Multi-sided Business Models Implementation in Healthcare Sector in Denmark

Master Thesis in International Business Economics

Lulu Pownall and Justina Sakinskaite

Supervisor: Arnim Decker

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AALBORG UNIVERSITY
DENMARK

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Chapter 1: Introduction

Today digital technologies are changing routines in all industries, in which one of them being healthcare (Watson, 2016), therein *'digital era is an unstoppable and empowering driver of healthcare that will be best seen in the near future through advances in EHR functionality, streaming analytics, virtual care teams and remote monitoring'* (Watson, 2016, p221). This industry is affected positively by the advancement in technology and faced change in work practices (Jensen et al., 2009). Through the use of digital solution, professionals gain access to patients records and can examine these data in the long run and from remote locations. Digitalization provides factors enabling customized content consumption and new monetization models (Bojovic et al., 2015). This is due to the development of e-health solution which intensified in the mid 2000s due to the increase on healthcare expenditure as a result of ageing population increase, and socio economic factors caused by new reforms.

Based on this changes, some of the countries worldwide especially in the advanced economies have seek to create better service for their patient, among them being Denmark. With the launch of the first action plan in the EU in 2004, paved a way in enhancing ehealth solutions across EU. This is still done until today, with a recent plan, which is also the second action plan with the target to improve healthcare within the period of 2012-2020 by lowering barriers for penetration in the industry, for example lack of awareness, low interoperability, lack of cost-effectiveness proof, lack of legal clarity, high costs in starting up health systems and regional differences.

Moreover, Denmark has shown a remarkable achievement in fostering eHealth among other EU members. This has been portrayed through clear governance and funding mechanisms, care reorganization, incentives and ehealth deployment whereby most of the e-health also known as telemedicine is grouped into three categories being long distance monitoring, video conferencing and digital exchange of photos (Danish Ministry of Health, 2012).

While focusing on telemedicine, a recent improvement in technology has resulted into new mechanism known as mobile health (mHealth). This is defined as "*medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants, and other wireless devices*" (Kay et al.,2011, p.6). It is a subset of telemedicine, and experienced a marginal growth recently with more than 100,000 apps available on the global market. Apps enabled Smartphone to perform functions, about which no one thought when the phone was launched (Cambell-Kelly et al., 2015). According to GSMA and PwC report, the global mHealth market will earn US\$ 23 billion in 2017, therein US\$ 6.9 corresponds to Europe.

With the launch in 2014 by the European Commission, public consultation is enhanced to assist in finding the right way to seize the potential of mobile health in EU. However, the potential varies depending on the country. For the developed economies, which already provide a satisfying access to the health care, the main focus is on reducing costs. Despite the difference among countries on mHealth, Denmark leads by having best market conditions for mHealth companies in European Union. In 2015, the country got the highest 0.75 market readiness score of the mobile healthcare industry among other European countries. The score is built upon five dimensions of eHealth adoption, level of digitalization among population, mHealth market potential, ease of starting mHealth business, and mHealth regulatory framework as drawn from the EU countries' mHealth app market ranking 2015.

Notwithstanding the development in healthcare as explained above, little is yet known on the literature with regards to mHealth application implementation in delivering value in the healthcare sector. The academic research needs to further the understanding of innovation dynamics, governance, strategies, and business models in healthcare and other industries (Carsten et al., 2015). There is a need to address practical use situations of digital technologies, in order to understand how and why they are adopted (Jensen et al., 2009) as there is lack of guidance and limited knowledge on how to found an effective business model for digitalized

healthcare solution (Mettler et al., 2012). Most of the research from the business model implementation perspective has tended to focus on industries such as entertainment, mobility, financial and information technology as exemplified in the work of (Hagiu and Wright, 2015; Rumble and Mangematin, 2015; Frankenberger et al., 2014; Sun, 2006).

Also inspired by the recent work of Reynolds Jr. and Jones (2016), new waves of data source such as Smartphone, apps and social media, are said to have changed people's daily lives. It leads to change in the roles within healthcare, where at the centre stands the major actor well informed, engaged and active patient, pursuing the chosen lifestyle and taking control for their health and wellness (O'Brien and Mattison, 2016). This is also the case in healthcare whereby monitoring of patient is significant and can be done from everywhere. Through sensors and mobile applications healthcare providers can access the data of the patient and deliver a service in a remote contact, enclosing management of chronic diseases, e.g. diabetes; support ageing of elderly; monitoring personal fitness activities; cancer detection; management of heart condition; vision enhancement (Kartsakli et al., 2014).

However, with the recent years exponential growth in data and costs in the industry specifically by the entity capturing and storing data, new ways are sought in efficiently delivering the value and minimizing costs. Hence, through these sources more data is captured, stored and used. With the use of these new sources of data, (Reynolds Jr. and Jones, 2016) argue that an architecture is needed for an entity to be able to thrive and survive in the new world.

Therefore, with the above explanation in mind, as researchers we have been inspired to investigate the gap by using the recent phenomena of multi-sided business model (Cambell-Kelly et al., 2015) on economics and business perspective on Smartphone as multi-sided, (Rumble and Mangematin, 2015) on multi-sided business model implementation and (Bojovic et al., 2015) on what innovative business model can be triggered by precision medicine, analogical reasoning from magazine industry, and generally in healthcare (Mettler et al., 2012) .

Thus, our research is mainly to find the operationalization of two or more business models in healthcare industry in the Denmark, using the following problem formulation:

How are multi-sided business models implemented in healthcare sector in Denmark: The cases of mHealth applications.

While the above mentioned research question being the core of our project. Other sub-questions are presented:

What are the motives for the multi-sided business model?

How are the different business model configurations influencing the implementation in multiple side markets?

And what challenges are encountered with the implementation of such model?

The remaining of the thesis is organized as follows (Fig. 1). In the second chapter, methodology will present our scientific approach to problem formulation. The following chapter of literature review will provide understanding of others scholars' contribution on business model concept and more specifically multi-sided business models. Afterwards, in chapter four we will present the data collected, individual cases analysis and common findings. Finally, the conclusion will disclose with the answer to the problem question of the research.

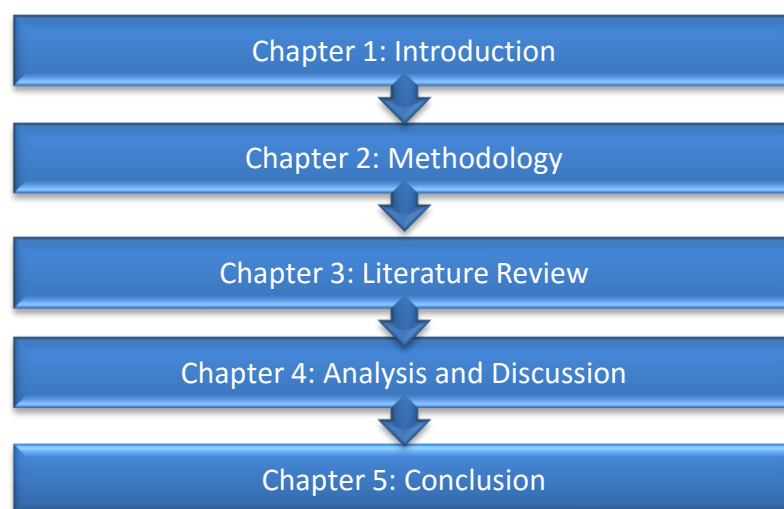


Figure 1 The Structure of the project by the authors of the project

Chapter 2: Methodology

2.1 Introduction

This chapter will provide an overview of the research design, which reflects researchers' chosen path for conducting the study. It is used as guidelines for identifying what is a philosophical perspective underneath the issues to be solved and how it leads to the specific paradigmatic approach providing a set of possibilities and limitations, which enable the researcher to make appropriate decisions on and choices of methods for answering the question. As stated in Kuada (2012), the research design is imperative to any academic research. It enables a linkage among all the important parts of the research, starting with the question formulation, following the theories, methods for data collection, and analysis deriving findings. According to Yin (2011), the design is naturally an implicit blueprint of a logic, which can be later explicitly defined by the researcher or not. Explicitly determined logic leads to valid and accurate study. To sustain the usefulness of the design, the researcher has to bear in mind that it is not static, but changing over time, and require adaptations in alignment to the study process.

2.2. Research design

The research design pictures all the parts of the study from the starting point of deciding on the issue to the final results. Kuada (2012) noted, that most of the social science research can be divided into four levels, i.e. philosophical viewpoint, epistemological choice, methodological decisions, and last one methods and techniques. The researcher has to elaborate his perception towards all these four components in relation to the problem formulation.



Figure 2 Structure and Levels of Discussion in a Methodology Chapter adapted from Kuada (2012)

2.2.1. Philosophical viewpoint

Philosophical viewpoint shows a researcher's perception onto a reality or ontology of the undertaken issue. The purpose in this level is to define the orientation in this study. The researcher have to determine how he perceive subjects' social world and its environment. There are two broad perspectives representing distinctive assumptions on human beings and environment (Kuada, 2012). On the one hand, the social entity can be examined as an objective truth, which reality is external to social actors. On the other hand, the discussed entity can be acknowledged as a social construction created by perceptions and actions of social actors (Bryman and Bell, 2011). The first one is called **objectivism**. It represents the social order to be accepted and followed by individuals who are part of the entity. This social order works as a constrain for the social actors, which is external and holds the tangible reality of its own. There are no traits between these two, and the reality is independent and separate from social actors. The alternative to prior stand is a **constructionism**. The social phenomena is codetermined by social actors through interactions and processes leading to constant change and dynamic nature.

Our research's perception on ontology corresponds more to the constructionism perspective as we are interested in phenomena through the eyes of several social actors, without aiming to conclude the overall and absolute truth for the whole mHealth sector, indeed the purpose is to orient to social constructions which can be a small units of the whole reality, but still drive implications and can affect it. Beyond that, the subjective meanings can be considered as true facts, as the questions asked direct to the business model of the legal entity and in this scenario persons interviewed represent the firm and its culture, values and rules, therefore it can be assumed as true facts. In addition to, we see that environment co-determine the social actors, therefore the objective facts will not be excluded. In addition to that, Kuada (2012) explains that these two perspectives can complement each other, and the research can benefit from both, in case the researcher is taking the pragmatist position, and allow the investigation objectives to determine the direction of the research. Therefore, we will bond objective and subjective information together in this study.

2.2.2. Epistemological Choice

This level represents the nature of knowledge and the means of knowing (Kuada, 2012). There is a debate between objective and subjective knowledge. The objective positions historically were adapted in the social science field from the natural science, i.e. mathematics, physics. It required measurable, factual knowledge. The popular and long time applied position assimilating to natural science, is called **positivism**. The knowledge is collected through facts, and creates the basis for laws. The researcher is expected to act in a value free manner and provide findings on the scientific statements. The contrasting stand is called **interpretivism**, which is influenced by hermeneutic-phenomenological tradition and symbolic interactionism. It is based upon the strategy requiring to pay particular attention to the differences between people and social objects, and require to assess the subjective meanings of social actions. It primarily refer to the interpretations of social actions, leaving external forces besides (Bryman and Bell, 2011).

In this study social world researched is representing more a subjective nature and leads to interpretations. Nevertheless, the external environment characteristics and objective facts, such as history, standard procedures, are relevant and useful to answer the question. Hence, the objective facts would not be neglected, if it allows to increase the extent of interpretation.

2.2.3. Methodological Decisions

This level presents the reasons underlying the decision of specific methods. Prior to decision on how to collect the data, researchers have to agree upon the expectations of the research and on which perceptions are accepted in this study. The lack of empirical data and deep insights on the business issues in mHealth market, leads us to the high focus on the investigation and data collected. Depending on the core part of the project, researcher can ground the research on deductive or inductive reasoning (Lewis et al., 2014). Deductive approach would start from the theory and hypothesis creation, while induction looks to the context and observation data first to identify the key areas of research and later the theory is used to analyze an empirical data. The former one is highly structured, requiring generation of quantitative data and explanation through analysis of casual relationships and covering the fundamental laws. The second one

concentrate on subjective meanings and its interpretations, it can be non formalized structure, which allows flexibility, but at the same is associated with complexity.

Due to previous levels and reflections on the needs of social actors meanings in this research, the interpretive reasoning will take an important role. Therefore, the qualitative stance is a dominant in this research. It is focusing on the culture and human meanings, how they are learning, knowing, acting and their ways of understanding (Kvale and Brinkmann, 2009). Beyond that, Bryman and Bell (2011) explain that, if the researcher is working in a topic on which no or limited research has been implemented in the past, the quantitative approach can be difficult to follow as there are not enough literature to draw leads, and the more exploratory stance can provide better outcome, so qualitative choice would serve better in this situation as multi-sided business model literature is still lacking in the context of digitalization and specifically in mHealth market.

2.2.4 Choice of Methods and Techniques

The fourth level introduces to specific methods and techniques, which selection derives consistently from the discussion on previous levels. Moreover the methods selected have to reflect on problem formulation. In consequence the case study strategy (Yin, 2011) is adopted in this research with the interviewing technique in mind, as it links to the understanding of the philosophical foundations above and practical issues in the selected context. Furthermore case study enable researchers to include both objective and subjective knowledge.

2.3. Methodological Paradigms

2.3.1. Overview of paradigmatic classifications

The reflection on philosophical assumptions above make a better sense of the research. Nevertheless, the further step is to consider these considerations and select a precise approach to conducting the study or in another word a paradigm, which represents the descriptive summary of all assumptions within four levels (Kuada, 2012). It draws on specific beliefs and boundaries, so dictates the path to follow, how the research should be done, and the results presented. This creates a clear linkage between philosophical considerations and operational choices of methods and techniques. In the business research on social science several scholars attempted to build a paradigmatic classifications, distinguishing mainly on objective and subjective perspectives. Kuada (2012) identified tree most popular typologies used and

discussed in social science methodology. The typologies are: the FISI classification (Functionalism, Interpretivism, Structuralism, Interactionalism), the RRIF classification (Radical Humanist, Radical Structuralist, Interpretive, Functionalist) and Arbnor and Bjerke's classification of six paradigms.

2.3.2 The FISI Classification

In 19 and 20th century sociology scholars Durkheim, Spencer, Parsons and Merton emphasized the importance of studying social phenomena through structures, functions, and interactions (Kuada, 2012). The main perception regarding ontology, was that social facts can be studied outside existence of individual actors. Nevertheless, the recent studies approved a need of understanding individual actors and the importance of adding subjective elements as beliefs and values to forethought. Consequently the interpretivism perspective was included in this classification. The four paradigmatic classes, which reflect on roots of their work are presented in (fig. 3), below.

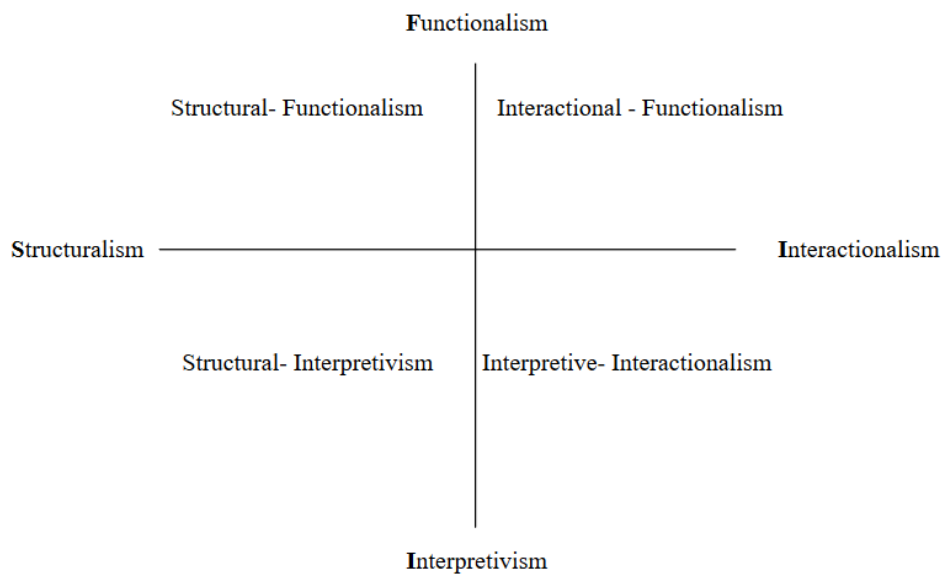


Figure 3 The FISI Classification adapted from Kuada (2012)

The four paradigms can be combined and presented in transformative perspectives, e.g. structural functionalism, structural interpretivism, interactional functionalism, interpretive interactionalism. The advantage of this classification is that it allows these combinations and adjustments. This permit the researcher to answer the research question from different angles and expand the potential of investigation in a broader extent.

2.3.3. The RRIF Classification

The second classification was delivered by Burrell and Morgan (1979). There are two sets of alternative perspectives in this typology, e.g. subjective vs. objective, and the sociology of regulation vs. the sociology of radical change. The introduction of radical change aspect sets this work apart from FISI classification. The paradigms involved radical humanist, radical structuralist, interpretive and functionalist, i.e. (Fig 4), below.

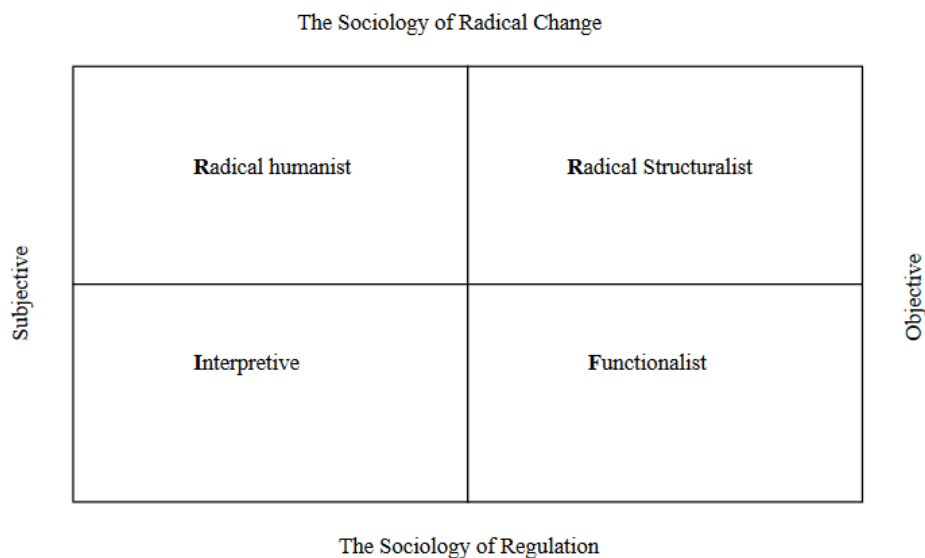


Figure 4 Model of Social Theory adapted from Burrell and Morgan (1979)

The four paradigms are contiguous to each other, but have to be kept separately, because of different characteristics providing explanation to the social phenomena. This is a limitation, if the researcher is willing to include diverse set of assumptions in the study.

2.3.4. Arbnor and Bjerke's Classification

The last and more recent typology was developed by Arbnor and Bjerke (2009). In advance to presentation of the classification, it is important to confirm a selection of this in our study. The decision is undertaken, because of flexible nature of the typology, where the set of presumptions in a single research is thought about. Furthermore, the distinction between theory of science and operational paradigms provides a well explained outline of philosophical matters and practical considerations for undertaking the study. In that matter, the ontological and epistemological concerns are reflected in the set of six ultimate presumptions, while methodological views are discussed by integrating a structure of **three research approaches**, i.e. the analytical approach, the systems approach, the actors approach (fig.5). The **six foundational and overlapping presumptions**, which should be seen in the point of objective-subjective continuum, i.e., O1 the extreme objectivist position versus S2 extreme subjectivist stand.

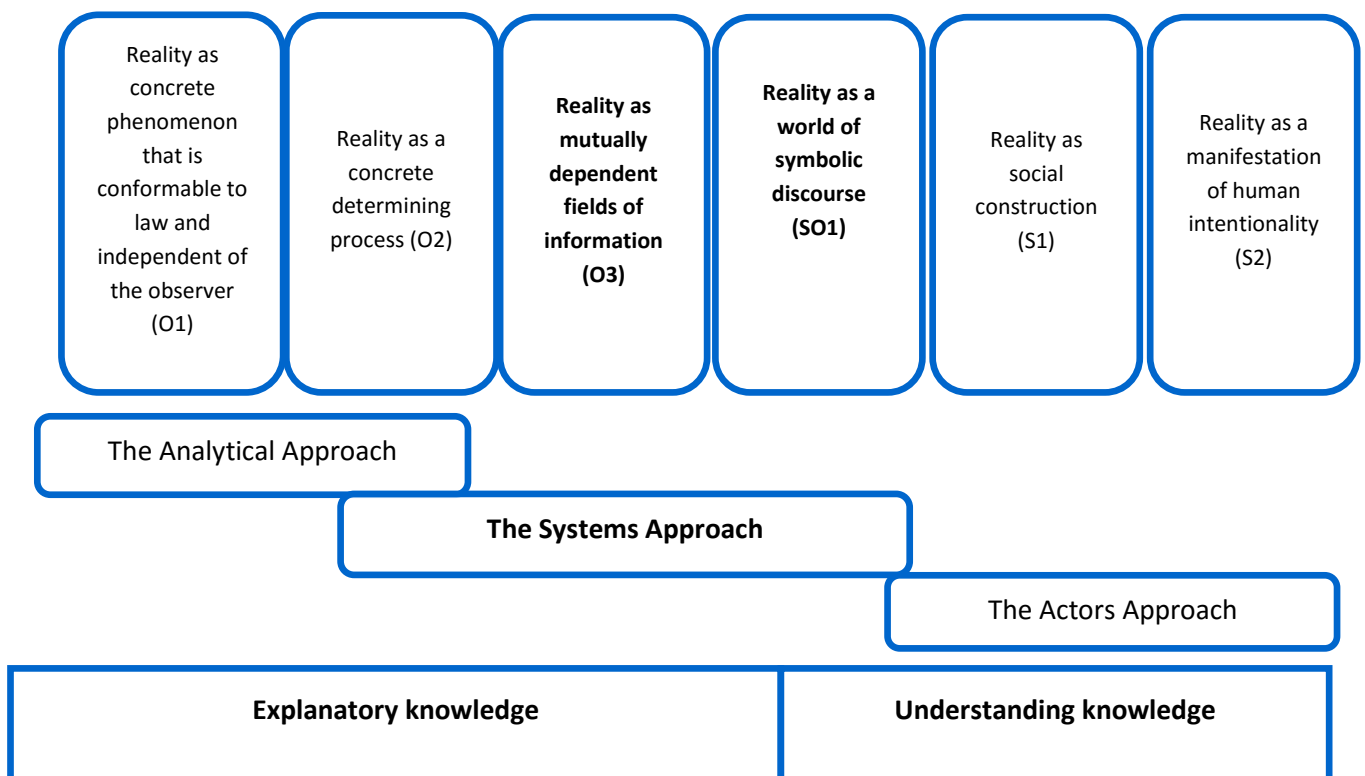


Figure 5 Methodological Approaches adapted from Arbnor and Bjerke (2009)

The six paradigms involve the considerations on objective-subjective continuum, researcher's involvement in the knowledge, and whether the aim is to explain or understand (Arbnor and

Bjerke, 2009). There are common values among these paradigms, while at the same time some are opposite and placed apart from each other. Nevertheless, the paradigms holding commonalities can be faced by employing the same methodological approach mentioned, one from the above named.

An analytical approach correspond to paradigms O1, O2 and O3, which represent the side of objective continuum. The ambition of this view is to explain the reality by collecting objective, i.e. history, statistics, and subjective facts, i.e., opinions, but both perceived as true. The main task is to identify the invariant quantitative elements in the environment creating causes and effects relations, which are part of the whole picture representing the truth. For data collection the research should look for the sources of public statistics and answers of those who know and have experience in the field (in the second source scenario, the researcher has to take a most objective role possible, while collecting data, and do not bring any value making impact on the data). Because of summative character the elements can be analyzed separately and at the end summed up to an explanation of whole. This depiction of picture should result in regularities and representative models based on similarities, so later it can be applied in many cases in practice. Furthermore, the structure for data collection with a well defined order enable to sustain validity of the results, which can be applied in consulting reports, investigation driven by set of rules (Arbnor and Bjerke, 2009).

A systems approach have a set of the paradigms O2, O3 and SO1, which are reflected on analytical approach. This approach has many common points with analytical approach, as the aim is to gain objective picture of the reality, even though the subjective information can be assumed as an objective facts in the systems view. Furthermore, the another comparable characteristic is a willingness to explain the reality as a whole. Though this reality is studied in a more complex manner, if to make a contrast apart from analytical approach. It is due to the requirement to study the whole as one entity, with consideration of elements and relations between them. Arbnor and Bjerke (2009) explain that elimination of one component have implication for the old picture and leads to a new one. So, the systems view aims either or both to explain or to understand the reality by taking in consideration facts of a whole, which cannot be divided and analyzed in a separate units, as interrelations among the elements of the system are meaningful in providing the understanding (Arbnor and Bjerke, 2009).

Actors approach matches three most subjective paradigms SO1, S1 and S2 and distinguishes from the two other views. The analytical and systems views are stressing more the need to review the existing literature prior to starting a new study. Oppositely, in actors view the reality is understood as a pure human construction, where the core concept is an actor, hence the past knowledge is not a must. Additionally, the researcher adopting this view seeks for inner qualities of the respondents and reverse it to denotations as general understandings, meanings, and significant insights (Arbnor and Bjerke, 2009). The data is collected through the intentionality¹ in a dialogue, which allow the researcher to associate with the concept, to be procreative and share reflections with the respondent. The responding actors are assumed as active, reflective and creative individuals and not bounded by external systemic forces. In the analysis, researcher aims to understand these meanings through interpretations. These interpretive findings can add value to the existing factual knowledge in the theoretical field.

2.3.5.Choice of methodological approach

The approach chosen for this research is systems approach because earlier depicted ontological and epistemological roots confide to the paradigms O3 and SO1 - "*reality as mutually dependent fields of information*" and "*reality as a world of symbolic discourse*" (Kuada, 2012, 84). These paradigms entail the focus on both implicit and explicit elements and are placed in the middle of objective-subjective continuum. The aim of this research is to explain the multi-sided business model implementation in mHealth market. To do so, the objective and subjective knowledge is relevant, due to currently limited empirical research in the selected context. Moreover, attention on the symbols such as language, expressions, can lead to collecting deeper insights about the individual and the business as a system, in general. Moreover, business model is a representation of different interrelated components, which will not function in a same way, if one would be eliminated or changed. Therefore, to answer the question we cannot focus purely on individual level, the explanation of the whole picture is necessary through models, but to explain it, first the understanding on components and interactions by interpretations have to be included.

¹ The structure that gives a purpose to experience (Arbnor and Bjerke, 2009:133)

2.4. Methods

Examinations of methodological paradigms and operational paradigm choice set the boundaries in methods selection. After determining the methodological view a right fit has to be found to relate it to study area. The systems view is not accepting independent units of study, the researcher has to grasp the idea of the whole system and interaction. To do so, the qualitative research is required that to answer the research question. According to Yin (2011) there are several overlapping variations in qualitative research, such as action research, case study, ethnography, grounded theory, etc. It means that one mean can incorporate others in its design. In addition to that, Arbnor and Bjerke (2009) state the two most common approaches are case study and historical studies. Our aim is to study multi-sided business models in mHealth and for this purpose we will apply case study strategy, as we want to understand the specific structures and interactions among the companies in implementing their business models. The historical elements will be seen in the description of the case, with the main focus on the structure and processes how it is now and could be in the future.

2.4.1. Case study strategy

The unexplored topic caused our decision to focus on the firm level and get deeper insights on how these companies actually implement multi-sided business models in mHealth market. The case study spots the bounded situation or system, and inform about the entity and the key functioning parts (Bryman and Bell, 2011). In this way it is be possible to gain insights into the situation and complement with more knowledge on the multi-sided business models research. The qualitative research and case study application have higher level of ambiguity and flexibility in comparison to quantitative approaches, nevertheless the researcher have to follow a methodological path. For this study, we take in consideration Yin (2009, p.2) proposed foundation for case study research, which the author called linear but iterative process, including stages, such as "*plan, design, prepare, collect, share, analyze*". Therefore, we will provide further explanation on the type of the case study, unit of analysis, sources of the data required, collection techniques and the analysis procedures.

2.4.2. Multiple case study

The focus on one case is an option, if the case is very rare or unique. If the researcher is willing to bring more evidence on the issue, then the multiple case design can provide a more compelling and robust result (Yin, 2009). In that event, the aim is still to reflect on each individual case and, in advance, to compare the cases and to discover the common points and differences among all findings. This enables research to produce a more extensive theoretical outcome at the end. Primarily, the interest is to see, if the common patterns emerge in regards to components and motives of multi-sided business. The particular cases choice was made based on the researched problem, aiming at investigating the implementation of multi-sided models in the healthcare sector in Denmark, as already mentioned, with the specific focus on mHealth sector as a representation of digital technology advancement and new opportunities. The cases were carefully selected with the idea that it could predict similar results or replication (Yin, 2009). In the scenario of contradicting results, the solution would be to provide the support to the results by retesting with another set of cases. The particular unit of analysis in this case study is organization, therefore the companies operating in this sector are at the centre.

2.4.3. Data collection techniques

Writing a research require the researcher to collect evidence to implement final propositions. The most commonly used sources of evidence in case study research (fig.6): "*documentation, archival records, interviews, direct observations, participant-observation, and physical artifacts*" (Yin, 2009,101).

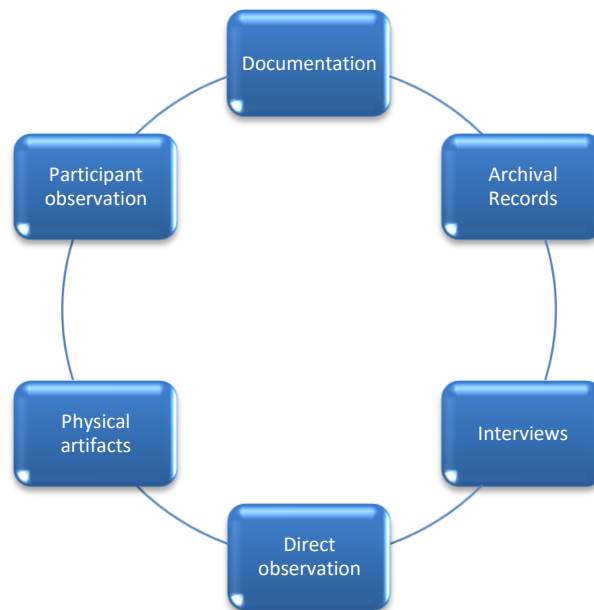


Figure 6 Six Sources of Evidence adapted from Yin (2009)

All listed sources have certain advantages and weaknesses when working on a research. The investigator may choose only one of all sources, and build the research on that. Nevertheless, the multiple sources as a basis for the research leads to addressing a broader range of historical and behavioral issues (Yin, 2009). It enables researcher to write a more convincing and accurate conclusion. Due to these suggestions and seeing limitations of single source we include documentation, and semi structured interviews in evidence creation. For building pre-understanding on the issue we used other scholars inputs in the field of multi-sided business models, furthermore, the rest of the secondary data was used in description of the companies and analysis in combination with the primary data collected in the interviews.

For an effective use of multiple sources, Yin (2009) proposed to have in mind different types of *triangulations*, i.e. data triangulation, investigator triangulation, theory triangulation and methodological triangulation. The investigator develops a convergence of evidence, by considering various aspects of the phenomenon and as a result transfer all this knowledge to the facts.

Pre-understanding

It is not pure inductive reasoning in this research, if the researcher is taking in consideration theories prior to data collection (Lewis et al., 2014). Literature review was implemented prior to the data collection, even though the decision on which theories are relevant for analysis emerged after identifying patterns from data.

The literature review has a characteristic of systematic and narrative type. First the broad concept of business model was considered. Therefore, the systematic literature review was conducted, after stating the question and identifying keywords, such as "business model", "digitalization", "digital". After screening the general articles and trends within this field, the special interest was held on digital advancement and multi-sided business models implementation. Therefore the literature review became more narrative as the aim was to gain better impression on the topic. Then the keyword "multi-sided business models" and "mHealth" were utilized in the searching process. Beyond that, for expanding the variety of articles, we looked to relevant articles' references and came with other valuable contributions to our research, even if these did not have the specific keywords stated.

Secondary data

In this study the combination of secondary and primary data is presented. In relation to systems view approach, to interpret the present of the company, the researcher has to look back to the history. To do so, he has to gain knowledge about the history through various documents. The complexity in reproducing history stand out when the decision on the relevant knowledge have to be made. The systems view suggest to follow three points, when collecting historical material, i.e. usefulness, the origin and interpretive procedure. The material have to be useful and trustworthy depending on the research questions, the researcher should always look for the original sources and interpret that information in a creative way, by assimilating to the past context (Arbnor and Bjerke, 2009). In our research, we started from searching information in companies' official websites. Additionally, to that we scanned social media activities of the company on Facebook, Youtube, which allowed to get an idea about the company' history, the phases of growth and key steps taken, and get better idea of what is a value proposition or possible modes to generate revenue out of the value created. Furthermore, the external

sources such as articles about the company in the newspapers, partners' websites were checked.

Primary data

There are various techniques, which enable researcher to collect the data within specific topic, in regards to type of the data, e.g. quantitative or qualitative. As it was explained before, our choice is qualitative data collection, as the main objective is to gain firsthand look at the environment by which unit of analysis is bounded and how the participants describe it through their own opinions (Kuada, 2012). The three common used techniques for qualitative data collection are focus groups; observations; and qualitative interviews. The presentation of these three is included for a justification upon selection, as according to Silverman (2011) it should be a norm to consider different means within qualitative data collection, even though a decision is to apply qualitative interviews technique in this study.

The focus group technique requires the researcher to gather a certain group of people and launch the open discussion on the interest. Often this technique is used in a business research for marketing issues, such as evaluation of new product or service, where the feedback from customers is essential. These people presumably have common experience or share the same views. During the conversation they can express their own thoughts about the subject and discuss together in a group. To start the conversation, the researcher has to act as a facilitator (Kuada, 2012) or moderator (Yin, 2011), who helps participants to engage through asking probing questions and stimulate the discussion on the issues, but with minimum direction. The task of moderator is challenging in a way that it requires experience to manage the group of people. Usually, some people will act as leaders and will dominate the discussion, while others can stay in silent, thus the task of the facilitator is to involve all in the discussion and keep the conversation going. Even though, it is a challenging role for the researcher, the discussion in the group let efficiently collect the desired data, but with lack of in-depth insights.

Observation technique is appropriate in the moment of unwillingness to share the personal opinion about issues and when people are avoiding participation in the discussion. The concern in observation can be many aspects entailing the selected humans, e.g. social behavior, routines, rituals, interactions with other people (Yin, 2011). The things observed at specific time

and location have to be recorded and documented in the notes, so that researcher will have a possibility to return and reflect on meaningful details, which have implications on the major findings. To strengthen the validity of these notes, researcher is allowed to incorporate other techniques, such as qualitative interviews, and gain more diverse knowledge about the situation, and so challenge own observations.

The researcher can choose between two types of observation either nonparticipant or participant. The first one is a sensitive as being an outsider, who is entering the organization and try to gain knowledge, even though employees can feel discomfort in the process of collection, that minimize the data comprehensiveness and true nature. The second option is to be a participant observant. This means that the researcher decides to take an active position and stay sometime inside in the organization. In this way, people observed can show more willingness to share their opinions openly and without a fare. If the second type is adopted, the researcher can implement some specific routine tasks in the company or assist observed individuals in the period of data collection. Both types require a long-term commitment from the researcher's side that to gain a valuable knowledge about the unit of analysis (Silverman, 2011; Kuada, 2012).

Qualitative interviewing is a third technique to be discussed. The decision on how to conduct an interview depends on the nature of required data. In our study, the data is supposed to reveal the personal experiences and opinions of managers, and this leads to qualitative essence (Kuada, 2012). Semi-structured interview is opposite to the structured interview, where the researcher is strictly following the pre defined questionnaire and adopt the same behaviour during all the interviews. Beyond that the structured interview will allow only several responses to the question, due to closed-ended questions (Yin, 2011). This study is seeking for gaining knowledge about each specific case, therefore the relationship between us as researchers and interviewees is not predefined. The conversational mode is followed, which let to create an interaction, but at the same time requires to listen to the answers and catch up with relevant questions on the topic. In this way, the data collected should express the interviewee's perception on how they implement business model, without any limitations. Yin (2011, p.136) provide several hints to follow in qualitative interviewing: *speaking in modest amounts, being nondirective, staying neutral, maintaining rapport, and using an interview protocol.*

Semi structured interview

To go further into details, the qualitative interview can encapsulate several types. For example, Bryman and Bell (2011) state that the two main types of qualitative interview are unstructured interview and semi-structured interview. The unstructured interview avoid any predispositions, and can be conducted through conversational form, where the researcher may ask only one question to begin the talk, but later the interviewee is able to freely express his opinion and give a direction for the researcher for other possible questions. Opposite to this approach, the semi-structured interview can be employed and we do that as according to Bryman and Bell (2011) doing a multiple case study research leads to common points between the cases and comparability opportunity, so including the structure in the interview allow us to fulfil this goal. Moreover, this choice means the researcher is still allowed to be free and tack the key points of interest in a dynamic process of interview. During the interviews the questions were asked without specific order, in respect to the answers provided by the interviewee. The new questions emerged during the interview as we picked up on the answers. Nevertheless, we sought to cover all prior defined sections of interest. Therefore the interview had a structure, but at the same time the flexibility was given.

With regards to the interview questions, the reflection to the business model theory, played an important role in choosing questions that lead to answering the problems. The questions are also influenced by the in depth discussion between the researcher and the supervisor of this project. The interview questions involved questions like; how do the firms create , capture and deliver value to their potential customers, how does the company operates using multi-sided models under the influence of internal and external pressure, what drive the company to use multi-sided models, what tools do they use in business model designing, do they consider inputs from their customers, how do they combine in their operationalization process, what strategies they use to ensure the application of such models are successful, how do they pilot their platform before implementing and the challenges they experience in implementing the multi-sided models. After selection of suitable questions for the interview under the influence of work of Osterwalder (2010), dates were set between the interviewers and interviewees.

During the interviews the data was recorded using audio voice recorder and then transcribed. This enabled the detailed analysis, and the interviewees own terms usage.

2.4.4. Data Analysis

Five principles in systems view

After data is collected, the researcher has to identify the main patterns of the system. In this process, the five basic guiding principles in regards to systems view have to be followed (Fig.7).



Figure 7 Five Principles of Systems View adapted from Arbnor and Bjerke (2009, p112-119)

First principle tells about the importance of *totality* in a complicated world where parts are dependent to each other. The totality can be limited in regards to external and internal delimitations. In our research, the totality of the picture means the business model of each firm in the context of mHealth market, however we do acknowledge the presence of digital marketing company that we use to get more insights in the healthcare sector. At the same time the external picture will be mainly explained by the primary data and secondary data from the firm, without putting emphasis on third parties, and target the firm as a priority. The second principle complexity just explain that there is no wrong or good delimitations, but just the ones in alignment with a specific purpose. Every system represent just some part of the real world.

The final picture of the system is affected by *relativity* to researcher. The personal characteristics leads to making certain choices in how to represent the system. Additionally, the component and interactions can have mutuality aspect, as depending on the concept it can change place easily, and provide a different picture of the system. Finally, the fifth principle of *unpredictability* show that a complex construction of the system and all interactions associate with constant movement and improvement, which minimize a possibility of predicting a future (Arbnor and Bjerke, 2009). The description of the full picture interpretation can be implemented in either or both static and dynamic manners. The researcher can attach to *structural or processual* perspectives, if to accomplish one of these. In this study, the intention is to explain and interpret both structure and the processual dynamics resulting in systems analysis.

Coding and Interpretation

To follow up these principles and do not miss the relevant information, the analysis starts from the coding procedure. Researcher can choose to disassemble data in different ways (Yin, 2011). The coding moves the research to a higher conceptual level. Having in mind, that each case has unique characteristics and terms to describe the routines, actions and traits can vary. The codes should be given certain names and labels and specific portions of transcript should belong to these codes (Bryman and Bell, 2011). There can be several levels of codes, starting from the broad perspective and narrowing down in the latest levels, where the specific theoretical contributions can emerge. The first time, the researcher implement a basic coding, which would give a number of codes. Later the researcher should review the codes and relate it to the content of what is said. Finally, at the last level the researcher reflects on codes.

Either the research comprise coding or not, it is just a way of managing data. In this way, the researcher can sustain analytical view, without focusing and copy pasting what the respondent said (Bryman and Bell, 2011). As the findings bring value, only when it is successfully theorized. Therefore the coding in our study will be based on Rumble and Mangematin (2015) theoretical propositions regarding multi-sided business models, which influenced our research through start to the end. Afterwards, the established list of codes are interpreted for each individual case. The major patterns are analyzed in the glance of common and rival explanations of other authors. After the findings for single case a *cross-case synthesis* follow up. The common

patterns are discussed based on the argumentative interpretation supported by the non-numerical data.

2.4.5. Reporting results

The research is limited to a few organizations, therefore the conclusions should not be applied as it is on other real systems. The reported propositions should be seen as a valuable proposition for existing knowledge in the academic literature within multi-sided business model field and mHealth context. The future insights included give a chance for other academics to contribute to this work with further research.

2.6. Evaluation of the study

The adopted research strategy trigger the common evaluation factors, i.e. reliability, replicability and validity. According to Bryman and Bell (2011), many times academics ignore these criteria of evaluation when conducting case study research. It depends on the type of research, as the focus on measuring reliability, replicability and validity depends on the research being quantitative or qualitative. There is a tendency, that case study researchers acquiring quantitative methods, give a thoroughly attention to these research criteria. The main point to remember is that these criteria allow to achieve generalizable results, which can later on be applied in other cases and contexts. Nevertheless, case study cannot fulfil this objective, as the intention is to reveal how the unique case or cases are functioning. In other word the priority is particularization rather than generalization, when researching the unique aspects of the case resulting in comprehensive understanding. Nevertheless, the measurement of these criteria should not be ignored, but explained specifically in regards to case study.

Validity, reliability and replicability in the systems approach is depending on the creator of knowledge. The measurements applied are not quantitative and the main requirement is that the system is presented from as many angles as possible. To succeed in that the researcher should use lot of primary and secondary information (Arbnor and Bjerke, 2009). Furthermore, Yin (2009) discussed *four tactics for testing research design*. First, construct validity test asks for operational measures, therein researcher should incorporate multiple sources of evidence, establish a chain, and allow key informants to review draft of the report. Secondly, the

researchers should test validity internally by doing pattern matching, explanation building, address opposite explanations and adopt logic models. A third test is called external validity and tells that in the situation of single case the theory should be used, if the multiple cases are studies the replication logic should be used. Finally, the fourth reliability test holds the tactic as case study protocol and case study database. Due to that, we used multiple sources, and argumentation is based on varying information. The research design included multiple case study approach, which enabled us to compare the interpretations of individual cases and replicate the results. In the analysis the patterns were identified and explained through interpretations, in concern to the existing theories. Last, but not least, during the whole writing process, the study database was established at Google drive, with separate folders about each company, enabling us to collect information and build the sources of evidence.

Chapter 3: Literature Review

3.1 Theoretical Background

In this chapter the authors of the project draw more attention into understanding business models as already mentioned in the introduction chapter. Business model theoretical understanding is the basis to further investigate **how are multi-sided business model implemented in the healthcare sector in Denmark**. First, various researchers views on business model are highlighted and afterward different types of business models, motives, configurations and why our choice is that of multi-sided business model will be presented.

3.1.1 Overview of Business Model Evolution

Business model is a widespread topic among academic scholars and practitioners. Despite, the origins of the expression that can be found in the work of Peter Drucker in 1950s (Casadesus-Masanell and Ricart, 2009), the particular boom of articles on this concept and practical application reached a peak in mid 1990s due to Internet, emerging markets growth and interest in 'bottom-of-the-pyramid', post-industrial technologies (Zott, Amitt and Massa, 2011).

Since then a vast of articles were published and business model was named as *"a statement, a description, a representation, an architecture, a conceptual tool or model, a structural template, a method, a framework, a pattern, and a set"* (Zott, Amitt and Massa, 2011, p.1022). The variety of descriptions and the prevailing interpretation and inconsistency on the term remain (Markides, 2015). Scholars use the term without determination of what it is the meaning behind, or they refer to existing works, which not necessarily cover all the aspects relevant to it. Eurich et al. (2013) enclose the future research proposal regarding higher level of generalization. Zott (2011) explained the divergence of the literature, and need for clear definition of the concept.

Even though, researchers do not yet rely on each other's work and findings extensively (Osterwalder et al., 2005), a certain progression can be observed. Based on their extensive literature review (Osterwalder et al., 2005) propose five phases in the evolution of business model literature, as already mentioned previously. These phases are shown in (fig. 8) below. They account only for literature that focuses on the business model concept and not on literature simply mentioning business models.

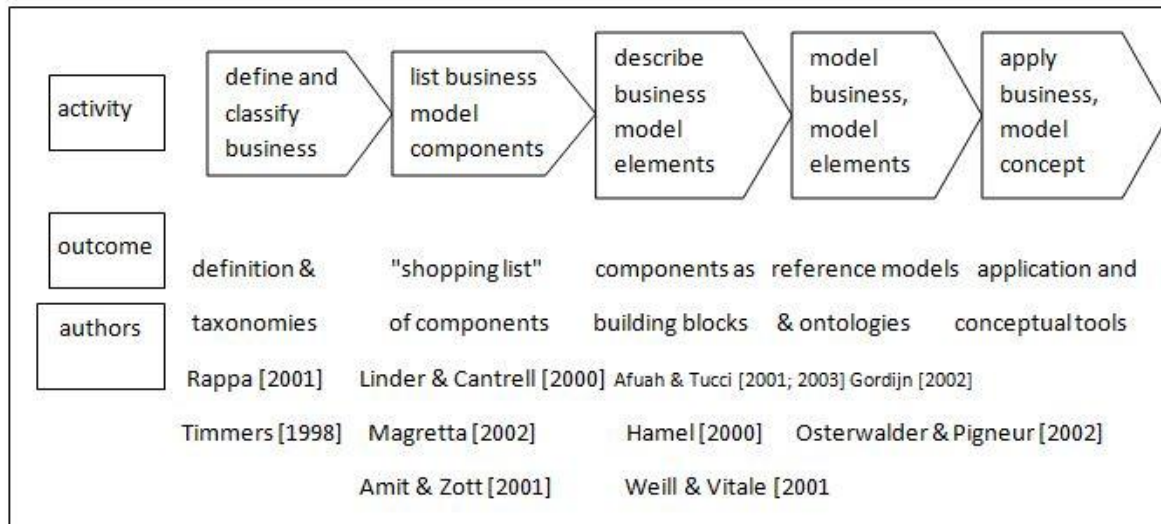


Figure 8 Five Phases in the Evolution of Business Model adapted from Osterwalder et al. (2005)

Based on the above mentioned figure, a step by step explanation of the phases is done. The first phase which is definition and taxonomies, occurred in the beginning when the term business model started to become prominent and thus a number of authors suggested business model definitions and classification (Timmers, 1998; Rappa, 2001).

In the second phase, authors started to complete the definitions by proposing what elements belong into a business models. At first, these propositions were simple "shopping lists", just mentioning the components of a business model (Chesbrough and Rosenbloom, 2002; Linder and Cantrell, 2000; Petrovic, Kittl et al., 2001; Magretta, 2002).

Only in the third phase did detailed descriptions of these components become available (Hamel 2000; Weill and Vitale 2001; Afuah and Tucci 2003).

In the fourth phase, researchers started to model the components conceptually. This work led to the proposition of business model meta-models in the form of reference models and ontologies (Gordijn 2002; Osterwalder 2004). In this phase models also started to be evaluated or tested more rigorously. Finally, in the ongoing fifth phase, the reference models are being applied in management and in information systems applications (Osterwalder and Pigneur, 2010; Baden-Fuller and Mangematin, 2013; and Rumble and Mangematin, 2015).

3.1.1.1 Business Model Definition

As earlier mentioned, business model concept has been defined by various authors in different ways. For instance, Markides (2015) viewed the definition of business model at a general perspective as ‘the content, structure and governance of transactions designed so as to create value through the exploitation of opportunities’ (Amit and Zott, 2001, p. 511). In addition, an early business model definition, given by Slywotzky (1996) and Slywotzky and Morrison (2002), argued that a business model is the collection of choices that a firm makes across 11 different dimensions including its choices of customers and of value capture methods.

In contrast, Hambrick and Fredrickson (2001) identified five key components of a business model; Markides (2008) proposed three key ingredients the Who, the What and the How of the business; Gassmann, Frankenberger, and Csik (2014) argued for four ingredients the Who, What, How and Why and Mitchell and Coles (2003, p. 3) provided a definition that included six main elements, namely: *‘the who, what, when, where, why and how much a company uses to provide its goods and services and receive value for its efforts’*. The only factor that seems to be generally agreed is that all these ingredients whether three, six, nine or eleven are interrelated: that is, to be successful, a business model must put them all together so that they fit with and reinforce each other (e.g. Afuah, 2003; Casadesus-Masanell and Ricart, 2010; Teece, 2010; Zott and Amit, 2010).

Furthermore, in their comprehensive literature review, Zott, Amit and Massa (2011) display how the number of articles on business model definitions within both industry and academia has exploded, mainly due to the spread of fast Internet connections.

Also as reviewed in the literature of Gudixsen (2015), the author agrees on the consensus of the literature that business models are built from different components as already mentioned in the previous paragraph. According to Gudixsen (2015), these components are interconnected to each other, and hence a change in one of the components results into a change in the entire business model, in which has brought light into how various companies have gone into crises while others managed to stay on top.

In addition to that, Baden-Fuller and Mangematin (2013), argue that what exactly can be deliberated as a ‘Business Model’ has been the subject of much debate, but contrary to the

skeptics' view (Zott et al., 2011). There is agreement among scholars that the model must link the workings inside the firm to outside elements including the customer side in which it is explaining how value is created (Amit and Zott, 2001 and Teece, 2010) and how that value is captured or monetized (Teece, 2010).

Drawing from their work, Morris, Schindehutte and Allen (2005) propose six major components: (1) factors related to offerings, (2) market factors, (3) internal capability factors, (4) competitive strategy factors, (5) economic factors and (6) growth/exit models. In a similar manner, Osterwalder and Pigneur (2010) propose nine components as part of their widely used business model canvas. This canvas makes business model discussions accessible to disciplines other than the traditional ones. The components of the canvas are remarkably similar to those suggested by (Morris et al., 2005). However, partners and collaborators are missing from Morris et al.'s proposal, while Osterwalder and Pigneur leave out the competitive component and focus entirely on companies' own business models.

Besides these differences, one can begin to observe a core of the business model concept. Furthermore, Osterwalder and Pigneur (2010, p. 14) suggest a prose definition: "*A business model describes the rationale of how an organization creates, delivers, and captures value*". Therefore, based on the above mentioned definition of Osterwalder and Pigneur (2010), which is also adopted by Gudiksen (2015), our understanding of business model will be established.

In our case, we consider ***a business model to be a tool that helps companies and institutions to create, capture and deliver value***. As from this research perspective, the fundamental point is to find how the creation, capturing and delivering of value is done in health care sector in Denmark, thus its applicability is reliable for this time and in this project.

3.1.1.2 Four business model typologies

While relying on the above discussion of the business model definition, a gap has been drawn into attention by the research of (Gudiksen, 2015) in line with the absence of some business model components in both (Osterwalder and Pigneur, 2010) business model canvas and that of (Morris et al., 2005). Hence, we choose to use the business model configuration which classify the business model typologies by (Baden-Fuller and Mangematin, 2013) in our project, to be able to fill in the mentioned gaps.

Without further ado, a more elaborative understanding of why we choose to consider business model categories is addressed. As formerly discussed, there are many debates on business models such as from strategy, for instance, Amit and Zott (2001 and 2007) regard that business models are real. Other well established fields such as economic historians also considers business models to be real (Hounshell,1985). With regards to fields of management, business models are considered as meta concept to illustrate firm strategy.

However, in accordance with the recent research (Baden-Fuller and Mangematin, 2013; Durand and Paoletta, 2012), **we choose to consider business models as a cognitive agenda as it is more challenging and promising field of study but also categorical structures based on causal models represent a fertile avenue for researchers because such structures can help explain firm behaviours and organizational survival.** In this context, business models have potentially a central place. Moreover, the business model in this view is not a complete description of what the firm does, but somewhat it should be a stripped-down characterization that captures the essence of the cause-effect relationships between customers, the organization and money. Hence, a business model is a special example of a configuration (Fiss, 2011).

Also as suggested by Baden-Fuller and Mangematin (2013), most attempts to describe and classify business models in the academic and practice literatures have been taxonomic, meaning that, the business models are developed by abstracting from observations typically of a single industry. With only a limited number, these attempts rarely deal fully and properly with all its dimensions of customers, internal organization and monetization, for instance as explained in the research of Rappa (2004) and Wirtz et al. (2010).

As the literature lacks clear typological classifications that are robust to changing context and time, Baden-Fuller and Mangematin (2013) suggest the typology that considers four elements. These are: identifying the customers (the number of separate customer groups); customer engagement (or the customer proposition); monetization; and value chain and linkages (governance typically concerning the firm internally). Each of these dimensions relates to the business model definition of either value creation or value capture or both and as amplified below, lend themselves to creating subcategories and thus the chance of a meaningful map of possibilities. Such a map as suggested by Baden-Fuller and Mangematin (2013), can be overlaid onto the real world of an industry – or an entrepreneur’s way of thinking – and by comparing

the map with the complete typology, they could identify the range of existing models. From such a map, one can also consider possible but omitted types (perhaps because they have never been tried, or more commonly, they have been tried and found not to work well). Therefore, figure 9 gives examples of some business model configurations (Baden-Fuller and Mangematin, 2013).

	Customer sensing	Customer engagement	Monetization	Value chain and linkages
	Are users paying? If not who are the other customers?	'Taxi' or 'Bus'	When and how is money raised?	Integrated or hierarchy or networked
Fast food chain - franchised BM	<i>Simple BM</i> consumer pays	<i>Bus</i> Scale based	<i>Complementary assets</i> Franchisee collects money from consumer and passes on fee	<i>Highly tiered system</i> of suppliers and franchisees, who are linked hierarchically
Boutique strategy consultant BM	<i>Simple BM</i> Customer pays	<i>Taxi</i> Bespoke projects	<i>Value Pricing</i> Often priced on the basis of fee plus share of the value created	Almost all value is delivered by the firm, little outsourcing, a network relationship with client
Newspaper (1990s) BM	<i>Two-sided BM</i> Readers pay per copy, but advertisers contribute bulk of revenues	<i>Bus</i> Readers and advertisers are given bus service	<i>Simple Pricing</i> Everyone pays close to point of use	Content and production are typically hierarchical but sometimes networked
Search engine (Google) BM	<i>Two-sided BM</i> Free for users, but advertisers pay	<i>Bus</i> for users <i>Taxi</i> for advertisers	<i>Value Pricing</i> Advertisers pay after service is delivered	Complex tightly controlled network linkages

Figure 9 Business Model Configuration by Baden-Fuller and Mangematin (2013, p.420)

Notwithstanding, the presentation of the business model configurations above, a more detailed explanation of each dimension is addressed eventually once our choice, types and drivers of business models have been explained. With regards to our problem formulation, the key question is to investigate the multi-sided business model implementation. Thus, the below paragraphs give a comprehensive understanding of this kind of models and its antecedents to

their implementation, as well as its market characteristics and thereafter a configuration that suits the multi sided platform is emphasized.

3.1.2 Motives for Multi-sided Business Models

Prior to focusing attention on the multi-sided models, the driver of multi-sided models will be presented. In this project, we perceive motives as influencing factors for changing or adapting a business model. These can refer to internal factors, such as organizational structure or leadership, or to external factors, such as regulatory or environmental changes (Demil and Lecocq, 2010).

Following the work of Rumble and Mangematin (2015), some of the drivers for multi-sided business models have been highlighted. One of the antecedent to multi-sided models is that of advancements in internet technologies. Based on Rumble and Mangematin (2015), they observed that alteration in internet technology has resulted to changing expectations about the roles of users and thus have enabled the implementation of such models, however, less is known about how these models are adopted in practice.

Moreover, industrial revolution changes the economic and institutional pressures put on firms, result into them seeking new ways to create and capture value in order to compete (Frankenberger, Weiblen, and Gassman, 2014). In particular, industry convergence has been highlighted as a key driver of new business model adoption, as companies attempt to access new markets while simultaneously having to deal with shifting competitive dynamics (Frankenberger et al., 2014; Hacklin, Marxt, and Fahrni, 2009; McPhillips and Merlo, 2008). Scholars have widely recognized that industry convergence redefines the structure and the competitive forces in an industry (Bröring et al., 2006; Hacklin, Björkdahl, and Wallin, 2013; Lei, 2000; Malhotra and Gupta, 2001). In addition to that, technological developments trigger the creation of new revolutionary firms which, in turn, challenge industry boundaries and the value propositions of industry leaders (Choi and Valikangas, 2001; Lei, 2000). As a consequence, firms need to acquire the competences necessary to create value for a broader market (Lei, 2000). In other words, they need to rethink their logic of value creation, value delivery and value capture

to respond to the new situation - hence they need to adjust their business model (Hacklin et al., 2013).

Rumble and Mangematin (2015) also argue that, a number of studies has shown that the roles of new technology and converging technologies such as the Information Technology that is used particularly in overcoming logistic constraints has resulted into firms new ways of creating and capturing value (Baden-Fuller and Haefliger, 2013; Bjorkdahl, 2009; Calia, Guerrini, and Moura, 2007; Chesbrough, 2007; Chesbrough and Rosenbloom, 2002; Dubosson-Torbay, Osterwalder, and Pigneur, 2002; Hacklin et al., 2009; Timmers, 1998).

Zott and Amit (2013) identify goals to create and capture value, templates of incumbents, stakeholder activities, and environmental constraints as antecedents for business model design in new ventures. Others argue that external pressure and regulations foster business model changes (Tankhiwale, 2009) and that new entrants can cause market leaders to change their business model (Casadesus-Masanell and Tarziján, 2012; Casadesus-Masanell and Zhu, 2013). Internal factors, such as changes in the cost and revenue structure (Demil and Lecocq, 2010) or organizational and managerial factors, have been identified as key antecedents for business model change as well (Hartmann, Oriani, and Bateman, 2013).

Other than the industry and technology motives to adopting new business models, other factors have been considered. For example, (Rumble and Mangematin, 2015) point out the internal determinants of business model adoption such as managerial decision making and assumption (Shafer, Smith and Linder, 2005). Also, building on (Teece, 2010, p.172), the business model that a firm adopts has been portrayed as “... *management’s hypothesis about what customers want, how they want it, and how the enterprise can organize to best meet those needs, get paid for doing so, and make a profit*”.

Lastly, firms' histories have also been portrayed to affect business model that they adopt, indicating path dependencies (Chesbrough and Rosenbloom, 2002; Frankenberger et al., 2014).

3.1.3 Multi-sided Business Models

As shown above in figure 9, business models can be into two major types based on a customer sensing perspective, which are: the multi-sided business models (two-sided) and the single-sided (simple) business models. However, as we concentrate on implementation of multi-sided

business models in this project, a short distinction between the two groups is presented before explaining into details the multi-sidedness of the business models.

Comparison between Multi-sided and Single-sided business models

Referring to the research of (Rumble and Mangematin, 2015), multi-sided models are more complex than single-sided ones since they involve more than one customer/user group, and those groups are often interrelated, for instance advertisers and readers in a free newspaper model. Moreover, the authors suggest that the models will be more or less complex depending on the numbers and types of their constituent elements and their interrelations. Conceptual complexity is important, since it has general implications for stakeholders' ability to comprehend, manipulate, or communicate a firm's value creation and capture mechanisms.

Also, Reynolds and Ruiz de Maya (2013) and Wood (1986) define complexity of business model elements in terms of 3 key points. These are; (a) the number of its constituent parts, (b) the degree of their interrelatedness, and (c) their susceptibility to externalities. In addition to the mentioned definition, business model complexity can be referred to the overall complexity of business model configuration. In that case, a multi-sided model can be more complex due to its architecture than that of a single-sided model.

Other than the complexity view of multi-sided models which serve multi-sided markets, the elements associated with this kinds of models include tailored projects base, repeated payments and networked structures which all respectively are aligned with the customer engagement, monetization and linkages. While on the other hand of the simplicity, the business models are observed to be for single-sided markets from a customer identification perspective, standardized scale from a customer engagement view, single payment under monetization and hierarchical structure from the linkage prospect.

Following the above paragraph, more hint on the characteristics of multi-sided markets which is a result of the implementation of multi-sided business model is drawn attention to. Based on the research of (Sun, 2006) multi-sided markets are featured by the market structure, fee structure, single-homing vs. multi-homing and within-groups vs. cross-groups network effects.

To start with **market structure**, by definition, there are two customers in a two-sided market. They interact with each other through a common network platform. For example, the

electronic payment systems and equipments (e.g. point-of-sale (POS) terminals, etc.) are the platforms via which consumers interact with merchants in the payment card network; the hardcopy yellow directory provide a platform via which thousands of households find information about the merchants who advertise in the directory.

In addition to the two sides of the market, there is a third party who creates and services the network. They are called network platform owners or sponsors. As an example, VISA, MasterCard, American Express, and Discover are platform owners of the U.S. payment card networks; AT&T, Verizon and other publishers are platform sponsors in the yellow directory business; Microsoft and Apple Computer are platform owners of their PC operating systems; Sony, Microsoft and Nintendo are the owners of the video game console platforms; etc.

Moreover, Sun (2006) illustrates the structure of the two-sided payment card network in figure 10. Merchants represent one side of the market and consumers represent the other. Each merchant installs a POS terminal in its store, which is linked via a satellite system to the electronic payment network owned by platform owners (e.g. VISA, MasterCard, etc.). Consumers can purchase goods or services from any merchant in the network. Platform owners operate the payment system and provide services to network participants (e.g. clearing and settlements, fund transfer, fraud protection, etc.).

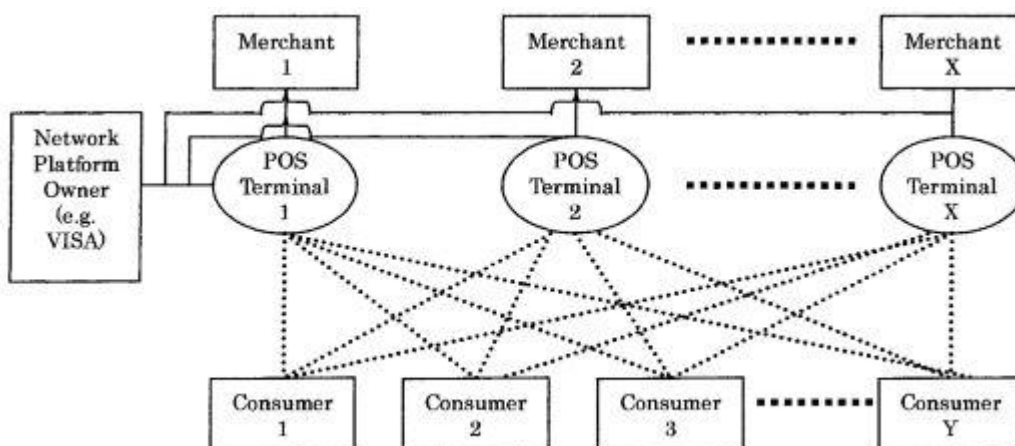


Figure 10 Two sided Markets Operation by Sun (2006)

In many two-sided markets, there is also a 4th type of agents which has not been discussed in the two-sided market literature. These are referred as the distributors of a network. They are the agents who produce and sell network-specific products to participants on either or both

sides of the market. For example, in the payment card network, banks such as Bank of America, Wells Fargo, Chase, etc. issue VISA or MasterCard cards to consumers and sign up merchants. They are neither the network platform owner nor any side of the market. Instead, they are the distributors of the corresponding network (i.e. VISA or MasterCard). Computer manufacturers such as Dell and Hewlett-Packard who produced and sold personal computers are distributors of the Windows operating system network. VCR player manufacturers such as Sony, Toshiba and JVC were distributors of the VHS standard network (Sun,2006).

The roles of distributors are not essential in a two-sided network because a network platform sponsor may decide to take this role by itself and not allow any distributor in its network. For example, Apple Computer manufactured Macintosh computers solely by itself and did not allow any third-party manufacturers. American Express had been issuing its Amex cards to cardholders solely by itself until 2004 when it started to allow distributors (i.e. banks) to issue Amex-branded cards. In the video game console market, all the three major players, Sony, Microsoft and Nintendo, made the consoles in-house and did not have any distributor for their game system. Recently, the example of Apple iOS and Google Android brought the same issues. After iOS launch, the external firms developing applications were not permitted to use this system. Then Google did oppositely and invited developers to create their applications for this systems, so that to embrace the end-users mass. Due to this successful step taken by Google, Apple had also to open their platform for developers outside the company. That led both firms to build a mass of users, who can share information through variety of mobile applications (Campbell et al., 2015).

Although inessential to a two-sided network, network distributors may affect the diffusion speed of a network. The collective efforts of the distributors in signing up network participants and in improving the quality and features of the network could have a critical impact on the growth and even survival of a network (Sun,2006).

Fees structure

In many cases, the two sides of the market can interact with each other without a network, but with greater inconvenience. For example, a consumer could purchase goods from a merchant

using cash or checks. However, such transactions are less convenient to both sides than using credit cards: consumers have to bring enough cash, sometimes in large amount, which may exceed their liquidities or subject to loss or theft; merchants may face the risk of returned checks or counterfeiting money as well as lost business due to consumer's lack of finance from credit cards (Sun, 2006; Baden-Fuller and Mangematin, 2013.)

Network platforms provide added-value to both sides of the market; therefore, platform owners can charge both sides for their services. The charges could be either lump-sum, periodic or on per-transaction basis. For example, in the video game industry, network platform owners (e.g. Sony, etc.) charged players a lump-sum fee for the hardware (the console); in VCR/DVD industry, the format owners charged royalties to hardware and software producers, which translated to lump-sum and per-transaction fees to consumers via higher hardware or software prices. Payment card network owners (e.g. VISA) charged merchants on per-transaction basis which is usually 2% of the transaction value. Yellow directory publishers usually charged merchants lump-sum inclusion fees, but not on "per-transaction" basis. Meanwhile, they distributed yellow directories to consumers free of charge. In other two-sided markets such as PC operating system, academic journal, newspapers, etc., consumers are typically charged on a lump-sum or periodic basis in the forms of annual subscription fee, periodic upgrade to newer systems, etc. Rochet and Tirole (2003) give a comprehensive review of different business models in two-sided markets.

Single-homing vs. Multi-homing

Multiple network platforms can exist in a two-sided market, and agents can choose to (i) stay out of the network, (ii) participate in only one network, or (iii) participate in multiple networks. Scenario (ii) is referred to as single-homing and scenario (iii) as multi-homing (Armstrong, 2005; Rochet and Tirole, 2003).

Sun (2006) argues that is important to note that single-homing (and multi-homing as well) is a concept at the individual agent level, not at the market level. It does not require that everybody in the same network. Though each individual agent joins only one network, different individuals may join different networks. For example, some people used only Windows PC while others used Macintosh, which is equivalent to saying that some people single-home on Windows and others single-home on Macintosh. On the other hand, multi-homing does not require that all

agents join all the networks. As long as an individual agent joins more than one network, she/he is multi-homing. For example, some people may carry both VISA and MasterCard cards while others may carry VISA and American Express cards.

Similarly, when some agents single-home in a two-sided market, others may multi-home in the same market. For example, some game players may only buy a PlayStation console (i.e. single-homing) while others may purchase both PlayStation and Xbox (i.e. multi-homing); on the game developer side, some write games for both PlayStation and Xbox (i.e. multi-homing) while others may write games exclusively for Nintendo (i.e. single-homing). Therefore, at the market level, single-homing and multi-homing is not clear-cut but really an issue of degree. Rochet and Tirole (2003) use “single-homing index” to characterize the phenomenon, which is basically a measure of agent’s loyalty to a platform. The index for a specific platform is 0 when all the “buyers” multi-home and 1 when they all single-home. However, most theoretical models on two-sided markets assume clear-cut homing scenarios for analytical convenience (Rochet and Tirole, 2003; Armstrong, 2005).

Within-group vs. cross-group network effects

An important feature of a two-sided market is the existence of network effects across the two sides of the market. According to Katz and Shapiro (1985), there are many products for which the utility that a user derives from consumption of the good increases with the number of other agents consuming the good. This definition refers primarily to network effects within one side of the market. For example, telephone subscribers derived more utility from the telephone network if more people subscribed to phone services. A subscriber would find the phone useless if nobody else installed it. This type of network effects is termed “within-group” effect.

Literature on two-sided markets distinguishes cross-group from within-group network effects and focuses on the former. The cross-group network effect refers to the positive or negative feedback cycle between two different types of agents, in contrast to the within-group effect which occurs among the same type of agents. For example, the positive feedback cycle between merchants and cardholders in the credit card network reflects cross-group network effects. The positive externality of TV watchers on advertisers and the negative externality of advertisers on TV watchers are cross-group network effects as well. No matter it is positive or negative effects, the cross-group network effect characterizes and defines two-sided markets.

The existence of network effects is supported by empirical evidences. For example, Gowrisankaran and Stavins (2004) show that network size affects a bank's decision on joining the automated clearing house (ACH) technology in payment settlement. Rysman (2004) estimates the cross-group network effects in the two-sided yellow directory markets and finds evidence to support the positive cross-group externalities between advertisers and consumers.

In addition to the cross-group network effects, within-group network effects may also exist in either or both sides of a two-sided market. For example, in the payment card network, merchants impose negative externalities on each other: given the number of cardholders, if more merchants accept a particular card, the incremental sales from accepting the card for an individual merchant will be lower. This is because merchants are competing against each other for businesses from the same cardholders. Similarly, if more merchants are included in a yellow directory, it is more likely that a particular merchant will be overlooked by a reader due to the clutter effect or congestion effect (Armstrong, 2005; Rysman, 2004). Such negative within-group externalities can also be found in two-sided markets such as shopping mall, dating clubs, PC OS, video games, etc.

Within-group network externality can also be positive in a two-sided market. For example, if more consumers used Windows system, file transfer and sharing among Windows users would be more convenient as compared to sharing them with users of different operating systems (say, Macintosh) who have to convert the files from one format to another. Video game players using the same type of console are able to exchange the game titles with each other, which is not possible if they are using different game consoles. This type of positive within-group externalities is called compatibility effects (Katz and Shapiro, 1985).

Therefore, based on the understanding of the mentioned characteristics of multi-sided market, a thorough picture of multi-sided business models application can be observed with the markets demand and supply and what is needed to create and capture value for the customers.

In addition to that, Ondrus *et al.* (2015) argue that multi-sided platforms assemble different groups of users who might otherwise never have the opportunity to interact with each other. The platforms facilitate these interactions by providing an infrastructure and setting regulations (Hagiu and Wright, 2014). Also as viewed by (Hagiu and Wright, 2014), an important feature of most multi-sided platforms is the presence of 'cross-side network effects' as already mentioned

in the research of (Sun, 2006), in addition to same-side network effects. However, Hagiu and Wright (2014) suggest that the presence of cross-side network effects is neither a necessary nor a sufficient condition for a technological system to become a multi-sided platform. Essentially, **"a multi-sided platform is an 'organization that creates value primarily by enabling direct interactions between two (or more) distinct types of affiliates customers'"** (Hagiu and Wright, 2014, p.7). **This is also the definition of multi-sided business model that is adopted to our project as it gives an extensive look into scenarios for either two-sided or more-sided business model literature.** In that sense, we will have less limitation and hence more information for our project.

Furthermore, Hagiu and Wright, (2014, p.7) also insist that different user groups should be affiliated to the platform in order to make it possible to interact together. Yet, the challenge in these arrangements is that multi-sided platforms must get both sides on board to succeed. This gives rise to the commonly called 'chicken and egg' problem. In order to attract users on one side, the other side has to have a significant number of users, but those users would only be interested in joining if there were enough users on the first side (Caillaud and Jullien, 2003). Ever since the seminal work by Rochet and Tirole (2003), there has been a significant inflow of research in economics and strategy on multi-sided platforms covering platform competition and pricing strategies (Rochet and Tirole, 2003; Parker and Van Alstyne, 2005; Armstrong, 2006; Chakravorti and Roson, 2006; Economides and Katsamakas, 2006; Hagiu, 2006a; Jullien, 2008; Weyl, 2010), ignition strategies (Evans, 2009; Evans and Schmalensee, 2010), platform leadership and innovation (Cusumano and Gawer, 2002), antitrust issues, policies and regulations (Evans, 2003; Evans and Schmalensee, 2007; Boudreau and Hagiu, 2008; Economides and Tåg, 2012; Evans, 2012), platform envelopment (Parker and Van Alstyne, 2005; Eisenmann et al., 2011), multi-homing (Gabszewicz and Wauthy, 2004; Rochet and Tirole, 2004; Armstrong, 2006), and open/proprietary standards (Economides and Katsamakas, 2006; Hagiu, 2006). Although, research on multi-sided platforms has tackled a number of important issues concerning mature platforms and their pricing structures, less attention has been given to the initial conditions that are necessary and/or sufficient to launch (i.e., ignite) and sustain a platform (Evans, 2009).

Nevertheless, the aim of this project is to investigate on the application of the multi-sided models. Hence, to have a meaning of the configurations, an in-depth explanation of each

dimension suitable to enhance the creation, capturing and delivery of value by such models is explained below.

3.1.3.1 Business Model Configurations

According to Baden-Fuller and Mangematin (2013), they suggest a typology made up of four dimensions in which business models can be categorized as already highlighted in the previous paragraphs. These include customer identification which also refers to the number of separate customer groups; customer engagement or the customer proposition; monetization; and value chain and linkages (governance typically concerning the firm internally).

Based on both previous and recent work of Baden-Fuller and Mangematin (2013) and Rumble and Mangematin (2015), the four elements will be explained below.

Customer Identification

To start with, customer identification is defined as a mechanism by which firms sense, identify, or even create customer groups. The process of customer identification can help in identifying how technology is mobilized to create value for the customer, or the value proposition from the customer's perspective (Day and Schoemaker, 2004). This dimension addresses multi-sided markets and the growing importance of big data as valuable information exchange (Casey and Toyli, 2012; Eisenmann, Parker, and Alstyne, 2006; Rochet and Tirole, 2003; Rochet & Tirole, 2008).

Customer Engagement

Secondly, customer engagement, also known as (the value proposition) encompasses the ways in which firms interact with their customers and create something of value to meet their needs. It also defines how the firm creates value; whether it is standardized or tailored to customer requirements. When discussing this dimension often refer to "bus" (standardized, routine service) and "taxi" (tailored journeys as and when needed, often at a higher price) models as illustrative analogies as mentioned in figure 9 above.

Monetization

Third, monetization addresses how the firm captures value, an essential feature if the business model is to be sustainable (Rayna, Darlington, and Striukova, 2014; Rayna and Striukova, 2010). This dimension covers a range of topics including revenue streams, the timing of payments, and complementary assets that can increase appropriation (Teece, 1986).

Finally, linkages and governance must also be considered for a robust business model concept. Business models articulate the architecture or governance of the business that is, those systems, routines, and processes that the firm uses to deliver the product or service to the customer. Each dimension covers a number of different business model elements (e.g., monetization may include subscription or simple exchange elements). The diversity of business models can be conceptualized as varied configurations of these elements. The project is primarily concerned with the adoption of business models that contain multi-sided elements, as we expect them to be more demanding to design and implement than are single-sided models (Rumble and Mangematin, 2015; Baden-Fuller and Mangematin (2013) .

Despite the categorization given above, a more recent and abstract business model configuration by Rumble and Mangematin (2015) has given us a more extensive outlook on how business models can be adopted in different industries and thus becomes more useful to be maintained in this project. Following their work, (Rumble and Mangematin, 2015) outline sixteen-types typology of business models in which the first four dimensions of (Baden-Fuller and Mangematin,2013), have played a major contribution in their formation. The sixteen-types typology are derived from the consideration of both multi-sided and single-sided types of business models, as mentioned previously. However, the multi-sided dimensions mentioned based on the complexity are used in the calibration of business model elements as indicated below. Notwithstanding their application and relevance, a set to identify the position into which the model fits in is used based on a continuum of 0 to 4 score (Ragin, 2000).

According to (Rumble and Mangematin, 2015), business models that contain a certain condition are said to be in that condition's "set." Rather than being fully in or out of a set, many businesses would more accurately fit somewhere on a continuum between in and out. In order not to lose this subtlety in their analyses, (Rumble and Mangematin, 2015) made the distinction between in and out into fuzzy-sets using a four-point scale: giving a score of 0 to business

models outside the set; 0.33 for BMs that are mostly but not fully outside the set; 0.67 for those mostly but not fully inside the set; and 1 for those that are fully within the set (Ragin, 2000). For example, a business model that is assigned a score of 0.67 for tailored engagement is one that is more within than out of the tailored engagement set, but does not fully meet the criteria of that set. The fuzzy-set scores of each condition were defined to ensure consistency. Thus each business model was assigned four fuzzy-set scores indicating the presence or absence of the four conditions, so that each case's business model is defined as a configuration of those scores.

The sixteen-types typology

<p>Multi-sided market</p> <p>0.00 Single-sided; appeals to a single or generic customer segment (e.g., newsagents)</p> <p>0.33 Multiple customer groups that are unrelated (matinees appeal to students and seniors)</p> <p>0.67 Two customer groups with positive spill-overs (breweries sell to pubs and consumers)</p> <p>1.00 Business dependent on multi-sidedness (free newspapers)</p>
<p>Tailored customer engagement</p> <p>0.00 Standardized, scaled model (factory)</p> <p>0.33 Minor, automated or self-customization (social media, deli counter)</p> <p>0.67 Major but limited customization (kitchen installation)</p> <p>1.00 Unique, project-based services (consulting)</p>
<p>Repeat payments</p> <p>0.00 One-time payment (fast food)</p>

0.33 Complementary payments optional (regular optional upgrades) 0.67 Complementary payments expected (razor and blade) 1.00 Contractual repeat payments (mortgage)
Networked structure 0.00 Hierarchy (supermarket) 0.33 Outside actors under hierarchical control (franchise) 0.67 Restricted network (brokers) 1.00 Open network (social media)

Figure 11 Fuzzy Set Calibration of Business Model Elements adapted from Rumble and Mangematin (2015)

To sum up, using the above table of sixteen typology adopted from (Rumble and Mangematin, 2015), the authors managed to provide the results of the investigation based on the key drivers to using the multi-sided business model in both designing and adoption. They revealed that, most of the business model designers rely extensively on internet to be able to work as a multi-sided model. In addition, multi-sided, tailored projects and repeated payment is the only business model configuration that depend mainly on hard data in designing. Moreover, the use of professional external agents in business creation and reconfiguration is also done in this category of business model, as well as use of press in obtaining ideas for designing. The other important things with the multi-sided models, is that, they require piloting for the new business and the use of qualitative feedback which mainly include the clients. However, the difference is that, the absence use of creativity, design and visualization tools was associated with these models.

3.2 Empirical Findings

3.2.1 Business Model Configuration

Based on the qualitative comparative analysis by Rumble and Mangematin (2015), the significant results on antecedents for the multi-sidedness based on the four configuration

elements of multi-sided, tailored engagement, repeated payments and networked structure versus to those of single sided markets are presented below.

Client Involvement

Foremost, Rumble and Mangematin (2015) found that client involvement is different between multi-sided and single-sided models. For instance, with the use of an event based social media platform case, clients and early adopters of this multi-sided networked models helped establish and scale the venture by promoting it among their peers, in order for both users (event seekers) and paying customers (event organizers), benefited from increasing returns on adoption. In addition, a brokerage firm that profiles job seekers, mentioned the significances of clients' involvement is to allow them adopt their business model according to the clients' expectation. This firm's clients took an active interest in its development and had expectations about how it should be structured. Interviewees from firms that adopted multi-sided networked models in Rumble and Mangematin (2015) study, repeatedly reported that clients anticipated benefiting from the new ventures and sought to (a) scale the firm to reap those benefits, or (b) tailor the firm's offerings around their needs.

In contrast, respondents from firms with single-sided, hierarchical models repeatedly stated that, although their clients were involved, that involvement was in response to firm-led initiatives to convince them to take part. The aim of these initiatives was to benefit the firms, rather than to convince the clients of the mutual benefits to be had.

Regardless of the finding that both multi-sided networked models and the single-sided hierarchical model to involve their clients. Clients were often convinced that they would benefit from the firm's establishment and expansion from the multi sided networked perspective. Clients not only assisted in the expansion where they could, but also sought to influence the business model so that it was more suited to their needs. On the other hand, clients of firms with single-sided hierarchical models were not as convinced that they would benefit from firms'

new models. Firms that actively tried to engage prospective clients were often met with indifference, while prospective clients appeared to be more willing to walk away than to try to influence the development of firm models.

Feedback

With regards to feedback, (Rumble and Mangematin, 2015) observed that multi-sided networked business models clients' feedback differ from those of single-sided models. The kind of feedback obtained from the single-sided models based on the value proposition involved that of products while on the other side of multi-sided models it involved services. But also based on their further research, the multi-sided networked models showed that they received feedback about the structure of their business such as commenting and rating on what to be improved while with other businesses providing the basis for their business system.

Regarding the second and the third question under investigation by (Rumble and Mangematin, 2015), which are: whether multi-sided business model associate with the use of tools to enhance design, creativity and visualization and if these models are accompanied with external activities. Their findings reveal that, multi-sided models were not designed according to the cases they researched but they have been copied due to the founders experience in particular industries where they have been involved in.

Furthermore, Casadesus-Masanell and Zhu (2011) contribute to the literature on innovation and imitation. Based on their findings, scholars have looked at how new products or processes can be imitated by their competitors (Benoit 1985; Gallini 1992; Pepall and Richards 1994; Ethiraj, Levinthal, and Roy, 2008) and whether firms should disclose or license their innovations (Hill 1992; Gans, Murray, and Stern 2008; Mukherjee and Stern 2009). They argue that, while mechanisms such as patents, trademarks and commercial secrets exist to prevent competitors from appropriating returns from product innovations, they are not generally applicable to business model innovations. Therefore, they suggest that, before an entrant decide to reveal

their business model, firms should take into account the competitive effects associated with it. Thus, in their study, they assume firms can imitate each other's business models once they are revealed. Entrants should realize that incumbents will react to innovations in two main ways: they can keep their business model intact and adjust its tactical variables (such as price); or they can adopt a new business model so as to change their value creation and capture logic. The new business model may be a replica of the innovator's, or alternatively a new hybrid that combines some of its elements with others from the incumbent's original model in a mixed business model.

3.2.2 Multi-sided General Findings

Other insights on business model in relation to digitalization are for example those of Ladib and Lakhali (2015), in which they consider the advancement of technology. In their view, it is important to consider the role of the information to create an advantage by conceptualizing the structure of the business model of exchange based on the contribution of the theory of transaction costs (TTC). Indeed, TTC has been used by many authors to conceptualize the business model (Amit and Zott, 2001; Warnier, Demil, and Lecocq, 2004; Zott and Amit, 2007; Brettel et al., 2012).

Moreover, the findings of Casadesus-Masanell and Zhu (2011) are related to the literature on platforms and multi-sided markets (e.g., Rochet and Tirole 2003; Caillaud and Jullien 2003; Armstrong 2006; Hagiu 2009; Casadesus-Masanell and Ruiz-Aliseda 2009; Zhu and Iansiti, 2012). Platforms are observed as institutions that act as intermediaries to enable transactions between multiple sides of a market-such as sponsors and consumers. Based on their work, (Casadesus-Masanell and Zhu, 2011) highlight that most of the literature on multi-sided markets and platforms considers situations where the sides attract one another as previously mentioned in the review. For example, operating system platforms connect two sides: independent software vendors and users. Clearly, the more applications are available for a

particular operating system, the more attractive that system is to users. Likewise, the larger the number of users of a particular operating system, the more attractive it is for developers to produce applications for that system. When a platform is sponsor-based, however, consumers prefer to access the product without interference by the sponsors (i.e., consumers prefer books without ads, or access to slopes without sales pitches).

An example in the context of sponsor-based business models the authors used the case of Metro Spain, the first ad-sponsored free newspaper launched in Spain in 2001. After observing the implementation of Metro Spain, several incumbents copied its business model. For example, Recoletos launched Qu'e! in 2005 and Editorial Pagina Cero launched ADN in 2006, both of which are ad-sponsored free newspapers. In 2009, Metro Spain ceased its operation as a result of stiff competition. The business model of Metro, the parent company of Metro Spain, is also being imitated in many other countries (e.g. Switzerland) by incumbent newspapers. Hence, Casadesus-Masanell and Zhu (2011) paper contributes to the literature by exploring the desirability (or lack thereof) of entering a market with a two-sided business model when one side imposes a negative externality on the other.

Muzellec et al. (2015) indicated several gaps in the multi-sided business model literature, first one in respect to identifying the importance of B2B and B2C customers; and second point of exploration need in how marketing strategies focus is shifting on one or another side within the time in the context of Internet ventures operating purely through the Internet. For the explanation of the phenomenon authors selected case study of five internet entrepreneurial ventures, from which the data was gathered and analyzed by applying Osterwalder's business canvas components. All internet platforms served two sides of customers, which can be defined in B2B and B2C terms. B2B is a customer paying for the service, while B2C is the end user, who may be charged or not for the service. In any scenario the participation of both sides provides mutual advantage. Authors identified that Internet business models lean on the fundamental element a value proposition of the business model (Muzellec et al., 2015). As it involves two

groups of customers, the question is why these two groups would like to engage in using a platform. The end-user can get certain benefits, while the B2B client is in need for the data of end users or the potential reach size. The demand and the needs of customers define the price and who should pay it, therein normally B2B client is obliged to cover the fee. Due to that the value proposition has to be considered separately for both groups of customers, for business model to achieve financial success. In regards to B2B the end users and data about them is the key value proposition. Depending on the size, unique characteristics from a demographic, psychographic, and behavioral aspect based on the activities they perform in Internet. The data of the time spent online, websites visited and other attributes form the end-user profile, which can be used for commercializing B2B.

The results of the research revealed the business model evolve over time, and value proposition is shifting. Muzellec et al. (2015) classify business model development into stages as embryonic, emerging, growth, and maturity. In the early phases internet ventures tend to concentrate on end users and offer free services to gain the critical mass. The marketing strategies used in this stage comprised search engine optimization and push communication on social networks. In the later stages firms must to attain revenue from the provided service, and therefore the business customers come to the centre. Usually business stakeholders and venture capitalists act as change agents in this refocus decision, as monetization is the main goal of the firm. B2B customers become clients paying for the service and key partners in adding inputs to the offering. Finally, the mature business models of such firms represent the dynamic interplay of both audiences, which affects the service offering and revenue streams, even though the end users are perceived as contributing less to a co-creation.

Hagiu and Wright (2015) discuss multi-sided platforms in relation to other more traditional models, i.e., vertically integrated firms, resellers and input suppliers in a context of professional services, below (Fig. 12).

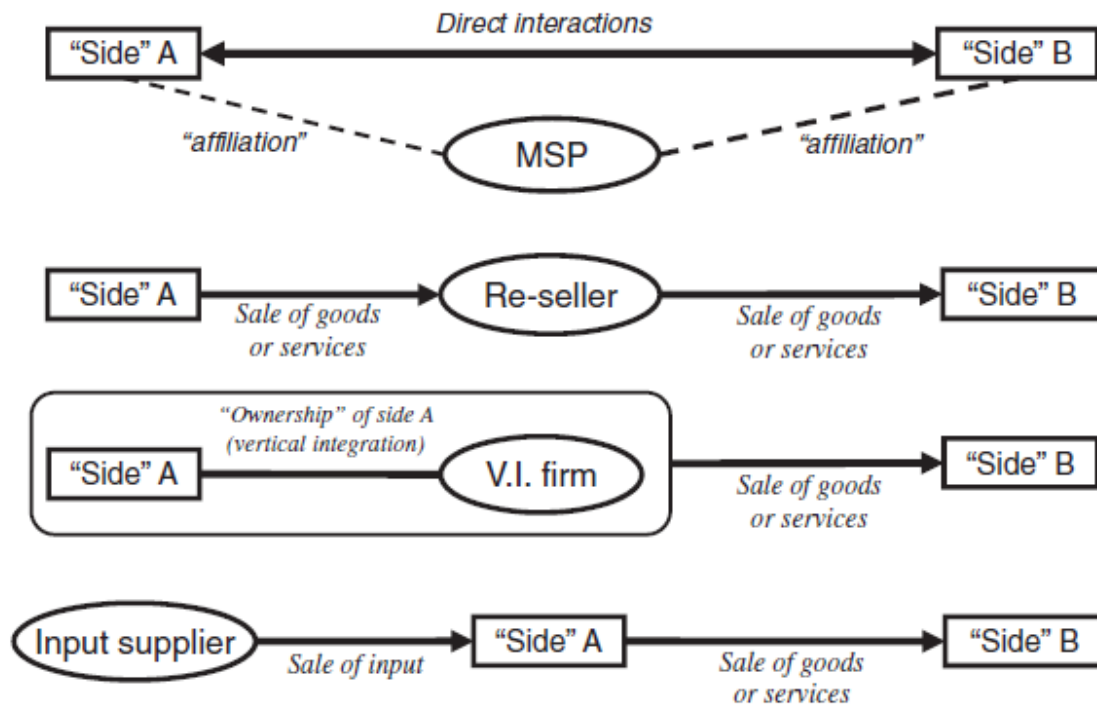


Figure 12 Multi-sided Platforms (MSP) and Alternative Business Models by Hagiu and Wright (2015, p165)

The dominant special features of multi-sided platforms are that they offer a direct interaction between two or more distinct groups (these groups exhibit indirect network effect); and both sides have affiliation with the platform. Nevertheless, sometimes direct network is already established between two parties, and one customer group can impact another group, thus B2B client is making the choice of the platform on behalf of the end user. For instance, academic journals' publisher adopts the editorial software, which herewith include authors and referees into the system. Hagiu and Wright (2015) share another example of event organizers, who select the platform through which participants can ask the questions and vote for the best ones to be answered at the conference by the speaker.

Regarding healthcare industry, the discussion on multi-sided platforms was discussed by taking in account challenges faced by the incumbents such as rapid technology evolution, increasing healthcare costs, coordination of various actors in the system. Bojovic et al. (2015) discuss

biopharmaceutical incumbent firms' behavior in disruptive innovation context in comparison to magazine industry. By engaging in analogical reasoning of cases within two different industries, authors draw a path to be followed by the precision medicine producers to sustain business. The common challenges of two industries were to turn from product logic to user-centric logic; and discovering new spots in a value chain network. For analysis authors collected secondary data of two selected cases in newspaper industry, i.e., Hearst Corporation and Vogue. Both companies have changed business model due to advancements in technology and reciprocally shift in customer behavior. Company understood that the focus should lie on the digital future by approaching business model in a new way. From *one-size-fits-all* thinking, they had to address the specific needs of the customers, and that digital solutions enable data-driven personalized content on different platforms. In the case of Vogue the disruption of digital technologies and economic crisis, affected the firm's decision to reshape the business model towards customer, engaging him through events and via digital platforms reachable through devices, such as laptop, tablet, and Smartphone. Bojovic et al. (2015) tell the biopharmaceutical industry has to learn from the magazine industry and invoke user-centered approach. To do so requires companies to gain extra knowledge through a new network of partnerships and new collaboration modes with users. The companies have to understand that linear value chains are not providing beneficial outputs, it is necessary to reform it in a networked and less linear one.

Tjalve (2013), also argue that to change or establish a business model comes with challenges. Such challenges are associated with the likelihood of requiring significant experimentation (McGrath, 2010). Hence, for a firm to have a successful implemented business model, often a number of iterative trial and error process that can be hardly planned nor anticipated must occur (McGrath, 2010). By acknowledging the requirement for experimentation in the process of business model innovation, (Chesbrough, 2010) extensively identified a challenge for business model establishment. That is, the company identifies the need for a new business model but has a difficulty in implementing it as it can be conflicting with the structural

configurations of the existing model the existing model. These configurations involve the rules, norms and ethics of the existing model (Johnson et al., 2008). As an example, the gross margin might be significant low in the new model, the end customer might differ.

Addition to that, Hienerth et al. (2011) examine the challenges to traditional business brought by ICT advancement in having a shift to user centric logic. New technologies enable business to benefit from co-creation value with the users. The research proves that customers are the contributors to a new product development and to the findings of novel business opportunities, regardless the age of the firm, industry or the target group is B2B or B2C (Hippel, 2005; Borgers et al., 2010). Young firms and startups are the one to pioneer this logic in their business models, as they have higher flexibility and willingness to be innovative. Social software is a channel to keep interaction with the user, which result in improved value proposition. These aspects are not always met in the established companies due complex structures and routines. Nevertheless, Hienerth et al. (2011) argue that this shift is necessary for enhancing innovativeness in the business model and identify the key success factors in integration of user-centric value creation and strategies to overcome internal resistance, by the findings of the case study research of three large companies Lego, IBM and Coloplast, which are well known established companies, which managed to change from traditional manufacturing business models to involving customers in the business processes.

Mettler and Eurich (2012) contributed to business model discussion in e-health context in US. The healthcare is pressed to decrease the costs and sustain the high quality of service. The challenges, such as ageing population, lack of qualified workers, growing mobility of patients, increasing expectations trigger this sector. The Information Technology advancement could improve the situation, but has low adoption rate in healthcare. Many initiatives in this field have failed, but the few successful, showed characteristics of unique value for the patient and ability to generate high profits. Many private companies and institutions participating in e-health projects development, have a low compassion towards customers and limited business

thinking in how to capture value of the e-health solution. Mettler and Eurich (2012) state that this fail result in firms being stuck in the pilot phase and not able to commercialize the idea, so there is a gap between these two stages, and it could be filled by applying existing business model design partners. Therefore, authors explored various business model design patterns to answer which are the sustainable ones for e-health. The three patterns were discussed in this study comprising freemium, two-sided market and crowd-based e-health, the findings were driven by the ethnographic research findings in hospitals, nursing homes and other medical practices.

The e-health business model should encompass the boundaries set in relation to the specific market segment and context as business model should solve particular problem. The pattern should explain well the stakeholders and the restrictions faced by actors. Moreover, it should work as a blueprint, providing understanding on how business model will function. The formation of pattern should come from other real examples with successful commercialization experiences, not necessarily from healthcare industry.

The three patterns included in the study (Mettler and Eurich, 2012) focus on how the created value could create a financial outcome. The freemium pattern leads to offering free service to the customer and extra service, i.e. expert doctors consultation, for a premium fee. The increased free users base leads to expanded portfolio of free services, and their feedback attract users, who may be willing to pay. The second option for subsidizing health service is crowd-based design pattern, which is based on donations and volunteer inputs, and led by the free service idea.

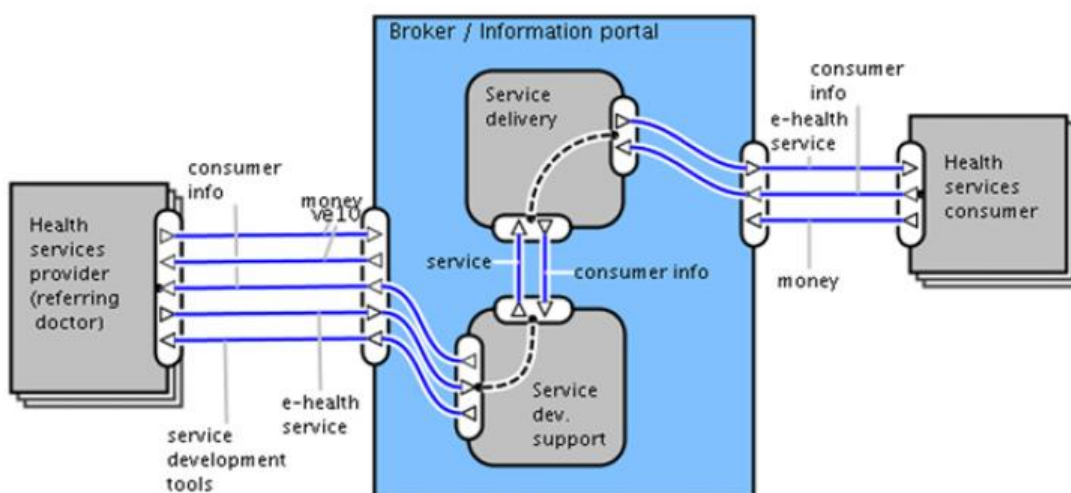


Figure 13 Multi-sided Design Pattern by Mettler et al. (2012, p82)

The other pattern for gaining financial value of the project is serving multi-sided markets (Fig. 13). It is applicable, when one party is interested in another, therein the second one is provided with free or easier access. In this scenario the key market segments are health care providers, such as hospitals, private doctors, and the health service consumers. The consumer gets the health service, while provider can gain information of patient history and diagnosis. The main boundaries in this pattern is the service can have very complex technology or face lack of trust, if the interested party works on its own. The major actor in multi-sided is the intermediary, who facilitates the service delivery, support and match between two parties, e.g. health information portal broker. The broker has a significant task to find a balance of subsidies and revenue, to attract large customer base, i.e., gain the trust of users, and facilitate a high quantity and quality of services (Eisenmann et al., 2006). To achieve that the broker has to think in a long-term perspective and invest to security and marketing.

Mostly the freemium and multi-sided market patterns demonstrated success in other industries, thus are promising to apply in healthcare context. These models are useful for explaining the business logic in a common language in a long term perspective to achieve sustainable profit. Nevertheless, the consideration of the model itself, do not promise progress.

Based on past research (Engelen, 2012), it is necessary to refocus from technology driven attitude to mere business orientation and listen to the exact needs of customers.

Chapter 4: Analysis and Discussion

In this chapter, we aim to analyze the data that was collected using the case study approach as already mentioned in the methodology chapter. This project is based on case studies of mHealth applications in the healthcare sector in Denmark. Thus, it is important for us to first present the cases that we used for our data collection and which are also going to be interpreted in this section. These are four cases in which three of them mainly focus on the multi-sided market in mHealth application implementation (Monsenso, Teleskin and FirstAED) while the one case (Vertic) act as an overall guide to understanding how the design of application, implementation and marketing is done for companies in health care sector.

The description of the cases will provide information about each interviewed company. The starting point is the history of the firm as it provides knowledge on how company evolved since establishment. Furthermore, presentation of the product offering, partnerships and team working in the firm gives a general overview of the firm and its achievements.

Once the cases are presented, the analysis will be done using the reflection of the literature review of the project from both theoretical and empirical findings perspective. This will determine the terms and key areas, which have to be coded that associate with the data collected from the interviews. First key findings regarding each individual case will be discussed. We will look first into the motives for each case, and thereafter the implementation of business model. In this phase we will start with customer identification, where we will explain the multi-sidedness of the business model and target groups of the company. Afterwards, we will identify value propositions for each target group. Third, the revenue streams and payment structure will be discussed. The fourth element network and linkages will reflect on mechanisms used by the firm to deliver the product to the customers. Finally, the challenges regarding their implementation will be presented. Consequently, the analysis will move

towards comparison of the cases. This will help us to both understand the commonalities and differences that are brought into reality using the cases and what the researchers have already found, and what is still missing in the literature, as we aim to complement the current scholars work.

Regarding the preceding sections after cases presentations, we aim to answer the research questions presented above which are; how these cases models are implemented in healthcare sector in Denmark using sub-questions; what motives are driving their implementation, the key components and configurations elements that the business models are made of and how they affect the interaction, value creation and delivery. At this point, we will also focus on understanding the differences among cases which more attention on the comparison and distinction is made in the discussion and lastly, the challenges associated with their implementation will be explained.

4.1 Cases Description

4.1.1 Monsenso

Monsenso is a result of the Monarca research project, which took place in the period of 2009-2013 and was funded by the European Commission under the 7th Framework Programme. The partners in this project were IT University of Copenhagen and the mental health unit from the Capital Region of Denmark. Therefore, the solution is based on an extensive research and trials. After the end of the project in 2013 the two founders professor Jacob Bradram and PhD Mads Frost established Monsenso, with the aim to develop further an idea and commercialize it. It led to hiring development team for continuous development of the solution and the first application for the support of the schizophrenia treatment in collaboration with the North Denmark Region. In 2015 the company expanded further, and signed first international contracts with clients and partners.

Currently, the company employs twenty people, who represent seven nationalities in total. The chief executive officer Thomas Lethenborg leads the firm with more than twenty years of experience. He holds a degree in Global Business Engineering and second degree in Strategic

Management from Copenhagen Business School. The co-founder Mads Frost works as a chief product officer. Second co-founder Jacob Bradram is a chief scientific officer. Finally, there is a fourth chief technology officer Samir Drincic, who has an extensive working experience at Sony R&D. Other employees are distributed within several departments: the product development; implementation, consulting, support and product management; sales and marketing. The constant growth requires them to look further for new employees.

Company pay deliberate attention to the security issues. The data management and security comprise the service as data is transformed via the Internet the encryptions codes are applied by using TLS with 'Perfect Forward Secrecy' technology. In addition, social security numbers are not transmitted or stored on the phone, after person stop using the service all collected data is deleted. Data management complies with regulations and standards, including CE marking, Danish law, Danish Act on Processing Personal Data, Danish Guidance to Executive Order on Security, ISO 27001. Company use a cloud host service from a partner, which complies with Cloud Security Alliance best practice, SSAE16 and ISAE 3402 Type II, ISO/IEC 27001:2013.

The company is particularly focused on partners. Monsenso launched Advantage Partner Programme providing four types of partnerships silver, gold, platinum and strategic alliance. Signing the collaboration in the programme hand over partners a right to resell Monsenso product line in the territory, gain communication advantages, co-branding opportunities, configuration services. This programme enable the sales of the partners, by granting sales training, promotions, free trial period, technical training and certification. Furthermore, it add to the marketing support by lead generation programme, customer programme enrolment, deal registration, net-new customer programme. Finally, partners could benefit from financial incentives such as discount on license/support list price, discount on consulting services, goal attainment, finder's fee outside the territory. However, the partnership programme implementation has not started as Monsenso is just a startup company at the moment. Hence, launching of the partnership programme can be considered as an idea with future prospects.

4.1.1.1 Motives for Monsenso using Multi-sided Business Model

The figure 14 below gives a presentation of both the external and internal factors that influenced the adoption of new business model by the Monsenso Company. These motives are explained following the figure.

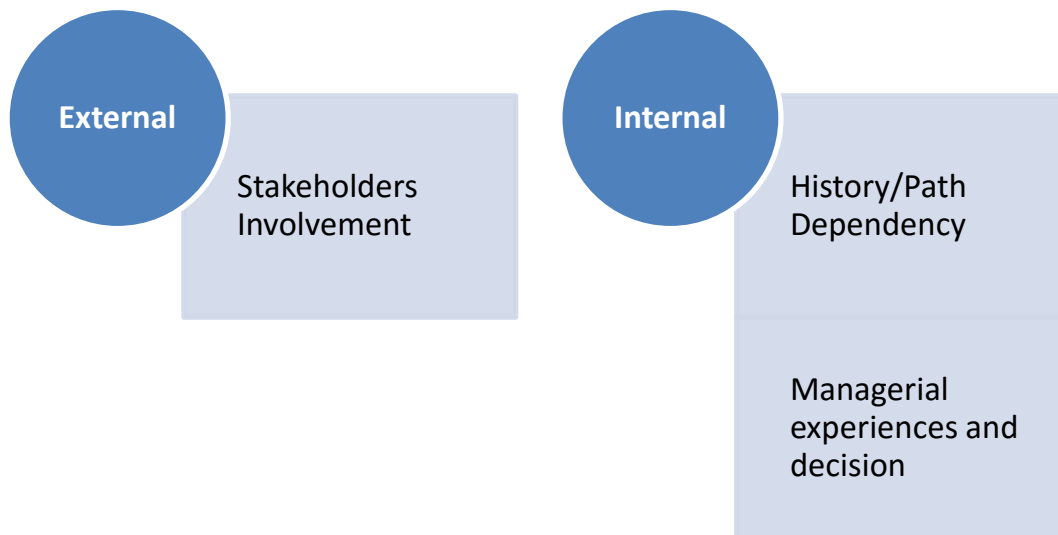


Figure 14 Monsenso Motives created by authors

History of the Company/ Path Dependency

With regards to the driver that pushed the company to be involved with serving more than one customer group using its platform, is a result of its history. This can be confirmed in the literature of (Chesbrough and Rosenbloom, 2002; Frankenberger et al., 2014) in which firm histories can indicate path dependency in adopting a particular model. As already mentioned in the company description, Monsenso is a result of a project known as MONARCA which was conducted between the IT University of Denmark and the mental illness regions of Denmark. Also quoting for the interview with the Marketing and Communication manager *"The way the company started was a research project that was funded by the EU commission. So it was 13 different countries and companies working together to develop a Smartphone based system for patients with bipolar disorder. So it was based on the MONARCA research project"*. Then after three years of research, from 2009 to 2012, the system was developed and piloted using doctors and patients in mental illness category to get feedback on how the system worked. This enabled Monsenso to make changes on the platform and again improvement on the system

application. Hence, this particular trial and error period for Monsensos Platform last for the three years before approved for the implementation.

Managerial Experience and Decision Making

Moreover, the establishment of Monsenso based on the key co-founders of the company experience, who are mainly from technology backgrounds with roots in engineering, computer science and health, indicates that the company is associated with the role of using new technologies and converging technologies such Information Technology to create, capture and deliver value in accordance with the literature of (Rumble and Mangematin, 2015; Baden-Fuller and Haefliger,2013 and Bjorkdahl, 2009).

Stakeholder Involvement

Lastly, with reference to the interview with Monsenso Marketing and Communication Manager, Jennifer Highland, highlighted that the establishment of the company was also a result of the request that came from piloted users (Casadesus-Masenell,2011) and showed interest into the application. This is also observed in the literature in which among the that lead to adoption new business models especially by start-up is a result of stakeholders' activities to the company (Zott and Amit, 2013).

4.1.1.2 Multi-sided Business Model Implementation

Based on the implementation of the multi-sided business model by Monsenso, the key elements of these model will be considered in understanding the implementation. In line with the literature of (Osterwalder and Pigneur, 2010) some of the key elements to deliver value by any business model involve both the front and back users' activities. In that sense, so does Monsenso with the use of its key resource such as human capital, key partners support and activities like data collection, analyzing and storage from the mental ill patient as mentioned in the interview. However, on the other end it involves customer who are doctors (who are representatives of the healthcare authority in Denmark), researchers and mental ill patients. Therefore, with the categorization of multi-sided business models based from the recent work of (Rumble and Mangematin,2015; and Baden-Fuller and Mangematin, 2013) which are

customer identification, customer engagement, monetization and network effect, will we try to understand how Monsenso operates its business.

Customer Identification

Under this category, Monsenso focus mainly in two types of platform which are clinical users and researchers. The clinical platform has a CE market through monitoring. As referred from the interview, Jennifer Highland mentioned that, from the piloting stage the company has had users of the application as doctors and patients who found that it was useful to keep on using the platform after the trial period. Therefore, the launching of the platform mainly constituted of these two main user groups.

Doctors and Patients (Double Loop)

Specifically, the application is based on those doctors and patient that make up the mental illness of the healthcare sector in Denmark. Despite the easiness of aligning with other kind of illness service by the platform, Monsenso aimed at specialize only in the already mentioned illness segment. As stated in the interview *"Yes, we decided to stay only in the mental illness, even though people would say it can be used for diabetes or heart disease or used for cancer. But if you go very wide you cannot specialize in one area. And there are already many applications that are used for diabetes and for cancer etc. It is because they are somatic illnesses. And somatic illness means that they are physical. You can actually track your blood sugar . You can actually check it"*. However, when it comes into Mental illnesses, they are very complicated. This is because, even though 10 people have bipolar, there are all going to have different symptoms and all will have different treatment. So, that is one of the reasons that mHealth technology has not been developed for mental illnesses before. Right now, Monsenso is working with different projects and it is for patients with bipolar disorder, schizophrenia, major depressive disorder, borderline personality disorder and anxiety, amongst others. For example, Monsenso's solution is currently used by more than 100 patients suffering from bipolar disorder at University Hospital of Copenhagen and from schizophrenia in Region Northern Denmark. Additionally, Monsenso is implementing the solution for borderline personality disorders in Region South Denmark and for depression at University Hospital of Copenhagen according to the data of 2015 by tech.eu .



Figure 15 Double Loop from Mosenso Website

Doctors, Relatives, Patients (Triple Loop)

In addition to the double loop system that Mosenso provides, Øresund start up news of March 2016, revealed that Mosenso is in the process of developing an application that can include relatives also known as family care providers into system. The app triple-loop solution is estimated to support the treatment of 1000 patients suffering schizophrenia. As referred to the interview with the CEO of Mosenso, Thomas Lethenborg, *“We are approaching treatment in a way that has never been done before. There are currently a few mHealth solutions that offer a double-loop treatment modal for patients and care providers. However, Mosenso will be the first company ever to develop and implement an mHealth platform that involves patients, care providers and family caregivers in the treatment of mental illness,”*.

To ensure that the system works well, the care providers (doctors) have to encourage the patients to download the application. Once the patient has downloaded the Mosenso Smartphone application, he/she invites the doctor and a family caregiver to access their data. The Smartphone app will be used to fill in routine self-assessments that reveal their current state of mind, and to collect sensor data. It can also be used as a self-management tool that allows patients to manage their symptoms and the behaviors that trigger those symptoms.

When the family caregiver is invited by the patient, will have the access to the patient’s aggregated data and fill in the routine assessments evaluating the patient’s state of mind. The patient information and relevant data will be accessed through a web portal which makes it

convenient for all interested parties. To sum up, the caregiver module is currently under development and will be ready to be rolled out in Q3 2016, and will initially be used for two years.

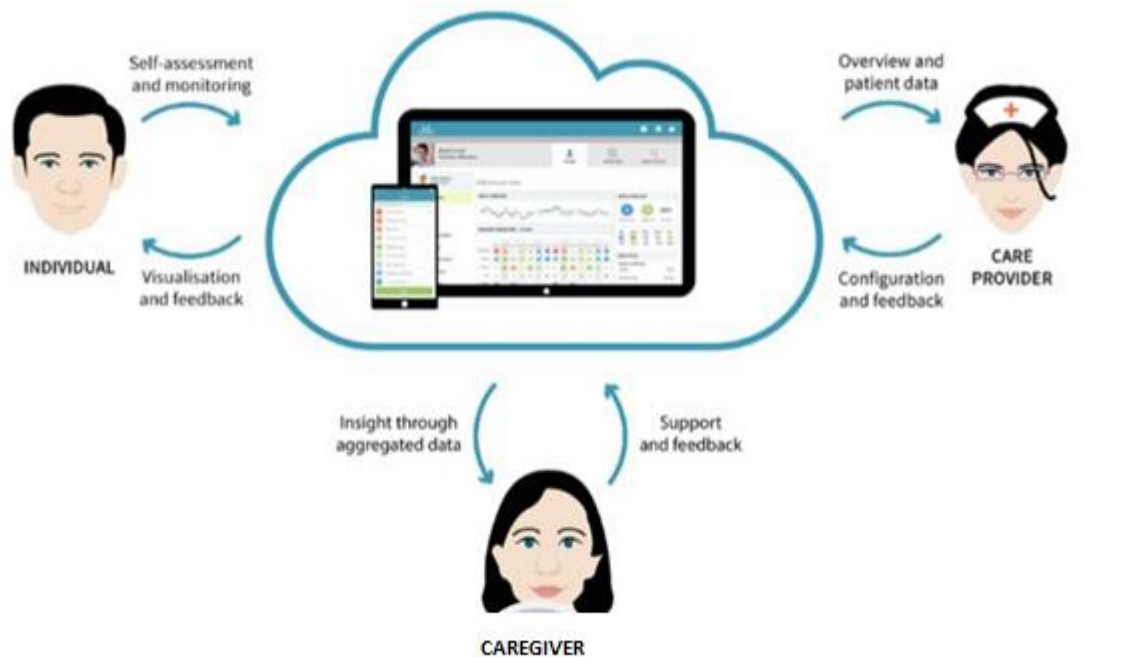


Figure 16 Triple Loop from Monsenso Website

Researchers

In contrast to the clinical users of the platform, other users are researchers. These are quite different compared to the clinical users. In this regard, the researchers are not linked with other users directly, yet their effect is part of value created in the end users utilization of the application. As exemplified in the research space, Monsenso have features that are not sold for clinical purpose. For instance, the company is developing a feature on the Smartphone that does analysis of speech patterns. In case of patient with bipolar disorder when they are manic. They will speak real high and loud and fast and when they are depressed they will speak slowly, with less energy. So, the machine has an algorithm that is analyzing the speech. But you cannot do this in a clinical setting, for example in a clinical setting you will say this patient is presenting a manic situation so the hospital is responsible for the healthcare. So then you get into an issue of liability. This is only for research purpose and nobody is responsible. It only to help and see what happens as specified by the Marketing and Communication Manager.

Tailored Customer Engagement

With regards to this category of the multi-sidedness of Monsenso platform, we will consider product customization, the customer integration and key activities that are accompanied with the users of the platform to be able to implement it. Rooted from the user groups of the platform, while concentrating on the first category, an analysis of how the customers are integrated to system is explained.

As already mentioned in the case description of the company, Monsenso uses the mobile health application to monitor patient condition and make an assessment through a questionnaire that is sent out to the doctors. Nevertheless, for the platform to work efficiently it needs customization of the product depending on the kind of symptoms that the patient present. As declared in the interview, Monsenso customizes its product, because there are symptoms that not all the illnesses have. For example, if one have a schizophrenia, will have hallucinations, but not all mental illnesses have this. Then for example if another has a borderline will have self cut, or pinch themselves, whereby other people with mental illnesses do not do this. So that is, the parameters that are analyzed by the Smartphone are individual depending on what one suffers from.

In addition to that, the company work directly with the healthcare provider who have a linkage to the patient as shown in figures 15 and 16 above. In this case, Monsenso does standardization of its product for example to doctors who serve patient with similar illness or symptoms. On the other hand, when it comes to hospitals, the company can have customized product depending on what mental illness the hospital is treating. This is aligned with the literature of (Rumble and Mangematin, 2015 ; Baden-Fuller and Mangematin, 2013; and Sun, 2006) on the customization of product in a multi-side market.

As an example, Monsenso customizes its product depending on the request of specific healthcare provider. In the case of Danish public healthcare, they needed to send clinic questionnaire with about 50 questions on top of the self assessment the patients do every day so that the patients can fill every month. And this is now customized to the needs of the customer. Another example is also drawn from a recent client of Monsenso, Lundbeck.

According to the Marketing and Communication Manager, Monsenso has signed a contract with the clients, in which the patient can download the Smartphone application and they can invite their doctor and relative to monitor their activity. This is also referred as a triple loop alignment as an extension of the double loop in separate format.

Moreover, as the integration between the platform provider and the users of the system is significant, Monsenso manages the interaction by making sure that the growth importance of the big data is valuable information exchange (Casey and Toyli, 2012) through accessing the mobility of the patient using GPS, analyzing the patterns that they trigger, and send this information to the doctors. In adding even more value to their product, the company send reminders in case the patient misses the assessment and when they trigger that the patient has been absent in the assessment session in more day, they can contact the doctor to inform about the situation through calls or encrypted text messages. Recently, they enabled the relatives of the patients to support their family through monitoring, sharing correct information about their progress and receiving feedback via Monsenso' app.

Monetization

With regards to Monsenso revenue stream, the company still receives funds. As stated in the interview “ *we have received new funds on market modeling funds, market development funds, and innovation foundation. We received some money from the government because the government want to help developing the Danish companies in IT Healthcare sector. What we are doing is we are trying to reduce costs for treating patients with psychiatric illnesses.*

As of January 2016, according to the Øresund news, Monsenso Aps will receive 1.575 million DKK (around 211 000 EUR) from the Innovation Fund to start clinical trials that support the treatment of anxiety and borderline personality disorder. The support can also be identified through a budget granted for e-mental project of a total of 19 million DKK (2.5 million EUR) in a collaborative project of The Mental Health Services in the Region of Southern Denmark (MHS), the South Denmark University, Aalborg University, Context Consulting and Monsenso.

Monsenso has also received a grant of over 3 million DKK (€410 000) from Innovation Fund Denmark to develop and trial a mHealth solution for patients suffering from depression and

bipolar disorders in February 2016. The mHealth solution aims to reduce the number of readmissions among psychiatric patients. The development and trial is part of the research project, RADMIS; a collaborative project between Monsenso, the mental health services in the Capital Region of Denmark, and the Technical University of Denmark whereby overall budget of the project is 10.1 million DKK (€1.3 million). According to the CEO "*this intelligent Smartphone-based monitoring and treatment platform for depression and bipolar disorders is the first of its kind; there are no similar solutions available on the market*". The success of this project will allow health care systems to reach out to the 75% of the population in Europe who need treatment but remain untreated.

In addition to the government funds, Monsenso does receive some funding from different organizations and also through sales from its customers. The healthcare regions in Denmark are paying Monsenso for using the system and also the company has a customer in UK which is St. Andrew's Healthcare. Apart from the mentioned customers, Monsenso has recently closed a contract with a unrevealed customer. Other customers are for example one of the NHS Trust in the government of the UK and also in Denmark, they are dealing with Lundbeck.

Apart from the revenue stream mentioned, another key element as a multisided is the use of **repeated payment system** (Rumble and Mangematin 2015, Rayna, Darlington and Striukova, 2014; Rayna and Striukova, 2010 and Sun, 2006). As a multi-sided company, Monsenso capture value in different ways. First, the company earn from licensing their application per patient per month basis from the doctors with a charge of 15 Euros .

In other cases that the company has worked with, for example in the case of Lundbeck, they required a lot of development as well as consultancy. Therefore, Monsenso had to charge a different fee depending on the amount of work it had to do for Lundbeck. That is why Monsenso do not charge kind of a standard fee. *For example if you need consultancy, if you need training, if you need how to implement the system. It depends how you want it. If you want to implement the system and need our help we charge some consultancy hours but they can also choose to do it themselves. So it is per patient license model of payment*" as quoted from Jennifer Highland. Lastly, Monsenso has still not started to earn profits as it still has to cover costs due to the early stage in which the company has. However, the company uses other channels such as sales partners in other countries to sell their product.

Network and Linkages

Based on the platform that Mosenso provides it links a number of elements inside and outside the business model which makes it successful (Osterwalder and Pigneur ,2010). As already mentioned in the previous configuration, the key elements associated with the business model involve entire users needs and engagement, the finance, key resource such as developers of the application and researchers. The agreement of the company issues to the regulations on personal privacy, and as well as partners who facilitate the storage of the big data and sales. All these together including the patient and hospital, makes Mosenso where it is today.

4.1.1.3 Challenges encountered by Mosenso

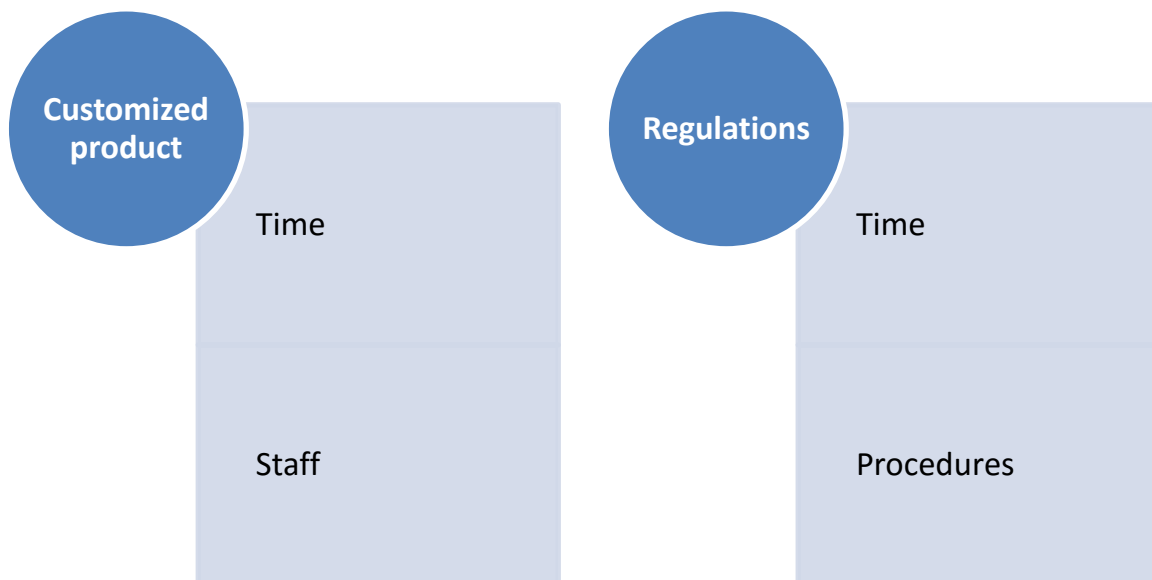


Figure 17 Mosenso Challenges created by authors

Developing customized product

One of the challenges that Mosenso is currently facing is linked with the development of the application as well as the service accompanied with it to be able to satisfy customer needs. This is due to the high demand of the customers in which they require a lot of things to be customized while the company relying only on a few number of developers. Hence, it is not

easy to just hire as development takes a lot of time and the developers need to be trained to adopt into the system.

Regulations

Another challenge that Monsenso is experiencing is that of regulations. With regards to regulations, the company requires a lot of time and process to abide with the rules. Recently, in this year March Monsenso obtain the CE mark and are still in the process of obtaining the ISO certification for the EU market. In addition, the company is considering to do a FDA approval for the US market as well.

4.1.2 FirstAED

The firm was established by four partners. Finn Lund Henriksen is a medical director, who is working as a Head of Odense University Hospital's AED Centre. General manager Henrik Schakow holds more than 28 years' experience as a rescue officer and is a founder of the Langeland AED Association for first responders volunteers. The third partner Bruno Hansen holds a technical manager position and is volunteering as AED first responder in Langeland. Finally, the business development area and daily operations are managed by Per Schorling, who together with Bruno Hansen came up with an app idea in 2011. Since that moment the word about the FirstAED was spread all over Danish media, naming its product as an innovation saving lives².

FirstAED is a first responder alarm and AED management infrastructure application³. The target group of the product is dispatch centres, who with a help of a tool can easier manage professional and volunteer first responders and AEDs. The principle of the solution is to send an alarm to first responders by tracking their current location for enabling faster help assistance in an emergency out of hospital, e.g. cardiac arrest. The first responder effectiveness depends mainly on a response time, which has to be as short as possible. Unfortunately, the prior communication methods before app was launched included SMS, telephone or address lists. In emergency the closest responders were selected in regards to residence or workplace address. Nevertheless, it is not effective due to circumstances, such as person can be on holidays, out of

² FirstAED system retrieved from company's website

³ FirstAED system retrieved from company's website

town, having lunch time, etc. All these situations decrease the possibility of getting the first aid in the best time. Therefore, the FirstAED solution eliminates this issues, as it is an integrated system made up of dispatch centre, first responders and AEDs transferring the data in an actual time of the event. It can stand alone or be integrated to the existing dispatch system. An offer includes tool for the dispatch centre, Smartphone application for first responders and management of AEDs and cabinets.

The key features of the product encompass: GPS function, turning on/off GPS on Smartphone for saving battery time, location of AEDs and its intelligent management, team work and roles to the first responders, road directions, first responder case reporting, intuitive user interface, administration interface, integration of the system to other It-systems used by the dispatch center and iOS and Android platforms(2014).

The principle of FIRSTAED product is that in the emergency case, the intelligent solution identifies nine responders who are closest to the incident location, to whom the alarm is sent via application. The alarm is loud to ensure the reaction. Then three responders at the nearest point who replied fastest get the directions to the place and guidelines to the task. Moreover, they can see the locations of other first responders and the nearest AED location. To get to the place the road directions are showed in a map. It is possible to call or the EMS via contact menu. After task completion the responder fill out a case report. If the responder request for a debriefing, the supervisor will be informed about it via SMS/e-mail and will contact the responder afterwards.

The product was tested during two years' period in the small Danish island Langeland, which is far distance from the nearest hospital and faced long response time from the ambulance. Therefore, volunteers are gathered in the AED association for the emergency cases and can be contacted by the dispatch centre supplementary to the traditional modes. The trial in this area was accomplished with satisfying results with reduced response time up to 50%, which shortened first responder's arrival time to four minutes and let saving lives.

The company has a proven example of application success in Langeland, and is expanding further in Denmark. Beyond that, FirstAED currently entered and implemented projects in Finland and Germany (Henriksen, 2016). Representatives of the company are actively

participating in international exhibition, meeting with policy makers and potential partners, in this way introducing product in foreign markets.

4.1.2.1 Motives for First AED using Multi-sided platform

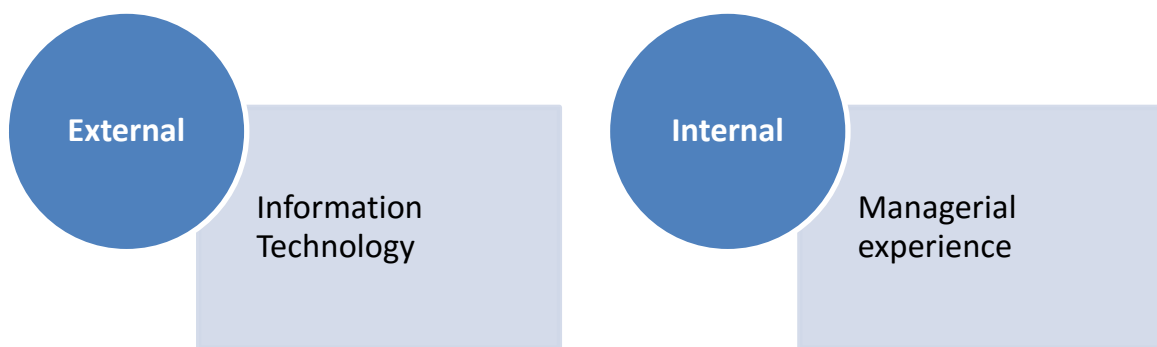


Figure 18 FirstAED Motives created by authors

Hereby, we discuss factors that motivated FirstAED to provide platform that connects a number of users. FirstAED is influenced by both the role of new technologies such as Information Technology (Labida and Lakhal, 2015; Rumble and Mangematin, 2015; Baden-Fuller and Haefliger, 2013) to create effective and efficient services to the customers and mostly for the patients who need a quick support. In addition to that, the role of managerial experiences and background played an important part in the establishment of FirstAED as previously explained in the case description.

4.1.2.2 Multi-sided Business Model Implementation

Customer Identification

When it comes to the group of customers that FirstAED serves with its technology are mainly the dispatch centers and emergency organization in the regions of Denmark. As stated in the

interview by one of the shareholders, Per Schorling who is also the business developer of the company, he mentioned that for example, in Denmark there are five regions which are responsible for diverse medical services and they have the groups of the first responders, so this is how it works in Denmark. On the other hand, in the UK for example, they have ambulance services who are their potential customers. In UK, they are far ahead in organizing first responders especially in the rural areas and not so much as in the urban space. However, in the rural areas where they have long ambulance responding time and thus the FirstAED comes into function. He also insisted that the potential customer could be for example region of Northern Denmark or it could be South East Ambulance services.

In addition to the customers that First AED provides the solutions to, other users of the application are the first responders and volunteers who are made available in circumstances where the first responders do not have a quick response to the situation.

To ensure that the system worked from the beginning, FirstAED began the implementation of the application as a pilot project (Casadesus-Masanell and Zhu, 2011) in the Langeland island in Denmark as mentioned in the description. After a number of experimentation, the system become available to the island. Thus, since its implementation the company has consider to rapidly expand in other regions in Denmark as well as in other countries.

Tailored Customer Engagement

In this section, we consider the customization of service as well as customers' integration with the users of the application (Rumble and Mangematin, 2015; Baden-Fuller and Mangematin, 2013 and Sun,2006) .

As already discussed in the literature (Hagiu and Wright, 2015, 2014 and Sun, 2006), in a multi-sided business model there is a cross group effect between the two sides. According to the case of FirstAED, this can be determined by the linkage that the company has as a technology provider to the dispatch centers and emergency organization, in which they are directly linked to the first responders who rescue the patients. Moreover, First AED organize and manage the teams of volunteers who act on behalf or prior to the arrival of the first responder. As quoted from the interview "*We do a lot of connection with the volunteers, we do that in some areas. But it is not our key concern. Our key concern is to work on technology, that to be the best*

technology provider. If you run ambulance, and first responders, etc. you cannot be the best technology provider".

Therefore, First AED mainly ensure that the communication between the dispatch centers and the first responder as well as the dispatch centers and the volunteers is efficient, through fast communication and responses using the application automated system.



Figure 19 FirstAED Multi-sided Business Model Implementation from FirstAED Website

Apart from what FirstAED focus at, dispatch centers focus mainly in ensuring that terms and privacy rules are complied with the regulation of personal privacy, while FirstAED support them where required. In addition to that, depending on what the dispatch centers want, the data can be stored either at the dispatch serve which is virtualized, or it could be at a local hospital server. In all cases, the data collected are very well protected. This means that the is no risk for cardio arrest address or confidential information about the first responder.

Referring to the interview, Per Schorling explained that they have a system, which is flexible and can be adapted to needs of the customer. That means, for instance today dispatch want to call 3 responders then in a year from now they find out that they need 4 or 2, then FirstAED changes the settings. This is also a big advantage for the company as it is a very novel technology that they provide.

Furthermore," *there are mainly globally 10 systems in fact, there are only 3 serious ones as ours and the rest are not serious. It is more like simple app for client's service system, which is quite technical but client service system means that you lock a lot of data and you manage everything in the server, and show patient data, and first responders confidentiality, so that you have everything sorted out*" as stated by Per Schorling.

Monetization

With regards to revenue and payment system, FirstAED depend on the shareholders investment to ensure that the revenue is feasible in the end of the day. Based on the interview with the business developer, it cost around 60% for the technology and 40 % for sales activities in the company costs. However, the company earn its revenue by selling the product directly and through agent (partners) outside Denmark. The earnings are collected first as a start up fee once FirstAED has signed the contract with the client. Thereafter, this start up fee is accompanied with the an annual license payment. This kind of repeated payment are also observed in the literature of (Rumble and Mangematin, 2015 and Sun 2006) as applicable for the multi-sided platform as that offered by FirstAED.

Network and Linkages

From FirstAED point of view, the company relies mostly on the external environment to be able to operate successfully. This means that, the company provide technology in Smartphone application, however, it needs markets for this solution and thus partners play a significant part for its sales. As point out in the interview, FirstAED is a born global company in which from the establishment it acknowledges external market (Kalinic, 2009). And by being a born global company's network of partners play an important role. Specifically, FirstAED uses it partners to gain market shares and increasing sales. For instance in Finland, the company uses an agent that makes the project happen and also this strategy will be adopted to other countries. Despite the partners' linkages, FirstAED uses networking strategy in gaining their clients. As

exemplified in the interview, most of the clients are obtained through calling and sending emails, as well as through attending conferences where they are potential interests.

4.1.2.3 Challenges encountered by FirstAED

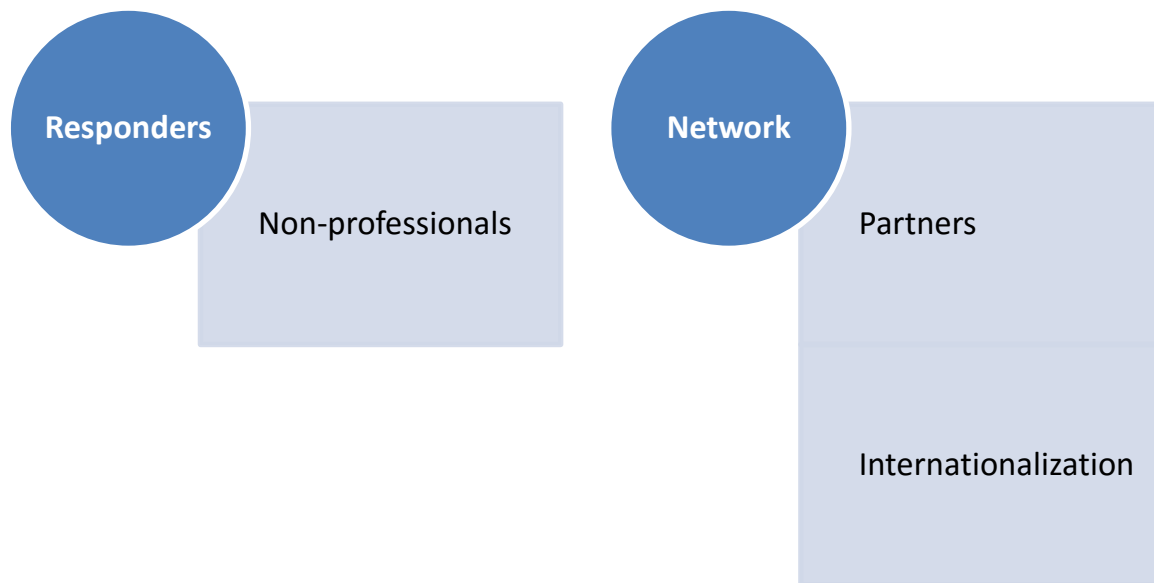


Figure 20 FirstAED Challenges created by authors

Non Professional Responder

One of the main challenges to the company is associated with the use of the non professionals in saving people with cardio arrest. As stated in the interview *"The point is that for cardio arrest you have 5 minutes and five minutes pass really fast. So we do not care who brings the AED, it might be as well somebody like you, who walks or bikes, but just comes with the AED. But maybe you do not have some much experience in heart massage, or mouth to mouth breathing, but it happens in the families in a normal life"*. This sort of group structure is being discussed by FirstAED with the ambulance service and dispatch centre, on how they want to integrate the volunteers in supporting the system. However, they all want to do differently. For instance, some want to call 3 persons, some want to call 4, some 5, and that is why FirstAED solution is very flexible on whatever you want to do.

Network Establishment

Another difficult faced by the company is that of building its network in different countries. As already mentioned FirstAED is a born global company and this rapid internationalization can be successful with the use of network. Therefore, the company is working hard in getting potential partners to work with.

4.1.3 Teleskin

The company was established in 2007 in Serbia with a focus on hardware and software development for the early detection of skin cancer, melanoma, and other skin conditions. They entered Danish market in 2014 through a partnership with NSC and Accelerace and are based in Esbjerg. The team behind the name constitutes of five people. The CEO is Serbian Zejlko Ratkaj, who has eight years' experience as senior research assistant at mechanical engineering faculty. In 2004, he joined one of the founder of TeleSkin and his colleagues in melanoma research. Later on this research transformed to the company and expansion to other markets.

The aim of this expansions was to present a new product scinScan. Denmark was selected because of third highest incidence of melanoma in the world. Moreover, here they received attention and 2 million Danish crones in Next Step Challenge organized under the Europe's growth competition. Furthermore, the company attracted Danish investors, such as Seed Capital a largest early stage venture fund in Denmark and Danske Welfare Tech Invest (Aagaard, 2015) . These investments allowed company to apply for the CE marking, which enables quality assurance.

SkinScan is a self-assessment app providing assisting information about pigmented skin lesions and skin self-examination. It enables an individual to skip the first consultation at doctor's room, by checking moles via app. This app provides moles check, reminder and tracking of moles in a long-run. The user has to follow four easy steps. First the photo of the mole is taken, then the mole place is indicated on the body image via app, third several questions have to be answered to provide more information about mole's appearance, at last the feedback of skinScan algorithm's indication will be provided whether a mole is typical or atypical⁴. This service is provided for free. If the customer is willing to get a specialist assessment (not diagnosis), by paying 239 kr. the customer after algorithm's indication can send a picture to the

⁴ SkinScan app retrieved from company's website

real doctor and get the response in within 48 hours. In case of not buying consultation of the specialist, but getting a result of atypical mole, the person should book a consultation at a real's doctor cabinet.

4.1.3.1 Motives for TeleSkin using Multi-sided Platform

During the interview the CEO of Teleskin shared the history of the firm, and how the founders came upon the initial idea. The several factors played an important role in establishment of the firm and working towards targeting two groups of customers. The factors are internal and external, as it is already stated by Rumble and Mangematin (2015), where they say that external ones are overemphasized while internal are forgotten and not discussed extensively in the literature. In this case the mutual contribution of both affected the decision of implementing the current business model, which is still not fully multi-sided, but with the aim of reaching this point in the future (Fig.21).

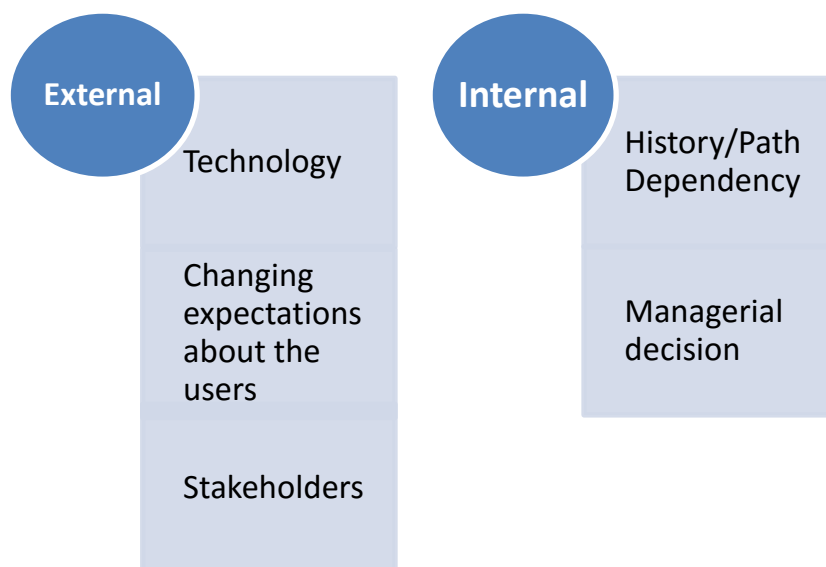


Figure 21 TeleSkin Motives created by authors

History/Path Dependency and Managerial Decision

It can be seen from the interview that first steps were taken due to internal factors, such as history or path dependency (Chesbrough, 2002; Frankenberger, 2014) and managerial decision itself (Teece, 2010). The CEO, Zeljko Ratkaj told about the beginning of the company, and gave a more details about the initiation of the project, adding to the described history above.

According to Ratkaj, the main influential person in this story is doctor Jadran Bandic. This person proposed the idea, which came into mind, because of more than 20 years' experience in dermoscopy and work in his private clinic. As Zeljko Ratkaj proceed *"he (dr. Bandic) wanted some solution for his patients, that they don't need to come to the clinic every time. So they come for the first consultation, and if there is no need to remove, he wanted actually some tool to give to them, so that they could take images by himself, let's say in two months, and these images there automatically transferred to the database, and became part of medical records of the patient"*. Since then they had an idea of serving two groups of customers with one product. After, dr. Bandic requested for the possibility of developing this tool, Zeljko Ratkaj took the decision to assign for this task and find the solution, because he saw the potential in this idea *"So, I said ok, maybe it is something interesting to play with"*. Therefore, the internal aspects gave a first inputs for scinScan app's development and facilitation of two customer groups.

External factors

Afterwards, the external factors influenced the development of this mobile application. The advancement in internet technology meant that it is possible for doctor to save time and costs with the occasion of decreased number in physical consultations, i.e. *"So they come for the first consultation, and if there is no need to remove, he wanted actually some tool to give to them, so that they could take images by himself, let's say in two months, and these images there automatically transferred to the database, and became part of medical records of the patient. He (dr. Bandic) examined the image, and said ok - there is no need for you to come now, see you in one month or in two months. So he was saving his and patient's time and everything"*. This time and costs saving align with logistics improvement and new ways of creating and capturing value due to technology advancement, and was discussed in the literature (Baden-Fuller & Haefliger, 2013; Chesbrough, 2007).

Another aspect of the technology, more specifically mobile phones improvement led to better quality of pictures, in consequence the algorithm used in the app could scan a higher quality pictures and provide an assessment, i.e. *"Back in 2008-2009 the images started to be better and better, originally the image of first mobile phone was really bad, the quality was questionable, but in 2008-2009 there were major phones, very expensive ones, which had good quality, and then later in 2010 and 2011 image quality started being better and better [...]"* Can we do

something with these images taken from the phone?". Due to this improvement in mobile technology they were able to offer a unique value proposition for the users.

Furthermore, the changes in technology changed the role of the end-users. As it was discussed by other authors (Rumble and Mangematin, 2015; Hienerth, 2011), the users' role is shifting as they become a central part, which is actively collaborating with the company or service provider. In addition to that, the companies are incorporating the ideas of clients into the development of business model. For instance, CEO Zeljko Ratkaj explained that it is most valuable when the patient is connected to the medical system and can get access to the data about his condition, even though it is still not expanded, but it is a near future " *You do not get access to this data. But it will be in the future*". For this reason, they created this app, as the CEO said it is important to "*start from somewhere*".

Finally, the last but not least motive were external stakeholders (Baden-Fuller and Haefliger, 2013). The first who supported - "*Microsoft was going to launch a new version of mobile platform, and they said they would like to have this kind of app in their portfolio. And they supported developing the original app*". Afterwards, TeleSkin decided it would be interesting to test this product in some country. Later on, as CEO Ratkaj expressed "*We stumbled upon next step challenge in Denmark, sponsored by SE and Accelerate*". They won this competition and the main financial incentive. Beyond that it led them to entering Danish market and working on adoption of this type of model.

4.1.3.2. Multi-sided Business Model Implementation

Customer Identification

The firm's product, the skinScan app is offered to the end-users who own iPhone, i.e. "*now we are targeting with the app individuals*". As it is explained in the description, the person is enabled to self assess the condition of the moles, and react if there as a risk of melanoma by going to the doctor. TeleSkin entered Danish market with the purpose to test the product and get more images of moles, so that to check the reliability of the developed algorithms. The piloting phase is a common practice in multi-sided business model implementation (Casadesus-Masanell and Zhu, 2011). After launching this iPhone app and announcing about it through various channels, they got mass attention and consequently many people downloaded it in the

early phase. According, to the chairman of the board, Søren Ankerstjerne during the first weekend after the launch 4000 downloads there reached and this was a 'fly' from the start (DR, 2015). Since august 2016 skinScan app was downloaded 46000, as the CEO expressed "*actually pretty big number. If you take into account that we are available only on iphones, we are not available on androids*". 65% of these downloads have created active accounts, which is an optimistic number. The main target group for this app are people in between 35-60 years old, and most often women. The CEO explained, that younger groups are downloading the app just to try it, but do not become active users, nevertheless he shows interest in changing this trend and reach younger people, as the earlier you get to know, the more chances to prevent person from melanoma. They target specifically women gender, as it was explained that "*We as a guys don't care. You are the one who care, you will make me go to the doctor*". Therefore, there is a major focus on feminine visualisation in app development and marketing.

The another customer group targeting is in undergoing process recently. As the CEO said "*We are just exploring right now, we really believe that we need to have doctors here, who could answer to the patient. So the doctor could call them if something, because people are lazy. It was on discussion since 2013*". The CEO explained many times that it is another kind of story as there are specific requirement if to serve healthcare providers. The company currently comply with class 1, that allow them to facilitate self-assessment for the individuals. However, if to provide the solution to the doctors, they are supposed to comply with class 2, which is still not realized plan. In the mostly discussed multi-sided cases, such as newspapers industry (Muzellec, 2015; Hagiu and Wright, 2015) it is discussed that creation of the mass of individual users, can attract business customers. TeleSkin use the number of application downloads as a prove of need for this offering "*The numbers that we have right now is actually proving that people want to use this kind of solution*". It is especially important, as they faced some issues of neglecting from the doctors.

Even though, they have not yet targeted healthcare providers in Denmark, they have features of multi-sided (Rochet and Tirole, 2003) as they offer the distant doctor's consultation for an extra fee, we will discuss this into details in monetization part. Therefore, they connect to distinct sides and create a direct interaction between these two groups (Hagiu and Wright, 2015).

Tailored engagement

Baden-Fuller and Mangematin (2013) explained that multi-sided business models have to create two value propositions for different target groups. As it was explained in the section above, the company is not selling the product offering to the healthcare providers in Denmark, therefore the value proposition is just imaginary, and not yet realistic.

In regards, to the individual users the company has both 'bus' and 'taxi' propositions (Rumble and Mangematin, 2015; Baden-Fuller and Mangematin, 2013). First then a person downloads an app and follow the procedures, i.e. defined previously, at the end the assessment is developed through algorithms and send to the user. It is proceeding automatically, without human intervention and can be seen as a 'bus' service. If, the user is willing to get a further examination on the picture of the mole, TeleSkin developed an extra tailored solution, where customer has to pay extra and can get a real doctor feedback. Nonetheless, both offerings lead to ensuring prevention, self-assessment opportunity and enabling individual to be an active in his wellness and health protection "*We want people to track the changes, and act on time, and go to the doctor*". The testimonials in their website give an insight on created value proposition for the users, for example one woman Birgit shared her personal story (Teleskin, 2015). She was worried about possibility of having skin cancer, but after visit at the general practice doctor she got an answer that the mole is normal. Nevertheless, she got to know about skinScan app and did self-assessment, which informed her about atypical mole and need to consult with the doctor. After she took initiative herself the mole was removed, and she could avoid the cancer⁵. Therefore, their delivered value proposition saved a life of the woman.

In the focus on healthcare providers value proposition is not created yet, but important that to strengthen the value proposition for individuals, too. As Teece (2010) stated the value proposition has to hold degree of creativity and sensing. The CEO explained that it is important to enable patients to be in the systems. To do so, they self have to serve healthcare system. The main value proposition they could provide to the doctors, would be time and costs saving as the number of consultation could decrease. It could be a standard or bus value, or tailored, with extra consultations, depending on the needs in the specific case.

Monetization

Finally, it is important to discuss how the firm is capturing the value. The current stage of business model and prior emphasis on the individual users not healthcare providers limited their ability to generate revenue. It is due to selected pricing methods. Right now application users can download it for free, and only if they request for extra consultation they should pay 239kr. This pricing has freemium model features, where the client has to pay only for an extra service (Mettler and Eurich, 2012). Nevertheless, the CEO explained that they have that option, even though it is not working, and therefore they need to have local doctors. In the scenario of local doctors, the health institution would be the one to pay. The CEO explained that it is difficult to define the price, but approximately *"The original system would cost 150 euro per month, but for 200 euro client would get system and two consultations with the expert. For 500 euro you could get system and 10 consultations"*. They would use repeated payment system as it is discussed in multi-sided literature (Rumble and Mangematin, 2015). Furthermore, it would be a customized pricing method applied for this target group.

Now the company is operating thanks to the investments and funds. Zeljko Ratkaj stated that *"We need more funding, we should improve the business model"*. The investors are both public and private *"Right now the investors investing with the money of Denmark. We can say that we are funded by the Danish government. But for example, in SE investment it can be private, depends how people find you"*.

The CEO explained that he would like to employ more people or to own the server, but they are bounded by finances *"So far we are minimizing the costs as much as we can. We are still in pre business model, we are not engaging in a real business model. We are like testing here. This is the question why we are in this developed market"*. Therefore, they have a strong focus on developing a value proposition and network/linkages. The main costs encountered in this development are CE mark, data storage and human resources. If they want to increase their presence in Danish market, they should increase costs, but they are trying to take it *"easy"* as they look for other markets entry possibilities. Nonetheless, there is lack of contribution on how firm could generate revenue in Denmark.

Network linkages

TeleSkin is a small company, however the governance is complex as it is a start up, and it is important to reach both target groups and finally generate revenue from the value propositions. Key activities are ensured because of existing linkages in the system. The partnerships are essential for TeleSkin, and they put a lot of efforts on finding new partners. First, starting with the key activities from a technological point they are constantly working on development of the algorithms, which are created internally. In addition, they ensure technological development through external partnerships. They started several research projects with Aarhus and Odense universities, which allow them to test further the products and produce the additional proof for the commercialization.

Afterwards, the external traits to the partners in Denmark, made it possible to enter Danish market as to note it. Starting from the investors, who are not only supporting with finance, but provide a strategic consultation and assistance in this market, i.e. *"It is completely different system, so we have huge support from our investors. We are always looking for strategic investors. We are not looking only for these who can give money"*. Therefore, partners are not only supporting them financially, but support them in strategic growth.

In regards to PR activities, it is a must in this company, as to share the story of what they are doing, and how they want to contribute in the area of melanoma as not all people are clear about their product. Therefore, they to talk with relevant parties *"We were on doctor days in Copenhagen last year, we were also in Fredericia for some exhibitions, we go doors to doors talking with people"*. To follow the standards in this market the firm contacted with Sundhedsstyrelsen, so that to undergo the process of CE marking, as to make any health assessment offering, the firm has to be this mark certified. Beyond that, they initiated collaboration with Kræftsbekæmpelse, and shared the story of their product and what is the aim of the company. The CEO explained, that every journalist writing an article about the firm will get in contact with this association to get more details about it. Furthermore, as Hienerth et al. (2011) explained the technology advancement and social media allowed firms to connect with users. The firm is connecting with users via Facebook and blogs, there they share news and relevant discussions on the melanoma and updates about the product.

4.1.3.3. Challenges Encountered by TeleSkin

The operationalization of business model is taking place, nevertheless company face certain complexities in this desired two-sided business market in Denmark (Fig.22).

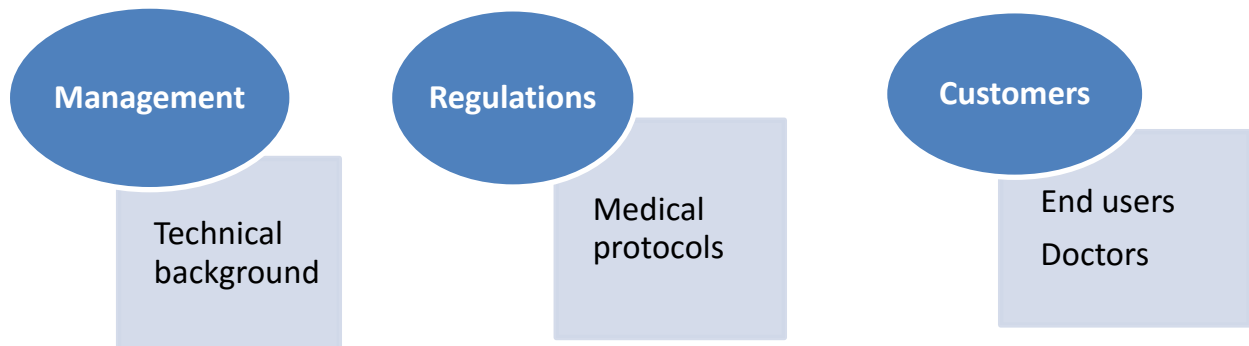


Figure 22 TeleSkin Challenges created by authors

Management

First, the management issues are visible and triggering the activities of the firm. This finding corresponds to the Rumble and Mangematin (2015), where they discuss that effectiveness depends on the top managerial level in a firm. The leader has to be able to make dynamic decisions, commit to the vision of the firm and follow the specific agenda. To do so the managerial competencies and agility is a must, especially in such a complex business model as multi-sided. TeleSkin deals with this issue. As, the CEO expressed several times *"I am a technical man and we need a business guy for it"*, he accentuated a few more times that personally he is into technology and has lack of skills in business management. For example, *"I am really technical"*, and later he added that luckily the new person under position of Chief Commercial Officer is hired and *"So he will take this part from by back a little bit"*. *Because now we have two projects going, it is impossible, and my day is 24 zero"*. Additionally, *"Working in start-up can be crazy thing to be honest, you need to be special kind of person"*. To add further *"I hope we will have a new CEO before that. Because for me it is aghh (application for funds)"* or *"But I am not a real CEO, so the boss and investors are consulting and managing. This is my first work, where I am having a company"*. These statements, just show that right now they are not working in full capacity, due to not a right managerial fit. This issue is affecting their value capturing, as CEO call himself idealist, for whom the aim with this product is to save at least one life. Nevertheless, when it comes to business side, where he has to give a clear answer on when

are they going to be in medical sector, or what would be the price, he is not so confident and clear in that.

Regulations

The regulation in this sector are slowing down this kind of business, despite the efforts and promising vision, e.g. *"If it is medical data, you have completely another concept, when we need specific protocol. There are many definitions about the servers, about the physical, when you own it"*. As it was mentioned above, the company is working towards becoming player in medical system, and it leads to many complexities and uncertainties such as not clear knowledge about finance, technological aspects in the near future development. The CEO express here *"This is not like you have a mobile app, when it is in health, you have to be very careful. You need to comply with everything, but it is very difficult"* or *"what is happening in medicine is tough"*. Moreover, in regards to marketing the company is very limited *"I am pretty much tight, when it comes to health"*. Therefore, it is easy to launch an health app, but if to propose the highest value, it has to be officially medical, and this leads to long processes and approval from governmental bodies, such as Sundhedsstyrelsen, which can confirm that firm comply with certain regulations.

Customers

The last challenge comes from the users' side, taking both doctors and patients in consideration. Starting from the healthcare providers the CEO told about the difficulties met in regards to finding B2B customers *"convincing doctors, that this is right thing, it is always like some people approve, some do not approve"*. After coming to Denmark, they got criticism from one doctor, who was negative about their product, and called it not reliable and not serious, that TeleSkin do not know, what they are doing. Therefore, since the beginning the company has to still convince the doctors that it is reliable, i.e. *"So I am trying to explain the guys that we are not trying to change them, we are trying to supplement them"*. Until the approval given they are not in the medical system, and cannot offer full service to the users of app *"It is possible only in collaboration with healthcare, being in the system"*. Nevertheless, their users mass could be seen as a cross-group network effect (Rumble and Mangematin, 2015), where the number of users should be a reason for the doctors to start collaboration.

Another issue in regards, to doctors is the healthcare system in Denmark itself. The first person who check the patient at the start is a practice doctor, who do not have a specific knowledge about one area and cannot identify melanoma in early stages, i.e. *"Because the first doctor patient is meeting is practice doctor, so he not so certain, and he has less knowledge, because of how many melanoma he has seen. But they are the most important, the first who you address"*. Therefore, people who are registered for specialized doctor are in the stage 3 or 4 and it can be too late to save a life, and build support on self-assessment tool.

Apart from healthcare providers, and looking into existing end-users, the CEO explained sometimes sarcastically how they behave and use the app. Every time the user has to confirm that he/she accepts the privacy and use terms, but *"it is funny, people do not care at all [...] and people still send crazy bleeding images, and etc. So people do not care, about that"*. They observed that people do not pay particular attention on how to use the app, usually they register, but do not send feedback on the possible improvement, anything, that is disappointing and do not allow fully, to involve users in the co-creation of business model as academic scholars accentuate (Rumble and Mangemantin, 2015; Hienerth, 2012).

4.1.4 Vertic

It is a strategic digital marketing agency launched in 2002. Now company has offices in New York, Seattle and Copenhagen.

In a healthcare sector Vertic creates online marketing solutions for healthcare companies from the pre launch to any other product life cycle stage. The company offers a set of services and products in a healthcare field: event activation; patient support service; e-detailing; healthcare apps; patient communication; HCP communication; digital strategy; digital brand IQ. The usage of Smartphone and tablets has enfolded, and people use the devices for different daily purposes. The aim of Vertic is to determine for the clients the right way to reach a target group by at the same time creating to individuals an app for monitoring their health; manage wellness. The core approach is to combine strategy, storytelling, creativity, and interactive design⁶.

⁶ Who we are retrieved from company's website

The portfolio of the clients include well known international brands like Microsoft, GE, SAP⁷. For instance, GSK a global pharmaceutical company, which hired Vertic for developing an app for digitalizing the pamphlet and pills dosing advice, that allows parents to take better care of the children⁸.

Motives Influenced Vertic to enter into Healthcare sector

Industrial and Institutional Forces

Vertic from its establishment started working in health care industry but at a minimal percentage (5%). Thereafter, the company decided to focus on the industry by obtaining a healthcare client as the agency world competition was becoming intense and the institutional demands on health care regulations became crucial (Demil and Lecocq, 2010 ; Frankenberger, Weiblen, and Gassman, 2014). As stated in the interview by global head of Vertic healthcare, Mikkel Arnoldi, *"we understood that when you first come in and you do not know anything about this industry, you don't really have their respect because there are so many things that are completely unique to healthcare that are around legislation, what you can and cannot do"*. As it is required by the regulations in healthcare, the companies cannot talk products to patients or market them in such a way in Denmark. All these ruled regulations apply only to healthcare, differently from selling other normal products. As a normal agency, who does not know about healthcare, as it was for Vertic in the beginning, the clients pay less attention to the agency company. Thus, the knowledge of the industry is very important in opening markets to the agencies such as Vertic or other companies dealing with healthcare. This can also be verified through the interview whereby Vertic had to educated itself about the healthcare world as well as legal limitations and constraints to establish itself better in the industry.

Technological Forces

Also by acknowledging the potential that can be found using technology as well as being creative and innovative (Rumble and Mangematin,2015), expanded the boundaries of the company to entering in a very sensitive and complex industry. As exemplified in the interview, today 8 out of 10 people go on the computer and Google the information. Therefore, suddenly

⁷Street Insider (2015, March)

⁸ Cases - Panadol app retrieved from company's website

there is a digital mind that is opened to reach many, those who have computers or a smartphone, which means advancement in technology. Vertic also recognizes the presence of advanced technology in Denmark as well as the Nordic countries. For instance, they observed that some of their clients like big companies from Germany, do their pilot projects in Denmark. Also, there is a really high mobile penetration in Denmark, and the same goes for tablets and laptops. This shows that the country is open to support new technology and innovation in implementing variety of business models.

Business Model Configuration

Clients Identification

The main clients that Vertic works together with are mainly pharmaceutical companies. For example some of Vertic's clients are Genzyme, Novo Nordisk, Newpharma, ALK, Lundbeck, Lilly, Leo, GSK (GlaxoSmithKline), etc. In regards to Bojovic (2015) the pharmaceutical companies have to react to digital opportunities and change their business models to more patient centric one, if they want to succeed in the future. The company identified most of its clients through direct contact such as calls and emails, and afterwards arrange meetings. The most significant condition to be able to capture the needs of the clients is the knowledge that Vertic has with regards to healthcare as previously mentioned. With the knowledge in the industry it also makes Vertic different from other agencies competitors in serving a similar market. Furthermore, what Vertic have done is to try to have some steady relationships with the clients. As mentioned in the interview, *"now we have that kind of relationship with 3 companies whereby we have a lot of repeated business. We work with the same brand again and again. So, when they need a new website or new video then they ask us to do it. Thereby, what we call classic key account management. We have the same clients that we develop to be bigger and bigger. Therefore, we do not waste so much time chasing the new clients and calling and calling. That is not a good way to drive business"*.

Value Proposition

Healthcare Application

The value proposed by Vertic to its clients include the provision of healthcare applications. With regards to the needs of the people (customers), who are embracing the use of digital media

such as tablets and Smartphone at a rapid rate and increasingly using them for healthcare purposes, thus pose a challenge to the industry on how to effectively use this new channel to reach their target audience. To be able to solve this challenge, development of applications for customers that are integral and critical to their health is significant and wellness management or health practices. Successful applications serve a specific purpose, whether it being a dosage calculator, emergency kit, a tracking functionality, a wiki, a reminder feature or similar. The relevance of the offering being mobile should be obvious to the user, and the app should at best live up to. Entrenched on the key application features that the companies offer, it gives them the opportunity to connect with stakeholders every time they download an app on their tablet or Smartphone. This enables them to dialogue with customers, forge customer relationships and develop a connection that can lead to greater brand preference. This ultimately can lead to increased sales and a superior ROI.

However, to deliver a good product or services by companies that operate in the healthcare industry, they need to acknowledge needs of the customer and offer valuable products or services. The added value could be helping the customer on their day to day basis to improve their health. Hence, based on this explanation, the company may be able to obtain a sustainable competitive advantage compared to others who imitate apps and offer just a narrow and easy product.

Digital IQ, Digital Strategy and Event Activation

Moreover, Vertic aims to provide good content and education to its clients. For example, through social media like LinkedIn, they keep up-to-date knowledge within digital healthcare for their customers. Vertic tries to be a knowledge source by proposing value through digital IQ and through digital landscaping. This helps the customer to even understand their clients better. In addition to that, Vertic hosts events which are about knowledge sharing as well. Referring to the interview " *we try to do it by sharing our expertise and knowledge without it only being a product, so on top of the product. We think that all clients need to start thinking that way. The product pushers of the old times are having a tough time these days because it is not about selling products anymore, but being resourceful to the customer so that they find you relevant as part of the solution. I think the days are over where we see products in isolation, we also buy the services around the product*".

Patients Support Services

Other kinds of value proposed by Vertic includes patients support services in which it provides the patient with content and tools to help them with self-management and psycho-social challenges throughout a disease journey and treatment spectrum. Vertic develops digitally-powered patient support programs across disease areas that leverage the best of digital opportunities with a detailed understanding of patient needs. By addressing patient needs first, this support program helps patients successfully manage their disease. By digitalizing the program, Vertic reach patient everywhere and anytime; and can track the program's effectiveness in terms of impacting patient Quality of Life; and we can scale internationally.

Healthcare Professional Communication

Vertic provide solutions that align the digital driven relationships between the healthcare professionals (HCP) and the companies to ensure that both the needs of the companies and the healthcare providers are met. By doing so, a consistent flow of relevant interactions drives stronger relationships and creates a positive perception by the buying partner, i.e., the HCP or hospital administration. This, in turn, drives sales. As an example, 3Shape A/S together with Vertic developed an online education platform alongside APPs for iPhone, iPad and Android platforms. Feedback was overwhelming with a top 3 spot on iTunes. Customer perception and sales improved significantly.

E-detailing

One more value proposed by Vertic is e-detailing. E-detailing refers to a creative presentation tool created for sales representatives in the healthcare industry. It constitutes features designed to achieve a variety of business objectives. Some simply digitalize existing details and integrates them with major closed loop marketing and CMS systems (including Veeva, Agnito, CQ5 and Proscapa). Other features activate the unique potential of tablets to make the sales meeting a collaborative, mutually educational experience. By customizing the E-detailing enables businesses to work more efficiently and effectively, whether it's cost cutting, improving a sales meeting or ensuring that relevant data points are collected from each sales meeting to optimize learning.

Patient Communication

Lastly, Vertic propose value by enhancing patient communication. This is done through patient relationship by building a digital ecosystem of interlinked digital assets that provides patients with the knowledge they seek while optimizing the digital presence within a given disease or treatment area. By maximizing the visibility of a select message across interlinked digital assets, a company maximizes its presence in all digital touch points, including search engines and social media, and in turn, maximizes the influence of its content.

Monetization

In this section we will consider the costs, revenue streams and payment methods that the company uses. Regarding the costs that Vertic encounters, are covered by the sales. The company has no big investors on the back, therefore they need to balance the revenue with the costs. This is also the reason why they consider good project managers so as to ensure projects are delivered on time and on budget. When it comes to revenue streams, the company obtains its revenue through the value it proposes to different clients as already explained above. The payment method applied by Vertic is through upfront contracts. As mentioned by Mikkel Arnoldi " *we scope a project with a client, and say I need that I have some concept but you also need to produce some concept, maybe produce two videos and an interview with a doctor, and we want to have these in an app, and the app should have six different screens and some functionalities like send an email and calendar etc. So, we basically scope and specify the project together and then we have fix price. Thereafter, we start the project and there are some payment terms, which means that they must pay the first 50% after 30 days and the other 50% when the project is done*".

Channels

Vertic similarly to its clients, uses channels such as apps, websites, Google , advertising and print leaf that can be left behind with a doctor. Also through promotion that can be done in patient organizations, social media and any kind of channel that are important in reaching customers.

Challenge

Some of the challenges that are generally experienced in healthcare industry are those like adopting to the changes in new technology (digital world) by companies. As explained by

Mikkel Arnoldi, more and more traditional methods of doing things are disappearing and people are becoming more attached to the digital technology. Thus, for companies to survive they need to adjust their business model to cope with the changes.

All in all, Vertic does what is called strategic creativity. The concept is not just about creating ideas but also about understanding the customers' needs and wants. And through understanding the needs and wants of the customer it can be measured through digital. This is due to the presence of information on what customers think, what they need and want and what they are searching for etc. Therefore, all these insights can be referred to as outside in. That is, listening to the customers and then use it in the company to make an impact instead of inside out, where the company pushes its ideas to the customers. This is also associated with a future trend that Vertic refers to as entangled marketing. It is a new marketing concept which is about becoming one with the customers. The core principles of entangled marketing are that the company is trying to build a relationship that is so strong with its clients. And is based on the value provided to the clients more than just providing products to them. And through that relationship you build a mutual trust relationship and a bond which gives you a loyalty that otherwise you are not able to do. Hence, Vertic is also on track to applying this concept as the concept has been explained more in the book of the Co-founder Stan.

4.2. The summary of analysis

The overview of analysis are presented below (Fig. 23) To discuss each case the key characteristics were selected from the interview in regards to the interviewees expressed views.

Companies	Motives	Customer Identification	Customer Engagement	Monetization	Network /linkages	Challenges
Monsenso	Stakeholders History/Path Dependency Managerial Experience and decisions	1) Doctors 2) Patients 3) Relatives 4) Researchers	1) Overview of patient data and feedback to the patient. 2) Self- assessment, monitoring, feedback from doctor. 3) Support family member 4) Data for research	Funds Healthcare institutions Licensing per patient (15€ per month paid by health provider) +Consultancy hours	Sales partners Storage partners	Customized product Regulations
FirstAED	Information Technology Managerial Experience	1) Dispatch centers and emergency organizations 2) First responders (users)	1) Real-time respond, AED on Time, organizing first responders. 2) Respond on Time and Save a Life.	Shareholders' investment Annual licence payment	Sales Partners Networkin g with clients	Non- professional responders Network
TeleSkin	Technology Users centric Stakeholders History/Path Dependency Managerial Decision	1) Individual Users (women) 2) Healthcare providers	1) Prevention, self-assessment, doctor's consultation. 2) Time and cost saving.	1) Free app/+doctor consultation fee 2) Fixed system fee per month, +consultations fee. Investments Funds	Networkin g Strategic partners PR activities	Management Regulations Customers
Vertic	Industrial & Institutional forces Technology	Pharmaceutical companies	Healthcare application Digital IQ, digital strategy, event activation Patient support services Healthcare professional communication E-detailing Patient communication	Sales Upfront contracts	Apps Websites Google Advertising and print leaf	Adopting to digital change

Figure 23 The summary of analysis created by authors

4.3. Findings

All cases analyzed represented the complexity of business model, especially because of multi-sidedness. As it was already discussed by Rumble and Mangematin (2015) the serving of two customer groups require distinctive value propositions and customer engagement, which includes tailored engagement that require more inputs and interaction with the customer. The three cases discussed showed how differently companies adopt the multi-sided business model in practice, mainly to its complexity. When considering the first case, Monsenso, we can observe the complexity as a result of the interrelatedness of the key components of their business model. As previously highlighted in the analysis, we can confirm that Monsenso is linked with several customer groups as firstly presented in a double loop (doctors and patients) relationship, but also currently with the development of an application with a third user (caregiver). This illustrates that such business model integration can be complex by ensuring that the information is collected, analyzed and communicated efficiently.

On the other hand, the second case study FirstAED focus on regional managing dispatch centres, despite the presence of the other users that are involved within their system. This is due to the fact that, FirstAED first acknowledge the presence of other users of the system like the first responders and non professional responders. Yet, the company would like to support for example the volunteers, but it is aiming not to concentrate much on that but focus on the technological issues and upgrading. In contrary, the third case Teleskin promoted the application first to the individuals and just after gaining the solid proof of usage they try to address to doctors with proposals. This choice is in line with Muzellec (2015) findings that new internet ventures tend to focus on end users, and just later on after investors interruption, firms refocus on business customers, who can pay. Therefore, all these companies have the same aim to serve two or more customers groups, nonetheless, the complexity appears in all cases.

The complexity is even more visible due to the specific context of the healthcare. Various regulations and procedures before launching the product are a norm in this sector. Therefore, all the firms had to overcome piloting phase. Entering the commercialization after pilot phase is not smooth, if companies do not have a strong managerial agility. For instance, Monsenso hired a CEO, who encompass both technical and business skills, FirstAED assigned a business developer, while TeleSkin struggled with business development as the CEO comes from a

technological background, even though they hired a Chief Commercial Officer for the purpose of solving this issue. The findings reflect that the mobile application development is not only a technological task, but the business orientation is a mandatory to proceed from value proposition to value capture. Also as discussed in the case of Vertic, the knowledge of the industry is important before starting doing business in healthcare sector. This is mainly due to the specificity associate with the industry such as regulations on how to serve the customers.

In alignment with the view of Frankenberger et al. (2014) the mHealth applications operation represent the industrial convergence of telecommunications, information systems and healthcare industries. We recognize the importance of value creation and proposition through a combination of knowledge from different sectors this corresponds to Hurley (2012) who explained that entrepreneurial success is linked to the proximity of previous business model experience to the current business model knowledge, despite the industrial knowledge differences. As to our case, the three companies are facilitated with distinctive backgrounds such as those from health sector and information systems. This can also be, as a result complex business model. In addition to that, the case of Vertic highlighted that, the digital information is becoming significant in the industry. As a digital marketing firm, it contributes to the sector by using and learning on both products, services important to professionals and patients.

Furthermore, the common finding of the three cases is that the core persons of the firm are the specialists in the product area, it being mental illness, first aid or melanoma. Their knowledge is important to engage customers to the product. We can verify this from the already discussed motives of each company in analysis, as they show that all the key founders and co-founders of these companies had a specific knowledge either in healthcare provision and /or in technology.

Another finding emerging from the cases is the user-centric approach. Even though, not all companies focus primarily on the end-users, they approve the necessity to understand the needs of the people and provide them a full set of solution. In the case of Teleskin, they are still in a process of connecting local doctors to their platform in Denmark, without that they cannot fulfil the aim to involve individuals to the system, which would create a most valuable offer for the users. As Vertic explained, companies have to consider the needs of specific users and ensure that they provide them fully.

In contrary to the traditional multi-sided model, for example as exemplified in the literature of (Rumble and Mangematin, 2015; Baden-Fuller and Mangematin, 2013; Casadesus-Masanell and Zhu, 2011; Sun, 2006) whereby the authors have focused on the multi-sided models of advertising companies, credit cards and searching engines. The business models of Monsenso and FirstAED present that, not necessarily the two sides of the business model must affiliate with each other through indirect network effect on each other, but one user (doctor) has direct contact with the patient and the opposite. Also in Monsenso case we discovered that the patient can have direct contact with the doctor and the relative. In this sense, the circumstance of the implementation aligns with the current finding of (Hagiu and Wright, 2015) whereby, they consider that the two users can already have a direct interaction prior using the platform.

Chapter 5: Conclusion

The purpose of this project is to research on how multi-sided business models are implemented in healthcare sector in Denmark using the cases of mobile health application (mHealth). The core aspiration in making this investigation was to answer the problems expressed using question words like how and what. While relying on these expressions we were able to look into the motives of multi-sided business model adoption, the key components of the configuration and their influence in the implementation as well as the challenges encountered in the process of implementing these models.

To tackle the abovementioned problems, we adopted multiple case study approach in which we focused on three main cases. These are companies that embody the characteristics of multi-sided platforms in the context of mobile health. The data collection from the cases were done through semi structured interviews with the top management of the companies. After data collection, we transcribed the audio records which were used for analysis. With a combination of both primary and secondary data and with the theoretical reflection, our evidence base was built for understating and explaining the operationalization of multi-sided business models in these companies.

The logic behind this investigation is facilitated by the insufficient research on implementation of multi-sided business models in healthcare sector. This is in companion with the literature (Carsten et al., 2015) whereby a need for further exploration of business model in healthcare. In addition to that, there is also a need to address practical use of digital technologies in order to understand how and why such models are adopted (Jensen et al., 2009)

The literature contributed to our understanding of theories that are used in this project. With regards, to the theories adopted, we used business model concepts from Osterwalder and Pigneur (2010), Baden-Fuller and Mangematin (2013) and Rumble and Mangematin (2015). These enhanced our understanding on the both traditional and multi-sided elements of business model. The empirical finding gave us more insights on the implementation of multi-sided business model especially with the inputs from recent researchers.

Afterwards, in the analysis chapter we interpreted the collected data by looking into the three key points of the research starting with the motives, business model implementation and lastly

the challenges. The aforementioned theoretical body, supported our analysis as for motives and challenges we considered other scholars inputs, while for multi-sided business model understanding and explanation the Baden-Fuller and Mangematin (2013) four elements configuration was adopted. In each case analysis the internal and external motives were identified, such as history/path dependency, managerial experience, stakeholders involvement and technology. The four elements of configuration included the key aspects relevant to every case, such as target groups, the approach to multi-sidedness, the customized or standardized product, pricing, government modes and partnerships and further on. Finally, we ended each case analysis with the identified challenges, e.g. human resources, regulations, network and customers.

Based on the individual analysis of the cases, we developed a discussion on commonalities and contradictory issues that emerges with application of such models. On common issues, we found out that all firms at different stages of implementation deals with complexity in applying their configurations. Moreover, the cases present similar driver such as company's history, managerial experience and decision making, stakeholders involvement, as well as the industrial, institutional and technological factors.

Our other finding shows the differences between the existing multi-sided models to those applied in mHealth. We found that the mHealth apps built already a direct network with the customers and did not rely on indirect network effect as it was explained in the previous works of scholars.

Despite the findings that we came up with, we acknowledge the limitations that are associated with this project. We therefore would like to encourage future investigation in similar area of interest to consider the broader perspective on the issue. Due to time limitation and other infrastructural issues, we did not manage to obtain variety of understanding on the implementation of the cases from their customers, authorities and partners.

All in all, we believe that this research has drawn more insights in business models commercialization specifically multi-sided business models with the use of digital technology. Thus, we encourage future research to consider this area of investigation as it is currently the centre of attention but also an interesting area of investigation for the future trends.

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Appendices

Appendix 1

1 A. Themes and Codes

Monsenso Case

Themes	Sub- themes	Codes	Configuration Category
Key Activities	Processes, distribution channels,	<ul style="list-style-type: none"> ● Piloting ● Researching ● Data analysis and storage ● Managing Privacy ● Follow-up on patients through doctors and relative ● Control information from both sides of the platform (doctors and patients) ● Sales of the product ● Training and Consulting 	Customer Identification
Key Partners	Who are they, key suppliers, key resources from partners, their activities	<ul style="list-style-type: none"> ● Value added by the partners ● Type of collaboration 	Customer Identification
Key Resources	Human capital, Financial, Intellectual and Organizational	<ul style="list-style-type: none"> ● Human capital- 8 developers, project managers 	Customer Identification and Network/linkage
Value Proposition	Service/Product, Customer needs satisfaction, Customer segment,	<ul style="list-style-type: none"> ● Specialized in mental illness through application ● Customized product 	Customer Identification and Tailored Customer Engagement
Customer	Important customer segment, who receive the value created	<ul style="list-style-type: none"> ● Doctors, Hospitals, patients and relatives 	Customer Identification

Customer Relationship	Type of relationship with the customer, customer integration, how costly are they	<ul style="list-style-type: none"> • Direct relationship with healthcare providers • Integrating with researchers for new application features development • Follow up on users activities on the app 	Tailored customer engagement
Channel	Selling method, best way to reach the customers,	<ul style="list-style-type: none"> • Selling through agents, partnership • Per transaction pay • Repeated contract • Licensing 	Monetization
Revenue Streams	Profit	<ul style="list-style-type: none"> • No profit • Still investing 	Monetization
Cost Structure	Costs encountered	<ul style="list-style-type: none"> • Developing of the app • Operational costs; employee's salary, equipments, external partner for data storage 	Monetization

1 B. Monsenso Interview

Interviewer: Lulu Pownall and Justina Sakinskaite

Interviewee: Jennifer Highland who is the Marketing and Communication Manager

Interview Setting: Interview was conducted via Skype in Aalborg, Denmark.

Date of interview: 13th May 2015

Audio Length:00:38:00

Question: What has influenced Monsenso to create the mental healthcare app?

Answer: The way the company started it was a research project that was funded by the EU commission. So it was 13 different countries and companies working together to develop a Smartphone based system for patients with bipolar disorder. So it was based on the MONARCA research project. After three years of research, from 2009 to 2012, the system was developed and then they would take it to the doctors and to the patients to get feedback on how the system works and try to make changes, and try again to improve it. So, they were doing it like this for three years.

Question: Was this piloting phase done here in Denmark?

Answer: Well it was done here in big hospitals in collaboration with Italy and Spain and just a lot of different countries and researchers and companies. So, that is how the system started. And after the project has been going on for a while, there were some patients and doctors that were already using the system. So, the research project was finished and they would like to keep the system because it was

useful . Then, the two main researches from the project decided to found the company and support people that were already using the system.

Question: What value proposition do you offer?

Answer: Yes, we decided to stay only in the bipolar mental illness, even though people would say it can be used for diabetes or heart disease or used for cancer. But if you go very wide you cannot specialise in one area. And there are already many applications that are used for diabetes and for cancer etc. It is because they are somatic illnesses. And somatic illness means that they are physical. You can actually track your blood sugar . You can actually check it. Mental illnesses are very complicated. Because, even though 10 people have bipolar, there are all going to have different symptoms and all will have different treatment. So, that is one of the reasons mHealth technology has not been developed for mental illnesses before. Right now we are working with different projects and it is for patients with bipolar disorder, schizophrenia, major depressive disorder, borderline personality disorder and anxiety, amongst others.

Question: Do you customize your offer for each client or is it standard?

Answer: It is customized, because for example one of the things is that there are symptoms that not all the illnesses have. For example if you have a schizophrenia, you will have hallucinations, but not all mental illnesses have this. Then for example if you have a borderline you will have self cut, or pinch themselves, whereby other people with mental illnesses do not do this. So that is, the parameters that are analysed by the Smartphone are individual depending on what one suffers from.

Question: Do you work directly with healthcare providers and patients or do you work in collaboration with care providers and they have information to the patients. How do you work?

Answer: We work directly with healthcare providers. What we do is we sell the solution to the healthcare providers which is for example the healthcare Danish regions, and NHS Trust or NHC in Ireland. So we sell to the hospitals and healthcare regions and then they use it for the patients. But we have nothing to do with the patients. But we collect the data and manage the data but we do not do with their patients directly.

Question: How is the relationship between you and the researchers, who are also mentioned as users of your app?

Answer: We have two kind of solutions. One is for clinical setting which is real doctors working with real patients. So this is the product that has the CE market through monitoring. For example in the research space we have features that we do not sale for clinical purposes. E.g. we are developing a feature on Smartphone that does analysis of speech patterns. In case of patient with bipolar disorder when they are manic. They will speak real high and loud and fast and when they are depressed they will speak slowly, with less energy. So, the machine has an algorithm that is analyzing the speech. But you cannot do this in a clinical setting , for example in a clinical setting you will say this patient is presenting a manic situation so the hospital is responsible for the healthcare. So then you get into an issue of liability. This is only for research purpose and nobody is responsible. It only to help and see what happens.

It is very important. One of the problem that we have with the solution is that the Smartphone patients can do like the Smartphone self assessment. This assessment will do things like , how many hours did you sleep, did you take an alcoholic beverages, how is your anxiety level, how is your stress level, have you taken your medication etc. And based on this questions, also the Smartphone can detect if a patient is presenting triggers or any worrying signs. For example, if it says I have not taken my medication in 3 days, I have only been sleeping for 6 hours in 2 days, and I have been drinking alcohol in 3 days. That means I am going in a manic episode. So, the Smartphone is alerting the patient and also the doctor. For example in the US where they sue everybody for everything . The doctors are afraid of

having this feature because if the doctor is not available and the patient is going on a manic episode and he see it but is I holidays, will think if they sue him. Obviously, in Europe is not the case.

Question: How do you manage the privacy of the patients? As it is possible to see their text, mobility, and who they talk with.

Answer: No it is not that you can see who they talk with, because for privacy issue we cannot. For example using the GPS, we will be able to see if the patient has moved or not. I cannot see if you went to visit their mother or went in a supermarket. I can only see that he left the house. So, I just you have been for example in different points of the city, I do not know which ones but just you have been in the city. So, for example in a case with depression patient a patient is going to stay in a house for three days and not move but if they move out it is a good sign, but with a case of a maniac patient will be moving around most times. and that can be like a warning sign. And also we can see you have made for example five phone calls, in very few minutes but we can see with who you are speaking or what you are speaking. Or you can say you have been on face book for 5 hours, and this is not good because face book can really depress people.

Question: Are you the ones responsible for data storage or do you have external partners who do that?

Answer: Yes, we have an external company that stores our data. And they comply with all the security and encryption and etc. Solutions part of the website also explain in details about this.

Question: What are the main important key activities for your company? Is it developing the algorithm or communicating with healthcare providers etc?

Answer: Well, we do sales for example of standard solutions to the doctor. And for hospitals they would like a customized thing. So, for example some of the Danish public healthcare they wanted to send clinic questionnaire because on top of the self-assessment that the patients do every day, they also wanted to like a 50 questions that the patients have to fill once a month. So now we have incorporated the clinical questionnaire to the standard part. And then for example we signed a contract with Lundbeck and the solution for Lundbeck the way it works, is that the patient download the Smartphone app and then they invite the doctor and a relative to monitor their activities. One of the most difficult thing about the mental illness is if you have the illness you will need a family or relative taking care of the patient. In most cases this will be a woman around 60 and like 80% of the caregiver is the mother and the sister. For example if one has a mental illness and the mother is taking care of the patient, and then you go into a psychotic break, the mother do not know what to do because she is not a psychiatrist. So, like this situation we have developed a new Smartphone app also for the relatives that they can say whether the patient is giving the correct information on the assessment or not. This can help the patient to stay on track and prevent them from risk behave. So now we also have the triple loop, which is going to be the healthcare provider, the patient and the relative.

Question: Just to add on what you have said how do you engage your customers? Do you call them or just send an email?

Answer: The system works as encrypted sms. So, for example if a patient is presenting like really manic symptoms and say he want to kill himself. There is two options, they can send the nurses or the mother or a fixed message to the patient or they can choose to call on the phone. By being encrypted this help to keep the privacy of the person example from hackers. That's why is a confidential information by being encrypted.

Question: How do you keep these app users active?

Answer: First of all the questions that they have to answer every day , it only takes like 15 seconds. So it is really fast. It almost takes nothing as it is a yes and no parameter. If a patient does not answer the question, it will send a reminder that the patient has not answered the questions and to do it that time. We try to keep them engaged. But on the other case, it can also be a trigger and a warning sign for a person for example if they have been answering their self-assessment for 30 days, all of a sudden for the 3 or 4 days they stop . That means the psychiatrist or a nurse can call them and ask if they are ok and try to know what it is going on with the patient.

Question: Are you involved in the process of contacting the patient?

Answer: No, no. We just provide the information and data. The relationship is between the healthcare provider and the patient. We do not talk to the patient at any time except when we were developing the system.

Question: What are the important resource for your company?

Answer: In six years ago we were six. And now we are 20. We have a team of about 8 developers and also we have some customer project managers, chief product officer and sales and marketing team.

Question: How about the financing of your company? Do you still rely on funds or you operate independently?

Answer: We still get funds for example we have received new funds you could see on the company news market modeling funds, market development funds, and innovation foundation. We received some money for the government because the government want to help developing the Danish companies in IT Healthcare sector. What we are doing is we are trying to reduce costs for treating patients with psychiatric illnesses. We actually do receive some funding from different organizations but also we have customers. The healthcare regions in Denmark are paying us for using the system and we also have a customer in UK which is St. Andrew's Healthcare and we just close another customer but it is not announced yet, one of the NHS Trust which is the government of UK. Then we are also dealing with Lundbeck who is one of our customer.

Question: What payment methods do your customer pay through?

Answer: It is very different because it not all they want to buy the solution as it is. If you want to buy the solution as it is the price is more or less is like 15 Euros per patient per month. So we charge for example if a clinician had 50 patients and another one has 50 patients we charge the license per patient. For example in the case of Lundbeck, they wanted a lot of development and it is a lot of consultancy , so that is why we do not charge kind of a standard fee. For example if you need consultancy, if you need training, if you need how to implement the system. It depends how they want it. If they want to implement the system and need our help we charge some consultancy hours but they can also choose to do it themselves. So it is per patient license model of payment.

Question: What value do your partners add in your collaboration?

Answer: Well, some of them are research partners, so we are trying to develop new features for example like the speech pattern that I was talking about. In this case we are trying to do different research because one of the most expensive things for healthcare regions is the hospitalization of psychiatric patients. So, they spend an average of three weeks in the hospitals once they get hospitalized. And trying to see that once you have been hospitalized, some of the patients will keep coming back so if they are using the app, we are aiming to reduce 50% of the number of hospital admission. So, according to this research we are doing these are the patient who have been discharged from the hospital and 50 percent less will go to hospitals.

We have some other partners what we do is that, they are selling the solutions for us in different countries. So, we have a partner in Norway who represent Monsenso.

Question: What kind of partnership relationship do you have with them because we saw on your website you have silver, gold, platinum and strategic alliances?

Answer: These are partnership programmes but we have not started to implement them as we are still very new. And also we do not have many partners at the moment. It is a one year company. The CEO was hired in March 2015 and I was hired in May. So before us it was only researchers and developer and there was no commercial. So we do not have so many partners yet.

Question: So the partnership program is still into development?

Answer: Yes. It is just the idea that we have to develop in the future.

Question: Have already start earning profit because you had already customized your solution from the previous project, right?

Answer: No, we do not have profit yet. It is expensive to build a company, you know all the expenses like salaries and we attend a lots of events in Europe. So, we do not have a profit. We are actually burning a lot of money but the company is well supported, whereby we have a lot of government grants but also we have private investors.

Question: Do you have other ways to sell your product rather than licensing and using your partners in their countries?

Answer: We have three sales managers, who are selling the solution to direct customers. And also a partner manager who tries to get partners to sell for Monsenso.

Question: What do you think generally about mHealth market readiness? Do you think the patients are ready to apply your solutions?

Answer: It depends in the type of the world that you talk about. The markets that we have discovered that are very ready is Scandinavia: Denmark, Norway, Sweden and maybe Finland, UK, the Netherlands, Australia and New Zealand. And they are already looking into these type of solutions.

Question: Why these markets? Is it because of technology advancement or?

Answer: It is because in these countries, people are more forward thinking, many start up, mental healthcare and this is driven by technology advancement, and basically all the Scandinavia is like that. The UK is also going strong on that. For example Germany even though is a wealthy country, people in Germany are extremely conservative.

Question: What are the advantages that you have as Monsenso from providing these solutions?

Answer: We get revenue and also personal satisfaction that we provide a solution that help people with mental illness. And in one of our research we try to do what is called mobile CBT(Cognitive Behavioral Therapy) and mobile DBT (Dialect Behavioral Therapy). One of the is used to treat depression and bipolar disorder and another is used to treat borderline personality disorder. So, it is about to try training the person to think differently on what is happening- be more positive. This is a type of the therapy that different psychiatrist are using in treating patients. So what we are trying to do is to put this kind of therapy into a Smartphone so for example in those places where they can not easily reach a psychiatrist like in Africa, then they can use the app to help them when they cannot easily get help. It is not substituting a doctor but is better than nothing.

Question: Would it be a free application ?

Answer: I think it will not be free. But affordable for people all over the world to buy using a Smartphone.

Question: What challenges do you face in providing these solution, specifically in Denmark?

Answer: The challenge that we are mainly facing is the development because customers want a lot of things to be customized and we only have a team of 8 developers. And it is not easy just to hire as development takes a lot of time and they need to be trained to adopt into the system.

Question: What about the regulations, is it not a challenge?

Answer: Oh yes, the regulations. It is . We obtain the CE mark and we are in the process of doing the ISO 23000.... certification. And we are also going to do the FDA approval for the US. All these certification requires a lot of our time. But we have to do them if we want to grow internationally.

Question: Is your app providing self assessment but not diagnosis?

Answer: Yes, right now is only self assessment. But the app I told you , mobile CBT and mobile BBT which is going to take place around 2017/2018, as we still have a lot of developing to do. Then we will go into diagnosis. But at the moment we do not do diagnosis, only monitoring and treatment and some basic action plan on how to advise on circumstances.

Question: Do you have advertisement in the app?

Answer: No, we will not do that.

Thank you!

Appendix 2

2 A. Themes and Codes

FirstAED Case

Themes	Sub- themes	Codes	Configuration Elements
Key Activities	Processes, data storage, technology development, networking	<ul style="list-style-type: none"> • Piloting • Researching • Data analysis and storage depending on the wants of the dispatch centres • Managing Privacy • Control information from both sides of the platform (dispatch centre and first responder) • Sales of the product 	Customer Identification
Key Partners	Who are they, key suppliers, key resources from partners, their activities	<ul style="list-style-type: none"> • Sales agents in Finland • Programmers 	Network and Linkages
Key Resources	Human capital, Financial, Intellectual and Organisational	<ul style="list-style-type: none"> • Human capital- 4 shareholders, programmers, 2 employees, • Copy rights 	Customer Identification and Network/linkage
Value Proposition	Service/Product, Customer needs satisfaction, Customer segment,	<ul style="list-style-type: none"> • Support Medical/Emergency services in any country • AED efficiency for cardio arrest • Customised product 	Customer Identification and Tailored Customer Engagement
Customer	Important customer segment, who receive the value created	<ul style="list-style-type: none"> • Denmark regions, dispatch centres, universities, emergency centres e.g. south east ambulance and north region of Denmark 	Customer Identification
Customer Relationship	Type of relationship with the customer, customer integration, how costly are they	<ul style="list-style-type: none"> • Direct relationship with dispatch centres or emergency organization • Create team work for volunteers to support response • Follow up on users activities on the app 	Tailored customer engagement
Channel	Selling method, best way to reach the customers,	<ul style="list-style-type: none"> • Agents/sales partners 	Monetization

Revenue Steams	Profit	<ul style="list-style-type: none"> • Start-up fee • Annual license 	Monetization
Cost Structure	Costs encountered	<ul style="list-style-type: none"> • technology development (60%) • Sales (40%) 	Monetization

2 B. FirstAED Interview

Interviewer: Lulu Pownall and Justina Sakinskaite

Interviewee: Per Schorling, business development

Interview Setting: Interview was conducted via Skype in Aalborg, Denmark.

Date of interview: 12th May 2015

Audio Length:00:29:38

Question: Briefly, we would like to hear from you as a person working in FirstAED, mainly what the company does. We saw in the website that you help people, but maybe you could tell us more how do you organize things for people to get this service.

Answer: Ok, there are many ways of organizing this subject and there are different system's models available from different companies, like ourselves. There are public founded companies, ..., was getting funding from the government to developing an app such as ours. They are our competitors, who got fund to development of the system similar to ours. Some of them organize first responders in groups and our business model is to be technology provider. So we base on how to handle, communicate service with responders, advise service for cardio AED providers, but we do not organize them. We support medical/emergency services in any country just doing that. So I do not know how much it is related to the market here.

Question: We were just looking at your website and see how your system works, you say that you have group of responders, and then you have a dispatch centre, and then you have location through the GPS which enables getting in contact with a patient. But we would also like to know in what markets you sell, is it only in Denmark?

Answer: No we are born global from the beginning, because you know Denmark is too small market. We have different kind of set ups in Europe. For example, in Denmark we have five regions, which are responsible for diverse medical services and they have the groups of the first responders, so this is in Denmark. In UK, for example, you have ambulance services, who are our potential customers. In UK, they are ok far ahead in organizing first responders. In rural areas not so much as in urban space. But in the rural areas there they have long ambulance responding time.

Question: But when you speak of your potential customers, can you clarify, for example?

Answer: Yes, it could be the region of Northern Denmark, for example. It could be South East ambulance service.

Question: So the customer is a dispatch centre and the users of app are volunteers?

Answer: Correct.

Question: Do all the regions have the same capacity of volunteers associations?

Answer: No, no, that is why in our system you can have different categories. So you have, for example, a helping tool, where we have a big project, where they organize responders first based on recruiting platform of the hospital staff, emergency rescues and train their responders from their central. So that is one type of doing it, but we do not do that work, usually it is a dispatch centre.

Question: So you came up with the app for the dispatch centre. Do you talk with them about responders, or they have to be ready?

Answer: A lot, because they do not know it, they do not know how to handle it. And there we have many serious problems, operations. But we do not handle the infrastructure of emergency medical service. And that is, because we think that emergency first responders have stronger relationship to the local dispatch centre than they have to FirstAED. Because, then we have to build all the awareness about FirstAED, to make it happen. But they know already the ambulance service, or they know the region of Northern Denmark or they know the chairman of first responders. So it is easier to recruit first responders with a no brand name than with a new brand name. But we have a large recruitment of professional staff, so it does not matter in making them of duty, they will act as volunteers, and normally they do that. It does not have to be people like you, who do not know anything about being paramedic. But you have taken a driving license and then you have a first aid course, then you can do that. So, but it is relatively hard group to manage. It is much easier to manage people, who are already professionals. That is why we have two levels. We have the professionals and the we have by standard which are normally like you. But both are important when you want to save the life of the AED.

Question: What kind of challenges do you experience with non professional ones and that they would be able to help someone?

Answer: The point is that for cardio arrest you have 5 minutes and five minutes pass really fast. So we do not care who brings the AED, it might be as well somebody like you, who walks or bikes, but just comes with the AED. But maybe you do not have some much experience in heart massage, or mouth to mouth breathing, but it happens in the families in a normal life. And that sort of the group structure we are discussing with the ambulance service and dispatch centre., how do they want to do that. But they all want to do differently. Some want to call 3 persons, some want to call 4, some 5, and that is why our solutions is very flexible on whatever you want to do.

Question: Do you have a customized offer?

Answer: We have a system, which is flexible and can be adapted. That means, if today you say, that you want dispatch to call 3 responders then in a year from now found out that you need 4 or 2 the we change the settings and that is the big advantage because as it is a very novel technology. There are mainly globally 10 systems in fact there are only 3 serious ones as ours the rest are not serious.. It is more like simple app for client's service system, which is quite technical but client service system means that you lock a lot of data and you manage everything in the server, and show patient data, and first responders confidentiality, so that you have everything sorted out.

Question: Where do you store the data? Are you the one to own the server?

Answer: No, it depends on what dispatch centre wants. Some store it at a dispatch server, virtualised one or some store it at a hospital server. But in any case it is very fine server with protection, so that you do not risk the address of cardio arrest, for example, or you do not risk the location of first responders. That it would not get public. We do not want to do that.

Question: Is it because you are restricted by some legal requirements?

Answer: Yes, there are very strict privacy rules regarding patients.

Question: Also are you are operating in medical or in healthcare? Do you have to comply with certain rules in each country you operate?

Answer: Yes, and even the server it is not on a country base, it is on a space base.

Question: what other kinds of regulations do you have to comply with?

Answer: The special rules, that is not so much us, that is more for the dispatch centre, whether first responders should find dispatch centre or whether they should target it as a charity agreement, they need to have all the certification, when they go to location, things like this. But these things we include in the terms, so that the responder fills the form, and agree that he read the terms regarding being first responder and accept them.

Question: Are you the one who prepare the terms? or dispatch centre do that?

Answer: Well, it is mainly a dispatch centre, but it is a combination. We normally do not want to get into this, because it is really the work of the dispatch centre, we think. We are technology provider. Some of our competitors want to handle first responders also, but we do not do that.

Question: Do you have connection with volunteers?

Answer: We do a lot of that, we do that in some areas. But it is not our key concern. Our key concern is to work on technology, that to be the best technology. If you run ambulance, and first responders, etc. you cannot be the best technology provider.

Question: So technology is the main resource you rely on, of course the human capital the people who have to develop this technology, but for example, to be able to have the technology and being able to be innovative and operative, how do you get the finance for this kind of work?

Answer: The budget? We cover ourselves.

Question: Does it mean you have shareholders in the company?

Answer: Yes, we have 4 shares, so we invested a lot. Then we have applied for entrepreneurial fund in Denmark, so the project we had was supported by market development budget. Then we researched and showed that project works. In healthcare it is a matter of testing and being patient, if it can really help.

Question: If it is a matter of being patient, what makes you flow to reach where you want to reach?

Answer: Authorities, it does not change anything, unless it is super and has a proof. There are many good ideas, but it is waste of money, if you cannot make it scientifically proven, that is why it is a good thing. It requires a lot of research to document all the work.

Question: You tested your product in Langeland island, so it is approved that it is working?

Answer: Yes, if you go to the website lhf-hjerte.dk, then you can see our research on that. Because as the company we do not publish research, the client can publish a research using our technology.

Question: So in Langeland you had the development phase of your product and now you are trying to expand to other markets? So what are the key activities right now in your business? Is it technology development or marketing?

Answer: Yes, market development, both actually. When we go out and make market development, we talk with very ambitious people and each of them have their own ideas, so they ask can your technology do this or this? And then we say, well not at the moment, but we are working on that, in this way we develop the technology with the customers. So we have new things coming up, which are not at the homepage actually, it does not show so much.

Question: How many people are working right now in the company?

Answer: We have 4 partners who are working, and it is part time job we have, since we all work besides that and then we have 2 employees.

Question: Do you have other external partners?

Answer: We have programmers we work with, we tell them what to develop, and we implement on daily basis. We have maybe 8 or 9 people working for us.

Question: Are they freelancers, or are you hiring the company?

Answer: No, we work with the company, but we may hire freelancers for marketing, we are looking for. But if you want to employ it takes resources, it is tough, you have to have a budget first, you need to have orders. So when we will have 10 orders, we can start hiring.

Question: So right now you rely a little bit on your partner, who is developing the technology?

Answer: We do not actually, because we know and understand how they develop the technology, we have a code, and we own the technology. So they have no right to our technology, or to go to competing industries.

Question: Do you have a patent?

Answer: You cannot have a patent for a software.

Question: About the order you just said, who are the one buying this, is it a dispatch centre?

Answer: Yes, but it can be university doing research on cardio arrest and so on. It is very complex system we have.

Question: When they start working with you, how do they pay? Do they pay per month or how?

Answer: They pay start up fee and then the pay and annual license.

Question: Do you have a license? and about the patent, if you cannot have a patent, how do you protect your idea, that no one will copy paste it?

Answer: They are not allowed to do that. If they would, then we would sue them. And we do not have patents, but we still have copyrights. And copyrights are actually more effective than the patents.

Question: How do you reach your customers? Do you call them, or do you meet them in the exhibitions?

Answer: We meet them in the conferences, we call them, and send emails.

Question: How do you keep day to day relationship, meeting about the inputs, how to develop, how do you do?

Answer: We meet at the conferences. And we talk with the selected most important customers, and show that we develop the product not because that they said it is a good idea, but because it is a good idea.

Question: Based on what you said, is it the technology where you have to spend a lot of costs or what other kind of costs do you have?

Answer: Actually we have 50/50 costs, or maybe 60% technology and 40% sales. We think to keep the same, because we are technology business, and we want to stay technology business.

Question: You started your sales activities in Germany and Finland, how do you operate, is it from Danish office?

Answer: Yes, in Germany we operate from the Danish office. In Finland we have agent, who make project happens, and we will do the same in other countries.

Question: Do they sell other similar products in the market?

Answer: Yes, they are quite well networked for this product area. The hard thing is to build network and that is what we try hard.

Question: Apart from that, what challenges do you face, apart from regulations?

Answer: It is not regulations, it is just takes time. Authorities do not make a difference from one day to another. For the project in Odense it took 1.5-2 years, and that is a long time, so they had to be patient.

Question: Are you going to fit into what you have now?

Answer: It depends, we do not know. It depends on market possibilities, if we can make some market investments or some technology advancements, on changes in the industry or competitors, so we do not know.

Question: What about the feedback from volunteers? are they happy about using the app?

Answer: Yes, I can send you the presentation about it.

Appendix 3

3A Themes and Codes

TeleSkin

Themes	Sub- themes	Codes	Configuration elements
Key Activities	Processes, data storage, technology development, networking	Algorithms development Testing Piloting Public relations Networking Protocols	Network/linkages Customer identification Tailored engagement
Key Partners	Who are they, key suppliers, key resources from partners, their activities	Investors Kræftsbekæmpelse, Sundhedsstyrelsen University	Network/linkages
Key Resources	Human capital, Financial, Intellectual and Organisational	Human capital CE mark	Tailored engagement
Value Proposition	Service/Product, Customer needs satisfaction, Customer segment,	Self-assessment Prevention Feedback from doctor Connection to the personal data Time and cost saving* Medical record Observation Prevention	Tailored engagement
Customer	Important customer segment, who receive the value created	App users Women 35-60 years Doctors*	Customer identification
Customer Relationship	Type of relationship with the customer, customer integration, how costly are they	Dialogue with doctors Facebook for users, blog	Network/linkages

Channel	Selling method, best way to reach the customers,	Facebook Conferences Doors-to-doors	Network/linkages
Revenue Steams	Profit	No profit Investment Funds Competition prizes Free app, doctor consultation for extra fee Healthcare providers: customized fee.	Monetization
Cost Structure	Costs encountered	Servers Data storage CE mark Human capital Minimizing costs	Monetization

3B TeleSkin Transcript

Interviewer: Lulu Pownall and Justina Sakinskaite

Interviewee: Zeljko Ratkaj, CEO

Interview Setting: Interview was conducted at the office of TeleSkin in Esbjerg, Denmark.

Date of interview: 9th May 2015

Audio Length:01:21:59

Question: Tell us briefly about your company, how it all started.

Answer: I was a university researcher assistant at faculty of mechanical engineering for 10 years and department of mechanical engineering biomedical mechanical engineering. My study was related with artificial network using that technique to work with students.

Question: From a technological background , how is it now you are a CEO?

Answer: Yes, and hopefully I will not be that much long. I am on CEO position because of presumably needs basis. I constantly telling my boss - I am a technical man and we need a business guy for it. I can do this, but if I really want to do this in my life, I would probably finish some business courses at faculty. I am really technical, and into everything related to research. So that is why I am both CEO and CTO. But hopefully I will be only CTO later.

Question: You have five people in the office. Who are they?

Answer: So, we have me and Saatia who is a image processing guy, responsible for the algorithms; Jette who is a marketing manager; we have Shetza who is a designer; then the fifth person that we are going to hire (we already signed the contract with him) CCO (chief commercial officer). So he will take this part from by back a little bit. Because now we have two projects going, it is impossible, and my day is 24 zero.

Question: Are you expanding, employing more people and are you employing more people in the future?

Answer: Yes, but it depends on money that are available, on the investments. But we need, I think I projected around 11 to 15 for the next 2 years.

Question: Would they mainly be from a technical background?

Answer: No, mixed. I think more in marketing/business side than technical. We would like to have lets say 2 more developers to develop algorithms and maintain the service.

Question: Do you develop algorithms here in Denmark or in Serbia?

Answer: Here.

Question: Is this company separated from the company in Serbia?

Answer: Yes. Originally we came from Serbia, company TeleSkin is founded in Serbia. It is actually the idea of one of our founders dr. Jadran Bandic. He has many years experience in dermoscopy, working with dermoscopy since 1995. He is actually the first person who started working with dermoscopy in his private clinic. He is one of the board members of international dermoscopy society. Specializing in plastic surgery, that is his main job, but he also do dermoscopy for 15 to 19 years already. So the idea with the app came when I started working with him back in 2004. I met with dr. Bandic at the conference and he approached me, if I would like to work with him on some issues about analysis of moles. I said sure, why not. He wanted actually to explore fractal behavior of the moles. Are you familiar with what fractal means, mathematically? Fractal is something repeating, snowflake is a perfect example of fractal behavior, some patterns which are repeating, some larger patterns. He wanted to explore that on moles. We started working on that and we never finished, because we started working on something else. And that one was one of my wishes to get back there. But 12 years already passed. So the original idea with the app was actually for his patients. Because we had developed a dermoscopy system in Serbia for the doctors with medical records, curriculum, about the patient. And he wanted some solution for his patients, that they don't need to come to the clinic every time. So they come for the first consultation, and if there is no need to remove, he wanted actually some tool to give to them, so that they could take images by himself, let's say in two months, and these images there automatically

transferred to the database, and became part of medical records of the patient. He examined the image, and said ok - there is no need for you to come now, see you in one month or in two months. So he was saving his and patient's time and everything. We started to make that link possible. That was the first idea with the app. Back in 2008-2009 that was a techno congress on international dermoscopy society, there we actually started to explore actually how fractions from dermoscopy images. Dermoscopy is actually to enlarge, a huge images, you can see lesions and fractals more clearly. We started to play with the analysis of application of adaptive resonance theory on the analysis of those kind of images and it is very interesting to see that there is something technically happening and then I started look for the images from the phone, because back in 2008-2009 the images started to be more better and better, originally the image of first mobile phone was really bad, the quality was questionable, but in 2008-2009 there were major phones, very expensive ones, which had good quality, and then later in 2010 and 2011 image quality started being better and better. So I said ok, maybe it is something interesting to play with. Can we do something with these images taken from the phone? And there is ABCDE rule, which is accepted by World Health Organization.

Question: Do you mean the images are accepted or what?

Answer: No. ABCDE law is asymmetry border diameter color evolution it is for self analysis rather, when you as a person are looking in front of the mirror for the changes in your body, you should follow ABCDE rule. Look for asymmetry in a mole, border regular or irregular, diameter - size of the mole, c means color (how many colors you see), and evolution - does it bleed or etc. Those kind of signs. So it is kind of questionnaire, that you have to reply and if it is ok, I should not go to the doctor.

Question: Is this ABCDE role after the person goes to the doctor or before?

Answer: When it comes to melanoma, it is cancer. You ought go to the doctor, so they tell you, they have knowledge. But often one part of the prevention is that you need to assess yourself. This is a major problem, people do not tend to do that. Your skin is darker, so you do not have that much problem, e.g. like her. But when you get melanoma it can be much more dangerous. When it comes to skin types - 3, 4, 5 - probability of getting melanoma is lower, but when it comes, it is actually more severe. Bob Marley died because of melanoma. So everyone can get melanoma. It is actually situation of assessment, what can we do by ourselves to minimize the risk of getting skin cancer and melanoma. So this is the area there we playing with app. We don't want to replace the doctor, we don't want to be diagnostic tool.

Question: I saw you writing in the website, that even if you provide doctor's consultation, you say it is not diagnosis, but assessment. Can you tell more about it?

Answer: Yes, it is assessment. We want people to track the changes, and act on time, and go to the doctor.

Question: Who are your customers? Are you targeting individuals here in Denmark? Or, are you targeting healthcare providers/hospitals at the same time?

Answer: It is actually two ways story. Right now we are targeting with the app individuals, which is free app, available for download by every person here in Denmark so far. I think tomorrow or day after tomorrow it will be in Norway, but right now only in Denmark. We want you to start using this app. The numbers that we have right now is actually proving that people want to use this kind of solution.

Question: On Facebook it was announced that you had 40 000 downloads in January. Please, tell a little bit more about it.

Answer: 46 000 download already in Denmark, which is actually pretty big number. If you take into account that we are available only on iphones, we are not available on androids.

Question: Iphones are popular in Denmark. Does it help?

Answer: Actually it is 50/50, but when you look on people who have iPhones are more prone to pay for the service than android users. We want to have app available for an android. But first we have to prove it on iPhone, we want to see how it works. So we have 46 000 downloads, 65% activation, because we want people to register right away and lots of people don't want to do that. Right, when you have to register or login, arhh... But we need to do this, because of we are CE mark certified application and there are some rules that you need to comply with. And we want people to register, because we want their emails, so that we could communicate with them. If there are some complaints about the app, we need to know who is complaining. If you use the app, and you want your data to be removed, I need to know who are you to remove the data. So we need to register people right away and we have 65% of activation, which is very high to be honest. In mobile technologies, when you have 30% of activation you are happy.

Question: How did you reach that? How did you manage to have so many downloads and this level of activation? What did you do?

Answer: I don't know. I am still asking myself how we did it, our business model actually was not so optimistic. I was planning to have smaller number of people. But I think it happens because of combination of things. The first thing it is actually based on the date of the launch, then fact of the marketing efforts and everything, when you are going to release the app. I am not sure that we would have the same result, if we would not launch in last may, or in August, when we released, when people return from holiday. And also it is very important to prepare as much as you can, the landscape, the market you are entering, in a ways that you minimize the risk on getting the bad reviews and everything. So you need to speak with a key people and companies, that you are entering. We spoke with a lot of people: doctors, cancer society (kræftens bekæmpelse), but they are nonprofit organization, they cannot support you. But it was important to get neutral opinion from them.

Question: Where they your partners?

Answer: No. You know what the problem is, when you release the app, you need to follow some PR activities and they will fall the story, and will look for it. And the first institution they will go to ask about it is Kræftens Bekæmpelse. This is the address every serious journalist will go to write an article about this. So they are mandatory organization for cancer. They have all primary activities and things, when it comes to any cancer.

Question: How did you make contact with them?

Answer: We called them. We talk a lot, we try to explain who we are, what we are trying to achieve, that we are going to support their story.

Question: It means you had an idea, before launching your app, how it will contribute to the healthcare system here, yes?

Answer: Yes, so that was like very important of the pre-launch activity.

Question: Was PR one of the key activity?

Answer: Yes, all the PR, preparing the PR, because that is coming, it will happen soon these mobile health apps, using mobile technology in healthcare, this is something that will going to happen. It happens right now, but on the very small scale, but it will explode very soon. And there are some who are up for it, and there are some people who don't support that. Even if I am working in this area, I am not fully supporting everything what is happening in this area, because everyone thinks can make something and it is generally good idea, but there a lot has to be proven.

Question: For example CE mark?

Answer: Yes, we have to undergo CE mark, before we release the app. But then there is another problem - Sundhedsstyrelsen. This is the organization dealing with the standards in healthcare. They are responsible for what is happening in Denmark. Everyone who has comply about something has to address them. So they said we have to have CE mark. We already knew, that we will probably will need CE mark before we asked them, but we asked to addition make the people inquiry about you. And basically, when it comes with CE mark in a medical healthcare is, when you collect some data from the user and you do something with this data, in order to make assessment, not necessarily diagnosis, but some information that can be related with the help, when you need to be CE mark certified. They have three classes: class 1, class 2 and class3. Class 1 is divided into smaller units like M and etc.

Question: At the moment, are you at class 1 or 2?

Answer: Class 1. And that's another problem, in which class you are. Because this kind of story can be treated two ways. Everything is about official claiming what you are and what you are not. When you are claiming something, then you need to fit to it all the time. It is very tricky. In all our conversations with the people about assessment, melanoma etc. it is very obvious that we are trying to fight melanoma, but we cannot use it in any our communications with the user, anywhere. Because, if we will use it melanoma, when we have class 2, then it is diagnostics, because melanoma is diagnosis. And right now we are not a diagnostic tool, and I think we should not be diagnostic tool.

Question: What are other rules you have to comply with? Is it the security, etc.?

Answer: Of course. But everything else is related more with the technical readiness, any technical application model has to comply with, security issue, security confirmation, security of data. So there are some facts you have to comply from technical point, and there are some from health and medical. So very problematic.

Question: What about business idea protection? Do you have patents?

Answer: Yes, we do have patents. Patents and trademarks, everything what we have to register, to monitor.

Question: How do you ensure that your ideas are not copied, is it based on this patent, or are competitors coming, using the same ideas?

Answer: We do have patents. But patent is not related with the flow, application, with the principle. It is more related with the skin analysis. But I cannot thought anyone to replicate it, it is pretty simple idea. But it is always about who will do best, who will do first, what you are.

Question: How do you ensure that you are the best?

Answer: Right now we are the best. There is no app right now in Denmark, who actually can do something like that. We are the first one. We have a traction that we have here in Denmark. We will probably have the same effect in all Scandinavian countries, because Scandinavian countries are pretty much the same. But it will be interesting what will happen in bigger countries like UK and Germany. But it is all about is your system good quality enough, can you prove that you are better than your competitors. We have our algorithm in our app, which perform analysis in a short reference based on ABCDE

Question: How about the activities/operations? Do you work in house, or you have some external partners?

Answer: No, in house.

Question: Do you have a big system, where you analyze information and store?

Answer: No, we developed the algorithm in 2014. And it is always evolve, depends on the data, on the variety units that we collect and everything. So the algorithm is one the server, so when you use the app, your data is transferred through the server, algorithm process the data, and through the server it is transferred to the app, and you get the answer.

Question: Do you own the server?

Answer: Yes, yes . The storage is based on website platform in UK, as it has also be CE marked, and all the data has to reside in EU. You cannot have data outside EU, we got enough space for storage of data in UK.

Question: Why is it UK and not Denmark?

Answer: We had a problem for lack of space for two years. So the space was ok, and they offered all services for free for two years. So we could play with it, creating the structure and etc. Then we said ok, we will go to UK.

Question: But, if you started in 2014 it supposed to end soon, yes?

Answer: Actually next month.

Question: What are you going to do then? Will you continue?

Answer: Depending on price, if they will require too much money for it, then maybe not. But don't forget that soon we will have regional data, city data. We cannot have separate for each, we need a centralized and we cannot have for each country it different. We need to have centralized database for

EU... It has to comply with the standards. So we need to comply with technical terms and with the medical requirements and with easy scalability requirement. And there are some major players Amazon, Rackspace etc.

Question: Do you depend on them?

Answer: We can do it ourselves, we can have servers here. It is not a problem of that. The problem is of maintenance and scalability.

Question: Do you have to hire other people to maintain it , or other companies for maintenance?

Answer: Imagine the situation, where my biggest worry was when we launched the app, because we had a huge response in the beginning, people started downloading and using the app, so what if the server crash. And immediately you need to have scalable solution, so that easily avoid crash thanks to decrease in pressure on the server. So this is cloud solution, virtual server. Having a physical server, you have a problem, you need to have another physical server and another.

Question: Is it like that you cannot focus on it right now?

Answer: Then we have completely other problem. It will be in half a year. Because we want to enter into medical field, we want to make forward.

Question: What is the difference between health and medical?

Answer: This is self related data, this is not medical data. This data is about assessment of moles self created data. Self related data and medical data is much different.

Question: If you comply with medical, could you offer that service to doctors/hospitals?

Answer: If it is medical data, you have completely another concept. Then there are medical protocols. One thing we do to gain A47 medical protocol for influence medical fact. Then you need to have that. We still need to explore in very deep A47, what is all about. Then maybe by this protocol we do not need to have physical server . And we only need our physical server to storing the data, when we need specific protocol. There are many definitions about the servers, about the physical, when you own it.

Question: Can you afford it?

Answer: Right now not of course.

Question: Where do you get the funds, or how do you manage all these costs you have, you have to pay, operations, etc.?

Answer: So far we are minimizing the costs as much as we can. We are still in pre business model, we are not engaging in a real business model. We are like testing here. This is the question why we are in this developed market.

Question: You are testing here, is it like a pilot phase?

Answer: Yes, we need to prove that what we are doing has a market. And then you must be aware of the people in the market, of the compliances you need to deal with, and you need to be aligned. Each country has different rules.

Question: What about the partners? Accelerate, etc.?

Answer: What partners? Yes, but they are investors in Denmark. In order to expand to other markets, you need to have that kind of partners, or hire more people, and then it has to be paid by yourself, this can be very tough. For example, now we have decision from New Zealand, all of the sudden. One of the people from there asked if we are going to come to New Zealand to help them to prepare this kind of solution over there.

Question: Did they just ask you?

Answer: Yes, yes. It sounds like a joke, But then we started talking about it, and we found it interesting. Actually, at that time our plan was to go for UK, but then the guy came here. So we started this, so that means we are very flexible. And again, in New Zealand CE mark is recognized, but they also have their own. So we need to have office there, we need to have person there, who is responsible for communicating authorities. So all the legal stuff is built on top of everything. This is not like you have a mobile app, when it is in health, you have to be very careful. You need to comply with everything, but it is very difficult.

Question: But also you say, that you try to minimize costs and until now it is one of the way until you have not expanded to other countries, but what about operations, salaries?

Answer: You have to invest for the good things in the future. Working in startup can be crazy thing to be honest, you need to be special kind of person.

Question: But, is the environment here in Denmark good for entrepreneurs and startups?

Answer: Yes, that is one of the reasons why we stay here. They are pretty much to start something new, and try it. Especially in the software. That why we came also in Denmark in the beginning.

Question: How did you come up with an idea to come to Denmark?

Answer: Back in 2013, when we developed the first app. Microsoft was going to launch a new version of mobile platform, and they said they would like to have this kind of app in their portfolio. And they supported developing the original app. And we won Microsoft competition in 2013 in Serbia. And it was very interesting to try the app on the smaller market before you go bigger. Our original app was nothing. So we wanted to see, if people know how to take a lead, if people will understand, what we want to do. And we wanted to collect as much images as we can that to see if it actually works. Algorithms work with all kind of images, and actually developed an app. And then in 2014 we started looking for other opportunities for the future. We stumbled upon next step challenge in Denmark, sponsored by SE and Accelerate. We said ok, it is interesting. It was interesting because of the prize, it was 250 000 euro. But for me it was more interesting, because it was in Denmark, where they are good in technology and accept new things. One of the first countries that introduced e-government, e-health medical records and everything. On top of that problem with melanoma. In 2013-2014 Denmark was at 3rd place worldwide, right behind Australia and New Zealand. Right now Denmark is at the 5th or 4th place, but it

is a big problem here in Denmark. It is not a problem when you as a person enter the healthcare system, because when you are in the system, the system here in Denmark is pretty much organized, when it comes to melanoma. They have completely free day for melanoma intervention, Wednesday or it is 2-3 hours I don't know. But when you are in the system it is pretty much pays forward. But get you to the system, react on time, that is a problem. Person is a problem. Because system is organized and innovative. But a lot of melanoma, which is diagnosed is in stage 3 or 4, then you are talking about 5 years survival, not talking about some cure. You need to diagnose it in stage 1 or 2. And the only thing to do is to make people to be aware of that. And the biggest problem is we guys , who go to the doctor - never. We are going to doctor when it is something really bad. And the girls are more careful about it.

Question: But about your downloads, you say that mainly who download are the women, yes?

Answer: Yes, but that's what we are targeting. Even when you see design, it is more feminine.

Question: Why do you target women?

Answer: Because of that, we as a guys don't care. You are the one who care, you will make me go to the doctor.

Question: What about the doctors? Do you try to target them, that they would convince patients to use the app?

Answer: That's the other part of the story. You have to understand that everything what is happening in medicine is tough. And convincing doctors, that this is right thing, it is always like some people approve, some do not approve. During our launch we had big fight with one of the papers, that this things can cost people lives. That was one of the articles. One of the doctors were saying that we came from the garage, that we don't know what we are doing, and this kind of app can make people be false assure that there is nothing.

Question: Did it happen here in Denmark?

Answer: Yes, here.

Question: But you are trying to help people, yes?

Answer: Yes, and we wanted to speak with him, what is happening, that we are actually CE marked, what we are doing, we really wanted to share with him our solution. but he did not want to.

Question: But here, did you not have any interest from doctors, from medical?

Answer: No, we do. We are actually going to undertake study in Aarhus , one study with dermatology department in medical university in Aarhus. So they are positive. There are also people who understands that is better for them to understand what is happening before it is too late. These people understand. We also have in Odense under dermatology department at university. And we have the system, they do some papers. and that is the best, the best thing to fight melanoma is to follow up all the time. It is good to own medical records, but what is the benefit for the patient, it is benefit for the system. There is benefit for the patient to be in the system. Before that it is nothing. So I am trying to explain the guys that we are not trying to change them, we are trying to supplement them.

Question: Is it more accessible to the people?

Answer: Yes, so we are trying to make it, to make people to react on time, before the dermoscopy. Otherwise it is too late. Here in the app you can see it, you need to go to doctor on time.

Question: So right now this data is used only for individuals, do you not use the data to provide some information to the doctors?

Answer: Not yet, that is related to what I told you about the first initial idea. It is possible only in collaboration with healthcare, being in the system. We can make a difference like this staying out of the system, we have testimonials in our site of people who actually use the app and it did make a difference. But we see that within 2 years we will be part of the system.

Question: Are you working towards that?

Answer: Yes, of course. If you log in as a doctor, then you can actually register the patient and start an app under his name. Then patient comes to the doctor, and can be checked. Later doctor can ask patient to download the app, so that he could access to all the data, which doctor has in the system. So the patient can continue to scan the moles on regular basis. And if something, doctor can call him to come.

Question: In this model patient is not paying for you, who is paying - the doctor?

Answer: Yes, doctor.

Question: Do you provide doctor consultation right now?

Answer: Yes, but we are just exploring right now, we really believe that we need to have doctors here, who could answer to the patient. So the doctor could call them if something, because people are lazy. It was on discussion since 2013.

Question: Would it be the same price, as you apply now?

Answer: Maybe, but we have problem with the system. And it is 30% tax, so it would be difficult now to define the price. But it depends here. The original system would cost 150 euro per month, but for 200 euro client would get system and two consultations with the expert. For 500 euro you could get system and 10 consultations. So it depends what doctor thinks, if he has some circumstances, if he is dermatology expert, what he thinks should do.

Question: Would you provide that, would they be from Denmark?

Answer: Yes, but here we have another problem. Because the first doctor patient is meeting is practice doctor, so he not so certain, and he has less knowledge, because of how many melanoma he has seen. But they are the most important, the first who you address. And what are they doing? If they are not certain, they can remove the mole, or he will refer you to go to dermatologist, so it will take waiting time or he will tell this is nothing serious. So for example, one woman first heard it is nothing, then they told her it has to be removed, that later turned to melanoma. So it is an issue. And you have to be very careful how you are going to navigate to the system. And we are just a company of five, which wants to do something good. We know what we want, but it takes very long though.

Question: If another company would offer you a good deal to sell the company, would you?

Answer: Right now, no. If they offer a brilliant amount of money, it could be, then I would retire from everything and would disappear.

Question: Are you open for new partners, for people who want to invest?

Answer: Yes, of course. We are looking for investors, because we need more funding, we should improve the business model.

Question: Do you fund all your activities by investments?

Answer: Yes.

Question: Is it private or also public?

Answer: Right now the investors investing with the money of Denmark. We can say that we are funded by the Danish government. But for example, in SE investment it can be private, depends how people find you.

Question: How do you apply for funds? Do you write some application forms or something else?

Answer: That's completely other thing. And I hope we will have a new CEO before that. Because for me it is aghh. When it comes to private investment it is easier. But ok, how much your company worth, do you think you can give this share for this amount of money, everything is about what is your current worth of the company in the market. When, for example, you go to Istanbul in the street to bargain about something. So you say my company is worth 10.5 million, but ok, why? - because this, this and this. But yeah, I think it is worth like 8, because he wants to get more shares for the same amount of money.

Question: Is it negotiation?

Answer: Yes, and my inputs here is very small. Because I am kind of idealist, that is why I am not good material for CEO.

Question: Apart from funding, what are other ways the partners support you?

Answer: They speak Danish, you know how this language is. And it is completely different system, so we have huge support from our investors. We are always looking for strategic investors. We are not looking only for these who can give money. But I am not a real CEO, so the boss and investors are consulting and managing. This is my first work, where I am having a company. So if you imagine that boss sit in one side, others in another, ok you do this, you didn't meet on time, you are fired, next. No, that is not how it works here.

Question: Here they are more flat structured.

Answer: Yes, we are discussing with boss, we understand the problems.

Question: Just one more question about your customers, how do you reach them, e.g. you have blog, instagram, etc.?

Answer: I think, right now FaceBook. Instagram not that much. I cannot actually tell you. But I think most is Facebook, and some articles we publish, because right now we are on the phase, where we focus on the other markets, so we do not have so much advertising, we are easy going right now in Denmark

Question: When it comes to consultation, is it e-mail or call, when the person has to visit a doctor?

Answer: No, via app. We are always concerned, don't trust the app, go to doctor.

Question: What about your users in a long term, how do you encourage them to come back?

Answer: I mean, when you buy a TV, I can show you how to use, but I cannot stop you from dropping a shore on TV, it depends on person. We can do anything what we can in our power to actually tell you, why it is important, we can send you the emails take the first scan or take the second scan. We have a newsletter, but according to privacy policy when it comes to health app we are not allowed to promote ourselves. You can but you cannot. So I am pretty much tight, when it comes to health. But again, we have right now, with no marketing activity, just easy going on monthly level we have 4500 users and 1000 new users per month. So 3500 old users are using the app monthly. But this kind of app, is not used every day.

Question: Are you allowed to have advertising on your app?

Answer: No.

Question: And when it comes to your customers, do they sometimes give you suggestions, that you should improve something, do you take that in consideration?

Answer: I really want that. We send some brochures telling good and bad things about it. Because we want to hear about the bad things also. But it is funny, people do not care at all. When you use the app we on purpose navigate you to the privacy policy, about personal information. We need on purpose to break the flow of the app what is that for, what is that not, it is privacy policy, how to use the app. And people still send crazy bleeding images, and etc. So people do not care, about that.

Question: What is the major age group of your users?

Answer: 35 to 60. We have also huge number of younger people like 18 to 25, who also download just to try. But 35 to 60 are the main, who know what the problem is. And me is interested in how to reach these younger populations. But I said it will come.

Question: How do you connect with your partners, how do you meet them?

Answer: We were on doctor days in Copenhagen last year, we were also in Frederica for some exhibitions, we go doors to doors talking with people. But honestly it is very hard, being a start up you need to be special special, especially when you have started in software, then even more

Our goal is to be part of the healthcare system. Right now, all the information at the doctor is medical data, you use your registration number, and then doctor in Denmark is connected. But you do not get access to this data. But it will be in the future. But you have to start from somewhere.

Question: When do you think, you will have it, at what time?

Answer: I don't have answer, it can happen in 2 years, it can happen in 5 years. Depending on the results. Do we have a solid proof that it makes difference. I always say like for me it is very important to save one life, everything else is not important, for me that is the purpose of everything. For example, if you think about Apple or Google health apps, all information can be visible in one page. This is nice. So you sharing data and it is secured, but it can be used by Google, so they can approve something else. So there is also a sense of corruption in data, and a fear that it can affect private life. This information can be used by scientific companies. So you can say here are the emails of the users, and 15 000 of Danish users, so pharmaceutical companies can start targeting you with the product. But we are not right now in this to be able to, but we could fit. But we have to be very clear, that we are not going to do that .

Appendix 4

Vertic Interview

Interviewer: Lulu Pownall and Justina Sakinskaite

Interviewee: Mikkel Arnoldi: Global Head of Vertic Healthcare

Interview Setting: Interview was conducted at the office of Vertic in Copenhagen, Denmark.

Date of interview: 10th May 2015

Audio Length:00:42:00

Introduction: We are Lulu Pownall and Justina Sakinskaite, students at Aalborg University in our 4th semester of Master's IBE programme. The objectives of conducting this interview is to be able to bring an understanding from the real practical experience to that of theories learnt from university in regards to how business model are implemented in healthcare sector in Denmark. We assure that the information provided for the purpose of our study will be treated as confidential.

Question: Can you tell us the background of your decision into healthcare?

Answer: Seven years ago I started in the company and perhaps 5% we worked in healthcare, here in this office (Copenhagen) and the rest was like B2B and B2C non consumer healthcare stuff. The agency world is very competitive and then at some point we started working a lot with just one client in health care. We understood that when you first come in and you do not know anything about this industry, you don't really have their respect because there are so many things that are completely unique to healthcare that are around legislation, what you can and cannot do. You can't talk products to patients, you cannot market this way or that way. All these ruled regulations that only apply to healthcare. And when you come in as a normal agency who don't know about healthcare , they do not pay much attention on you. In a sense that you are not aware of our world and you are wasting our time. So with one client we actually educated ourselves a little bit more on the healthcare world and try to understand their world, a lot of legal limitations and constraints and so on. And then we went out and talk to them again and suddenly it was a completely different experience. They were full understanding and respect because we knew more about them and not like the other agencies who think they can come in and make a coca cola commercial because you cannot do that for the many reasons as they are special. Basically, by educating ourselves within healthcare went from being amongst agencies to an agency who has respect in healthcare industry.

Question: Do the clients look for you and ask you to create the solutions?

Answer: Typically we call them and ask if we can have a meeting , we would like to show you who we are and what we can do and then hopefully they say yes and then we come up with the power point presentation and show them our references from previous work experiences. And try to ask them what challenges they face and then we can help what and so on. But in the beginning we came up and showed what we have done for Carlsberg and MacDonal'd's and they were like this is not relevant to us because we are healthcare we are special. And after educating ourselves in healthcare and from the little knowledge we had, they started to show interest. So it was kind of an eye opener. The minute you show them that they are special and understand them, then you differentiate yourself from other agencies. So we decided that was a good way to go. We kind of had a "bombing allies" strategy meaning that we know what where to go and we know what target we have in the end and try not to do other things. We keep doing this that we are good at. We kept reading on healthcare, reading about what it means to work with doctors and patients and specialists and all these kind of things, and what we can and cannot do.

Question: What time did you identify these digital opportunities in healthcare?

Answer: We have always been a digital agency. So we are concerned with digital solutions. I think six years ago we decided to focus on digital healthcare.

Question: Where did these digital trends come from? Is it USA.

Answer: I think it does not come from a country but from technological advancement. In the old days you could print a brochure and give to the doctor and print a brochure and put in the waiting room and think that the patient will take and read it or you give to the patient association and you hope that they give to the patient but it is really hard to get in contact with people. Today 8 out of 10 times, everybody goes on the computer on Google, so suddenly there is a digital mind that is opened to reach many, those who have computers or a smartphone. So I don't think it is a country, region or industry but simply I think it is the advancement in technology and mobile phones that has become the place we go to when we need answers. So, the same thing go for health like when you need to buy a new bike or plane ticket you go online and you search for your needs and something comes up and you read it, and read several views and make a decision which to take. Hence, in healthcare is the same thing.

Question: Where is basis of your company? Did you start first in Denmark and go to other countries?

Answer: Yes, we are founded in Copenhagen in 2002, and the we opened up first in New York, then in Seattle and then Singapore.

Question: Do you provide ehealth solution in all these areas?

Answer: Yes but Copenhagen is the main one. So, six years ago it was like 10% healthcare and today is 100% healthcare.

Question: Does the Danish governance system also has influence on what you do in healthcare?

Answer: No, not for us. Our clients are not particularly Danish to be honest. Our clients are from all over the world.

Question: So do you have any Danish clients?

Answer: Yes, I just went to talk with them, we work with Genzyme, Novo Nordisk, Newpharma and Lundbeck but not because they are Danish. But because they are big and ambitious and they have a lot of money.

Question: Which companies in healthcare do you work with mainly? Is it pharmaceuticals?

Answer: Pharmaceuticals definitely.

Question: So is it more about customer engagement than healthcare monitoring?

Answer: No, it is not about healthcare monitoring. We do all kinds of digital engagement. That could be for example when a company is launching a new product and they want to help the patients that are getting this new product and they want to give them some good information about how they can live their life in best possible ways to avoid side effect and emotional complication. So, it could be that a user website, it could also be a promotional website. And this is why in healthcare you distinguish much between promotional and non promotional. Non-promotional do not have any brand names or product names on it and promotional it does have.

What we could also do, is to do a product website, you are launching a new product and you create a nice website about the product, what it can do and why is better than the others and give the clinical

studies, and you try to get doctors to go on the website and read about the products and hopefully give it to the next patient. We also do apps of different kinds.

Question: And talking about non promotional, what is it mainly?

Answer: Non promotional is more like scientific, communication. So it is more about the disease and treatment type but it is not related to one specific brand and product. So that is the distinction.

Question: So you do that as well?

Yes, we do that.

Question: Can you tell us some name of your clients?

Yes, right now we work with Lilly, Novo Nordisk, Genzyme,, etc

Question: Do you have any knowledge about how your solutions affect your clients' business model?

Answer: Absolutely, the business model is fundamentally changing completely for pharmaceutical companies right now and any kind of healthcare company also e.g medtech companies. This is because in the old days which is 5 to 10 years ago, the way product were sold is that sales representative who have a suit case with printed materials and will go to the doctor and knock at is door (direct contact), and request to tell about his product. And when he has done that several times , he would hope the doctor will start giving the products to the patients. That's how all the big pharma companies where built. Then suddenly, digitalization meant that doctors have a computer and do not need sales representative to visit them and tell them about the product because they can go online and read themselves. So what happened is that doctors are very busy , so the time that they have to spend with the sales reps. is declining. Therefore, doctors they do not want to see sales men(pharma employee) as much as they used to. And of course, pharmacy companies get scared because it means that the number one access point to their customer is slowly disappearing. For example, I got a story from sales representatives who know that doctors do not want to meet them as they can use the computer. What happen is that the sales men are losing control , the pharmaceutical companies are losing control. So, they need to reinvent themselves with new business models. And if the doctors use online information, they have to make sure they are visible to them. E.g in big portals like medspace hey have to make sure they are more visible to the doctors than their competitors, which is about completely new channel mix. All that personal relationships slowly declining and pharmacy needs to be visible and accessible through digital channels. So they need to reinvent themselves a lot.

Question: And what are those digital channels that they should use?

Answer: It is through apps, through websites, through Google and advertising and print leaf that you can leave behind with a doctor. Promotion through patient organisations, social media and any kind of channel so to speak.

Question: And for you to reach your clients, do you use similar channels?

Answer: Yes, we use similar channels.

Question: What payment methods do your clients use to pay you?

Answer: It is typically done through making an upfront contract. So, we scope a project with a client, and say I need that I have some concept but you also need to produce some concept, maybe produce two videos and an interview with a doctor, and we want to have these in an app, and the app should have six different screens and some functionalities like send an email and calendar etc. So, we basically scope and specify the project together and then we have fix price. Thereafter, we start the project and

there are some payment terms, which means that they must pay the first 50% after 30 days and the other 50% when the project is done.

Question: Do you designers and market analyst in your company?

Answer: Yeah. We have a team of strategy and insight, the team of eight people extreme specialised one of the best team in the world in that field. They collect social media conversations, real understand what patients and doctors and families are talking about diseases and treatments. how they are feeling, what products they are looking for, what are their frustrations and hopes and so on. Digital market research you may call it. But they also look what people search for in Google, because if we know what our customers are searching for something that we can provide. And then we look at what are the competitors doing, because we don't want to just copy them but we want to be different. Other big influencers like clinic leader online and people with big follow ups, that we need to be aware of and part and work together with. They do that kind of exercise they call digital IQ.

We also have concept people who comes up with creative concepts. So, one thing you need a website but how is it going to be built, what is the creative idea behind it. And then we have designers who do designing, with front developers who code in all things you can see. And back developers who developing the code behind it.

Question: Speaking of competition, how do you differentiate yourself from other agencies?

Answer: First of all we are specialised in digital healthcare and we are very strong in this field. So everyone who is not part of that, is not real a competitor not in healthcare. Then we are much more creative than any traditional healthcare agencies, because a lot of our competitors are old big advertising companies who came from print and then moved into digital because they saw that everybody else did. However, they are not really digital wide. I think on a standard the way we do as we are born a digital agency. And we do something that is called strategic creativity. It is not just about a creative idea but also about really understanding the customer and this is what you can do in digital because you can measure. You know, what are they talking about, what do they want from us, what are they searching for etc. And those are the insights we call it outside in about. So listening to the customers and then sort of impact what we do as a company, instead of inside out, which is we something is great and develop and push it to the customer and hope they want it. This really differentiate us.

Question: Based on strategic analysis that you do, do you have your own systems for big data storage?

Answer: We have a combination. Some tools license for but then we develop our own tools also.

Question: If you make an application and clients give data who do the storage of these data?

Answer: We do it here. For example we build a big patient support programme where patients can store their data if they are suffering from diabetes or so. They put in their data and then they get customised support over the next three years you need to have their data stored. We are hosting those kind of data as well.

Question: Do you charge them from the beginning?

Answer: Yes, we sign a contract from the beginning.

Question: Do you identify some kind of challenges they face when they start implementing the digital solutions that you provide?

Answer: I think the challenge is that you can have some customers that are less experienced. Meaning that they do not know what they want, they do not know the possibilities upfront. This means that they might have one idea in their head about what we are doing together and have another one. So that could be a challenge. Therefore, it is our job to be good advisors upfront, and guide them because they don't know how to ask the right questions.

Question: Do you do on application training to the customers?

Answer: We do that sometimes. We train them on using the system or we write a playbook at the end of the project which is how they roll it out. We might produce an app with a headquarter, but they need to give it to the rest of the world. For instance with WHO, we create for them an app for immunization vaccines of children. So, we gave them one app for them and a source code and the playbook and they could go out and give it to.. developed for 53 countries in the world as they had the code and how to use the product. Other tools that clients could use for implementation could be things that are productised or conceptualised digitalised tool for example which is a stand out product, where they monitor digital analysis for their brand.

Question: Do you have any important partners?

Answer: We rely on some special partners on specific things. For example it could be we are using 3rd person, translation, specialised medical writing.

Question: Do you have any specific rules that you have to comply with to be able to sell your products?

Answer: No, there are no any specific rules we have to comply with. We only have to abide with the rules that any company has to. We have to pay salaries and taxes, but nothing else.

Question: Which are dominant digital applications in Denmark? Is it customer engagement or healthcare monitoring?

Answer: It is not that I have seen something specific in Denmark than anywhere else. We have pretty strict rules in Denmark compared to most of the European countries. So it is not in Denmark you do most of the big investments in pilot projects and so on especially when it comes to solutions to doctors. I think we are good at generally using technology in Denmark. Most of our clients for example big companies from Germany use the Nordic countries as a pilot (Denmark and Norway). You know the mobile penetration is really high and the same goes for tablet and laptops and so on. But on top of that we are technologically quite advanced, so I could say they normally try to test something here. But there is no specific thing like monitoring apps that they mainly focus here in Denmark.

Question: How do you reach your customers? Do you have any special relations with medical centres' for example?

Answer: Not really. What we have done is to try to have some steady relationships. Now we have that kind of relationship with 3 companies whereby we have a lot of repeated business. We work with the same brand again and again. So when they need a new website or new video then they ask us to do it. Thereby, what we call classic key account management. We have the same clients that we develop to be bigger and bigger. Therefore, we do not waste so much time chasing the new clients and calling and calling. That is not a good way to drive business.

Question: Would like to expand your business?

Answer: No, we don't do that. We have been reaching people successfully based on the channels that we have. But when we do it is by using our network a lot and by using LinkedIn a lot to reach out to people. And then we try to use content marketing, that we do not just sit and call people and say buy our

product and similarly to what we tell pharma company not to do. We write a lot on LinkedIn and so on. Our perspectives and articles on digital healthcare. And trust that our clients by seeing that, can see that we are a leading agency, a thought leader who knows how to work in healthcare and use technology in this industry.

Question: Do you write on blog?

Answer: Not on blog specifically. We use LinkedIn and I am also running some groups LinkedIn where I am discussing digital healthcare.

Question: How do you cover your costs as a company?

Answer: It is basically from sales. There is no a big investor on the back of the company. We need to balance all the time what we sale and what we spent.

Question: Was this done from the beginning or?

Answer: Yes, and that is why today project management is important. We have some real, good project managers, who are good at controlling the project and making sure that they are on time and on budget.

And one thing if you are looking for future trends which is happening right now is what we call entangle marketing. It is a new concept, so not a lot of people have heard about it. Actually, our founder just wrote a book together with Stan from New York. They wrote a book together they have just released on entangled marketing. It is a new marketing concept which is all about entangling with your customers. So becoming one so to speak. The core principles of entangled marketing is that you are trying to build a relationship that is so strong with your clients. And is based on you providing value to your clients more than providing products to them. And through that relationship you build a mutual trust relationship and a bond which gives you a loyalty that otherwise you are not able to do.

Question: What is your value proposition to your clients?

Answer: We are able to continuously provide good content and education to them. If you look that we are running groups on LinkedIn, you will not see a word about our product. It is only about giving our customer the latest knowledge within digital healthcare. We try to be a knowledge resource, so like we do digital IQ and digital landscaping etc it is about providing value to the customers so that they understand their clients even better. We host events which is about knowledge sharing as well. So, we try to do it by sharing our expertise and knowledge without try it being a product, so on top of the product. We think that all clients need to start thinking that way. The product pushers of the old times are having a tough time these day because it is not about selling products anymore, but being resource to your customer so that they find you relevant as part of the solution. I think the days are over where we see products in isolation, we also buy the services around the product. We buy the brand, and other things than just a product. And if those things around the product itself are important. Then you need to deliver those types of service to gain loyalty. If only need to pay the price will not last for long time as customers. I think this is the most important trend going on right now. And it requires the industry to think completely differently. So we try to implement it with our customers when they come to us and say, to met the extra needs than product of their clients.

Therefore, the company need to consider this other need than just the product that they offer to the customer. As an example a person with rashes on skin will need to buy medicine bit also with an extra advise on what to dress while applying the cream, travel to salt health treatment...so have a service that facilitate them to get this extra treatment.

Question: Do you acquire these services from other companies?

Answer: It could be. We actually contracting some people to help us find and create good content. Sebastian reached out to a marketing guru and say lets write a book together to our customers. We do apps and websites why do we need to write a book? Because people who are responsible for digital marketing are responsible for marketing in a general sense. You write a book on general marketing not particular digital.

Question: Do you think people are ready to use these applications and engage with the company?

Answer: Again, if you do what other companies do, you create a narrow app that just help you with your product then no. And there are so many imitated apps out there today that doesn't do anything. Does that help no. But then again there are real smart apps which actually provide value to the patients, which could be to help them track their skin condition or measure their blood sugar levels. That is value adding because it helps them with the general problem on a daily basis. I think those are great.

Question: So what do you think are the main elements of business model for the companies adopting digital solutions? Is it channels or?

Answer: It is about content. It is about your value proposition.

Question: Customer relationships?

Answer: Yeah, but you build your customer relationship through the type of interaction you do with the customers. If, you sort of look at your own agenda, you will not have much of a relationship, you will be a one way. But if you build a true relationship, it is because you try to understand who you are with. So, it needs to be a two way relationship. I think with the amount of competition a lot of smaller companies coming in now, because today with very little money you reach a lot of customers. I think with the internet making us able to do that there is a much more competition. So you need to be sharp and provide that extra value.

Question: Do you test your product before launching?

Answer: We tested it internal. And for some clients they want external testing as well and we can do that. Some time we facilitate, sometimes do ourselves and sometimes the client do it.

Question: Are you up for that or is it not necessary?

Answer: It is actually. There are different ways of testing. You can test the content, you can test the app either technically. Or see if it works with the patient and let them do what we want them to do.

Thank you!