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THE ARCTIC UNIVERSITY OF NORWAY

School of Business and Economics

Developing a Feasible Commercialization Strategy for "Erdusyk"

Where entrepreneurial education meets academic entrepreneurship

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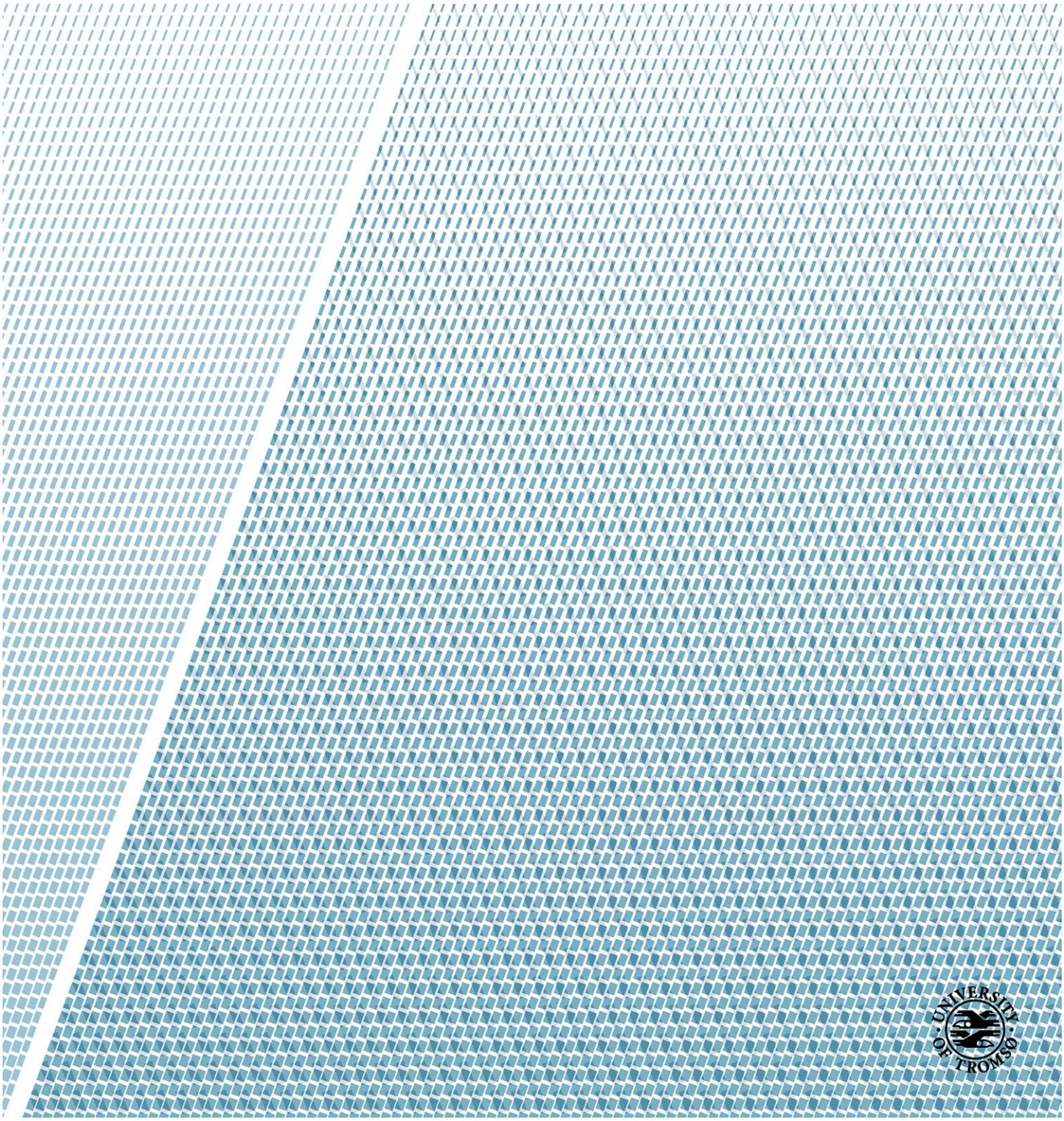
Master's Thesis in Business Creation and Entrepreneurship- May 2016



Acknowledgement

First of all, I would like to express my gratitude to my supervisors for guiding me through the work and enlightening me with their professional skills. My special thanks to professor, coordinator and supervisor Lene Foss for her encouragement, guidance and advices. I am really thankful to her for her support throughout the process.

I am extremely delighted to have had the opportunity to know Mr. Johan Gustav Bellika. His support has been instrumental in my pursuit of every single piece of information and the completion of this master's thesis. I feel myself privileged to have received chances for numerous meetings with him despite his busy schedule. He had been really encouraging throughout and the fact that he appreciated the mistakes as a part of learning process opened up rooms for creativity in me. I would like to thank him for everything. I would also like to thank people at Norwegian Center for Integrated Care and Telemedicine (NST) who helped me through the data collection process. My sincere thank goes to Norinnova for providing me the opportunity to work with the project and special thanks to Wenche Poppe for guiding me through the process and for her every single help.

I want to reserve special thanks to my wife Shanti Acharya without whose support this thesis would not have been completed in time. I owe my sincere gratitude to her for taking our common responsibilities on her own and helping me to concentrate on the project and complete it within due. I also want to thank my family for all the support. Whatever I have achieved until today, the credit goes to my family.

Finally, I want to thank all my classmates at BCE for providing me the privilege of having all your acquaintance. Thanks to my boss for adjusting my working shifts according to my study schedules. Thanks to UiT for providing me the opportunity to learn in a pragmatic environment and thanks to Norway for letting us to stay here and learn in such a mesmerizing environment.

Abstract

A research group named “Snow” at Norwegian Center for Integrated Care and Telemedicine (NST) has developed a prototype of a Disease Query Engine that is capable of performing epidemiological searches. That feature coupled with interface for electronic consultation makes an interesting product “Erdusyk” that has good customer, societal and business utility. The research group has a larger focus on academia and quite lesser motive for commercialization. In an attempt to assist the researchers in the commercialization process as well as to enhance entrepreneurial education through providing students with knowledge from both the academia and the industry, the idea was presented to a master’s degree student of Business Creation Entrepreneurship at UiT to find out a viable commercialization strategy. The viable commercialization strategy is presented in this master’s thesis.

The research is guided by a main research question which is then divided into three sub-questions for specificity. The main research question that is “development of feasible commercialization strategy for Erdusyk” goes through the process of innovation study, marketing study and business plan each guided by their own sub-question. The innovation study provides insights of the technicalities of the product and utilities it offers to the customers, society and the business world. It also identifies the type of innovation involved in the product. The degree of innovation involved in the product has implications on the market strategy. The market strategy is formed on the basis of the innovation study and information from a questionnaire survey, some semi-structured interviews and some secondary data. A market entry strategy is formed as a result. Similarly, closely linked to the innovation study and market study, a business plan is formulated. The business plan will provide the real world image of several players in the value chain and their interests. It will propose a business model that is suitable for the idea and the financial scenario that might follow with that model. Calculating a tentative value of the firm, it will propose a suitable investment offer for investors.

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List of Abbreviation

AS	=	**Aksjeselskap (Stock-based company)**
BCE	=	**Business Creation and Entrepreneurship**
CEO	=	**Chief Executive Officer**
COPD	=	**Chronic Obstructive Pulmonary Disease**
CPU	=	**Central Processing Unit**
DQE	=	**Disease Query Engine**
HER	=	**Electronic Health Record**
FTO	=	**Freedom to Operate**
GP	=	**General Practitioner**
LIS	=	**Lab Information System**
NHS	=	**National Health Service**
NOK	=	**Norwegian Kroner**
NST	=	**Norwegian Center for Integrated Care and Telemedicine**
NTT	=	**Norinnova Technology Transfer**
OECD	=	**Organization for Economic Cooperation and Development**
PCP	=	**Primary Care Providers**
PEST	=	**Political, Economic, Social, Technological**
R&D	=	**Research and Development**
RHA	=	**Regional Health Authorities**
SEDA	=	**Sentrale Data fra Allmennlegetjenesten**
SMS	=	**Short Message Service**
SWOT	=	**Strength. Weakness, Opportunity, Threat**
UiT	=	**University of Tromsø**
UNN	=	**University Hospital of North Norway**

1. Introduction

Universities have for long been associated with their functions of educating and research. The two functions were considered the first two missions of the Universities. However, the concept of 'service' as the third mission has also been established lately. This mission of the university is more concerned with assisting in the economic development of the region the university is situated in. In excess to their traditional and primary focus on education and research, universities now also invest heavily in the creation of value for business and society (Curley & Formica, 2013). Following that notion, there has been a gradual shift in Universities' focus towards commercializing research, licensing of technology, creating university spin-offs, introducing entrepreneurship programs, and expanding university-industry relations. Foss & Gibson, (2015) point out that, universities can become entrepreneurial in two ways; through academic entrepreneurship and through entrepreneurial education. First through academic entrepreneurship, universities strive for commercialization of knowledge and research often known as technology transfer. Second, through entrepreneurial education, universities build their entrepreneurial capability through the students, faculty members and researchers. According to Ambos et al. (2008), universities are demonstrating ambidexterity in their ability in producing both scientific knowledge and technology outputs and in being vital engines for economic growth by introducing the produced knowledge, innovations and technologies to the commercial market.

UiT - The Arctic University of Norway links the academic entrepreneurship process with entrepreneurial education by providing students of entrepreneurship opportunity to work with academic entrepreneurial ideas. This master's thesis is created by a final year master's student of Business Creation and Entrepreneurship at UiT and is a case of an academic entrepreneurship. This paper strives to find out a feasible commercialization strategy for a technology developed at a university based research organization. It attempts to create a new potential business venture by transferring the theoretical knowledge originating from an academic environment, into commercial activities.

The technology was developed at Norwegian Center for Integrated Care and Telemedicine (NST) which is a University based research organization in Tromsø. The technology developed at NST has, among others, opened up possibilities for disease query, electronic consultation with doctors and epidemiological search. The three possibilities are bundled up and offered as a package through the internet at https://www.erdusyk.no. The technology seems to provide some values to people by eliminating some of their problems and thus have a business potential. The business potential of the idea has been explored by a student of entrepreneurship manifesting the feasible customer group and a way to effectively introduce the idea into the market. For the convenience, the technology will be referred to as Erdusyk in this paper hereafter.

1.1 Erdusyk within E-health

With the introduction of information and communication technology, the health sector has dramatically changed. Currently, a significant share of disciplines of Medical Informatics address the usage of internet to provide health related services and information. Being an important aspect of current society, current healthcare system needs to be effective and efficient. Haux et al. (2002) point out that constant development of new technologies is critical for the health care system in order to comply with the rising global population. Information and Communication Technology is one of the key sectors that have the potential to improve the health care system to fulfill the increasing demand of improved health care system. When the electronic communication and information technology are incorporated within the health care sectors, the conjugation is commonly known as electronic health or simply e-health. Practice of e-health increases the efficiency of the health care services and also provides comprehensive information and support in decision-making process for health care providers as well as seekers. The use of e-health technologies has been, in many cases, known to reduce the administrative costs, make efficient use of medical resources and provide better collaboration across the different levels of the healthcare systems. One of the main objectives of e-Health lies within the support and relationship between patient and their healthcare providers.

The thesis topic is to develop a feasible commercialization strategy for Erdusyk. Erdusyk is an e-health innovation designed to assist health care seekers (patients) and providers (mainly doctors) in their pursuit and delivery of health care services. The main value of the innovation for patients

and doctors is in providing relevant information and knowledge about the disease and diagnosis for them to make decision regarding what to do next, in an attempt to eliminate the unnecessary transportations for physical consultation by substituting it with an electronic one if possible when people are ill. The invention was made at Norwegian Centre for Integrated Care and Telemedicine (NST), which is part of the University Hospital of North Norway (UNN). The project started more than a decade ago and the prototype of the innovation is available at https://www.erdusyk.com already. A research group known as "Snow" at NST was formed in 2003 and it has been working with the project since 2007. The necessary infrastructures are mostly in place and the business value of the idea is noticeable. However, the research group had low commercialization motive as is the case with most of the researchers and other people from academia (Harding & Bosma, 2007).

1.2 The Importance of the Topic

Borges & Jacques Fillion (2013) point out that the resources that universities put at the disposal of researchers and academics have not been effective enough on its own to encourage that group of people to create spin-offs. That ineffectiveness was clearly visible in this case too as no commercialization endeavors were made for a technology that started about over a decade ago. According to Borges & Jacques Fillion (2013), the reason for the ineffectiveness is, among others, due to the lack of the necessary business networks. In other words there is a big gap between researchers and the business world. Foss et al. (2013) highlight the roles of entrepreneurship students in filling up the gap between the researchers and the business world. The fact that entrepreneurship students have academic education, the idea of the real world environment that a business has to live through and also greater degree of autonomy as compared to academia, makes them more likely to contribute in the commercialization than researchers. The third mission of a University is concerned with enhancing the rate commercialization of researches for economically assisting the region the university is embedded in. In an attempt for the successful recognition of the third mission of UiT, along with the academic entrepreneurship endeavors, entrepreneurial education was introduced. Norinnova Technology Transfer (NTT) is a technology transfer office for UiT and it provides different kinds of support to business ideas from providing incubation service for startups to finding investors and industry partners for them. It has an important role in the academic entrepreneurship process. Similarly, on the other

side, the master's degree of Business Creation and Entrepreneurship was begun at UiT in 2009. Following the notion of the importance of students in bridging the gap, the entrepreneurial education program (BCE in this case) is expected to contribute highly to the academic entrepreneurship process. Under the same notion, BCE students are provided with the opportunity to write their master's thesis on the commercialization of researches. The process is believed to develop academic entrepreneurship by enhancing the number of university spin-offs resulting from the works of the students from the education program.

This thesis case is a part of that very endeavor of UiT. The research based potential business idea from NST was presented to the students of BCE by Norinnova Technology Transfer (NTT). Under the premise that entrepreneurship students are able to fill up the gap between the researchers and the business world, the students were provided the chance to work closely to the inventor together with the supervision from BCE faculty staffs and NTT. It is beneficial for both the entrepreneurial education as well as the academic entrepreneurship process. As such, the case ended up in the hands of the author of this thesis who is a final year student of master's degree in BCE at UiT.

1.3 Research Question

The main objective of this case, as stated above, is to generate a commercialization strategy for a research based idea. According to Alänge & Lundqvist (2011), the commercialization process begins with development of technical and market information, and then identification of market opportunities and finally evaluation of the business potential. The steps provide a framework on how the thesis will proceed. To determine how feasible the technology is and to identify the unique value propositions, an innovation study is conducted. The insights from the study will inform about the values the customers receive from the product. It helps to evaluate the situation of use and potential customer segments. The market study is built on the knowledge from the innovation study, by developing a strategic tool for evaluating the feasible target market on the basis of market analysis. The findings from both the technical and market study will provide vital information in order to create a business plan.

The research questions will provide guidelines on what the entire thesis and sections of the thesis will deal with. Bryman & Bell (2015) insist on breaking the research question into sub-questions

in order to serve as a guide for the study. The research question is thus divided into two parts viz, the main research question and sub-research questions. The main research question deals with the objective of the entire paper and the sub-questions dictate the focus of the sections of the thesis stated above. The main research question for this thesis is:

What is the viable way to successfully commercialize Erdusyk in Norway?

The sub-question for the innovation study is:
What is the innovation level of Erdusyk and what value propositions does it provide to the potential users?

The question is answered in the Innovation study chapter where the current prototype of Erdusyk and the technology behind it is discussed. The level of innovation involved and the impact of that on the next steps of commercialization process is evaluated.

The sub-question for the marketing study is:
Is there a real market potential for Erdusyk and which market strategy will lead to successful commercialization?

The market study will deal with the evaluation of market structure. That is a task consisting of garnering information about the potential customers, targeting them and finding out way to effectively reach up to them. This will all be vital information for establishing a marketing strategy for Erdusyk.

The sub-question for business plan is:
What is the development strategy for successfully starting the business and operating the entire value chain process?

The business plan will illustrate the risks, rewards, market strategy, action plans, financial evaluation and an investment proposal for the business based on information on the two preceding chapters.

1.4 Methodology

This study is mainly based on a qualitative method. The analysis of potential customers however was based on a quantitative approach. Thus, the study made use of both the qualitative tools and the quantitative tools.

According to Cresswell (2003), qualitative research is built upon the multiple interpretations of individual's experiences that are socially and historically constructed and have the ability to develop a theory or a pattern. Quantitative research, however, is more based on cause and effect and has pre-specified variables and hypotheses that are tested. Mixed methods make use of both qualitative and quantitative techniques and are more consequence-oriented and problem-centered and have pluralistic implications.

According to Colin (2002), qualitative methods are often chosen when the focus of research is on the process rather than the outcome. It provides enlightenment, understanding and extrapolation of the situations and is much suitable in understanding a certain phenomenon. Qualitative research includes observations, interviews, content analysis of documents, case studies, articles, books, in addition to descriptive statistics such as census data (Strauss & Corbin, 1990). Quantitative research is more of a fixed design as there needs to be a concrete pre-specification before the data collection is done (Colin, 2002). The pre-specified hypotheses are either verified or falsified by the findings. Quantitative research involves experiments and surveys and statistical processing. It makes use of different measurement techniques such as questionnaires, time studies, tracking of outcome, and a broad range of more or less rigorous designs such as randomized controlled trials, meta-analysis, cohort, case control and observational studies.

In a mixed design, both quantitative and qualitative techniques are used. Usage of both quantitative and qualitative methods provides improves validity and reliability of research which is also known as triangulation (Quinlan, 2011). By this method, the results of quantitative method can be checked against that of qualitative method and vice versa. In a mixed design, usually a hypothesis is created from qualitative method which is then tested using the quantitative method (Colin, 2002). Qualitative research provides rich description of the context and the processes while the quantitative method provides an account of the outcomes of the

research. The conglomeration of the two provides the account of the process as well as the objective truth. This thesis case makes use of both qualitative and quantitative techniques of data collection. The research follows a mixed method in that sense. However there is "minimal integration" between the two where there are separate results sections for each method, and only a brief discussion of their mutual implications. Questionnaire survey, qualitative interviews, observation and secondary data were used for the study.

In the early phase of the study, data were collected using interviews, informal discussions and several meetings with the leader of the inventor group. The initial meetings dwelled around the issues of understanding the innovation itself. Notes were taken for the documentation. The technology being heavily relied upon the consent of doctors, need to solicit information from doctors was evident. Five doctors were approached out of which three agreed for interviews. Semi-structured interviews were conducted ranging from 20 minutes to 40 minutes. Two of the interviews were tape-recorded while only notes were taken for one. More than ten meetings were done with the inventor during the period. Notes were taken from every single meeting. Similarly, nine meetings were done with the supervisors of various parts of the thesis.

Similarly, a questionnaire was prepared to carry out a market survey as a part of thesis (refer to appendix 1). There was very little information on the people's attitude towards the healthcare service from the perspective that was relevant for this case. To elicit that information, people's response about the healthcare system in Norway was needed. The questionnaire was created in English language. 145 people participated in the survey. Convenience sampling method was used mainly due to the resource of study. Time and financial resource for the study was quite limited and thus limiting the data collection to convenient sample only. The research was based in Tromsø. Most of the data collection took place online through distribution of questionnaire by friends and colleagues. The responses were especially important for the marketing study part. The questionnaire and the responses are available in the appendix. Use of secondary data was much relevant for generating knowledge about the competitive scenario, some statistical data, and the regulatory information.

1.4.1 Innovation Study

The purpose of the Innovation study is to investigate the technology in order to identify customer utilities and its commercial potential and to place it within an innovation framework. The development stage that the technology is in and the degree of innovativeness involved in the technology has important role in the marketing plan and next steps.

The innovation study will make use of Alänge & Lundqvist's (2014) idea evaluation framework. According to Alänge & Lundqvist's (2014), the idea evaluation process identifies and expresses the potentials of the idea and makes it more likely to gain momentum and attract more resources in the commercialization process. The idea evaluation focuses on the creative packaging and communication of the idea. The packaging attracts future and many yet to be identified stakeholders towards the idea and help to bring the idea forward. The packaging concept makes ideas attractive and gives ideas new destinations, inspiring new settings and new people.

Alänge & Lundqvist's (2014) idea evaluation process consists of four sections; *a summary, an idea description, value visions* and *next steps*. First, the *summary* part will primarily frame the essence of the idea and its potential future value in as attractive way as possible. The motive behind this is to capture the attention of reader and get them to read further. An *idea description* will try to capture the idea and its setting. It often includes a technical description, a novelty and freedom to operate (FTO) analysis and the presentation of the idea provider. *Value visions* present the specified situations of use and identification of customer, societal and business utilities. Finally the *next steps* involve indicating market potential and needs of further development and verification, and some financial estimation.

After the idea evaluation for the technology is done, the next step is to determine the innovativeness involved in the innovation. As Kassicieh et al. (2002) state, different innovation types require different marketing and business orientations. Thus it is imperative to find out the degree of innovativeness involved in the product. This section will follow a framework of Garcia & Calantone (2002) as well as that of Thomond, Herzberg & Lettice (2003) and Dosi (1982) to evaluate the innovativeness.

According to Garcia & Calantone (2002), radical innovations have been defined as innovations that embody a new technology that results in a new market infrastructure and results in discontinuities on both industry or market level (macro level) and firm and customer level (micro level). Incremental innovations cause a marketing and/or technological discontinuity on micro level but not on macro level. Really new innovations consist of the largest frequency of innovation and cover the combinations in between these two extremes except the discontinuity in both marketing and technology in macro level.

From another perspective, Thomond, Herzberg & Lettice (2003) posit that disruptive innovations allow organizations to transfer the demand and needs of markets. The innovations that do not cause the market discontinuity are sustaining innovations. Similarly, Dosi (1982) posits that radical innovations break the continuity of existing technological paradigms and set the stage for new technological trajectories. The innovations that do not cause technological discontinuity are incremental.

This section of determination of innovativeness makes use of a conglomerated framework of Garcia and Calantone (2002), Thomond, Herzberg & Lettice (2003) and Dosi (1982) to evaluate the innovativeness and classify the innovation. The idea evaluation and the innovation classification provide the context for the innovation to explore marketing implications and develop marketing strategies.

1.4.2 Market Study

The market study builds on to the findings of Innovation study. Different types of business ideas that have different types of innovations involved require different marketing orientations. For evaluating a suitable marketing strategy, the concept of revised technology adoption life cycle proposed by Moore (2014) is considered.

When a new disruptive target enters the market, it follows a certain pattern of adoption by the customers. The technology adoption life cycle model have, for long, believed to consist of a smooth bell curve having customers of high-tech products, progressing from Innovators, Early Adopters, Early Majority, Late Majority, and Laggards. Moore (2014) has revised the old curve

with a new model that has cracks between the customer groups. The largest crack is between the early adopters and early Majority which he refers to as “the chasm”. The cracks denote the difference in attitude and preferences of the different groups and the inertia to accept the new technology. The chasm denotes the huge difference in the acceptance of new technology between the early adopters and early majority.

It is believed that early adopters are enthusiasts and that many firms might somehow be able to get the enthusiasts buy the product. However, they are quite less in number and the true dollars lie in the early majority group which consists of people who are more pragmatic. For successful commercialization, there is a need to cross the chasm and that is where many companies fail. Providing a D-day analogy, Moore (2014) suggests that to successfully cross the chasm, firm should focus on a single market segment, dominate over it and then attack the adjacent segments.

For the development of market strategy, customer analysis, competitor analysis, market analysis and environmental analysis are performed in that sequence. Market strategy is developed based on the analyses. Customer and competitor analysis and market analysis are developed from the data from questionnaire survey, interviews and secondary data. Environmental analysis will use PEST analysis to evaluate the political, economic, social and technological environment. Similarly, to identify the internal strengths and weaknesses as well as the opportunities and threats presented by the environment, SWOT analysis is conducted.

Marketing strategy is developed using marketing mix strategies. The marketing mix can be defined as the set of tactical marketing tools that the firm blends to produce the response it wants in the target market (Kotler & Armstrong, 2013). It consists of 4Ps namely, product, price, place and promotion. Following the notion, strategies for product, pricing, distribution and promotion are developed to achieve the marketing goals.

1.4.3 Business Plan

It has been widely believed that the sole purpose of a business plan is to persuade investors to invest in the new business. However, even before that, business plans enlighten entrepreneurs so that they realize future problems and risks in advance and be ready to adjust to the problems as

they occur. The business plan is a paper where the future plans and future company itself are written down. According to Hormozi, Sutton, McMinn, & Lucio (2002), describing the company on paper provides an opportunity to identify problems and propose solutions without real world consequences.

Despite the benefits for the entrepreneurs, the business plan is usually prepared for the outsiders especially the potential investors. The structure and content of business plan varies according to the external readers and their motives. In this case, the business plan builds upon the findings from innovation study and market study. The business plan is thus constructed on the context that is established by the technical and market study. The thesis ends with the business plan.

There are many structures for business plans available and they serve different purposes. The framework of the business plan used here is a customization of plurality of business plans available in the internet and the one illustrated by business plan supervisor. The business plan begins with an executive summary that includes background information, the values and the market potential. Next it will go on to describe the problem and then the solution offered in detail. After that the value propositions for different value chain members are illustrated. After that, the entrepreneurial team and the members are introduced. The market potential is then explored and the competitors identified. Then the business model is presented that describes the entire value chain activities. After proposing the market entry strategies, it will lay out the important milestones for the future. That is followed by financial estimation and company valuation. Finally, the critical risks are analyzed and the exit strategy is identified.

The business plan is prepared in a way to appeal equity investors in investing in the company. It acts thus as a stand-alone document in itself. However, it also serves as an operational plan for moving the idea on through the commercialization process. It creates a roadmap for the steps to be followed while proceeding with the further commercialization process.

1.5 Limitations

There are some limitations to the thesis. Firstly, the availability of just a semester's time for the study is a limitation. This seriously limits the extent of information that can be gathered and

studied. From few interviews with doctors, it seemed like the whole plan was falling apart because doctors would not approve the product due to problem with their remuneration as defined by the law. Later on it was found out that there was a way to work around the issue and that would not cause any problem for the doctor's income. However, the deadline had already approached and there was no time to talk to other doctors and include the response modifying the work already done by then. The limitation of time and the complexity of the idea warranted drilling down the idea for a narrow focus for the master's thesis. That left out some of the important features of the invention that would appeal different sets of users in different ways making the product more complete.

The data collection methods included questionnaires, semi-structured interviews, observation and secondary data. The primary data usually consist of sampling and respondent errors. The sample for questionnaire survey was chosen using a convenience sampling method. The survey was done mainly on people living in Tromsø. Also, the respondents were approached through networks of friends, colleagues and acquaintances. The use of convenience sampling might have infiltrated some degree of bias in the data collected which have not been considered in the case. Similarly there is a chance that some respondents may have been reluctant to provide the true information or in some cases make unintentional errors due to, among others, not understanding the question given. Also interviewer might have made some mistakes during interviews due to various reasons such as not being trained in performing field studies and qualitative research. The size and scope of the data collected is thus not free of limitations. That being the case, the responses that led to the decisions about the product being favorable for the common people and their willingness to pay for it imply the assumptions that people are really willing to pay for it. That is an expression of interest from the customers and it cannot be known for sure whether or not customers will really pay for it unless the product is really out there in the market.

Similarly, it proved really difficult to get to connect to doctors and receive information from them most probably due to lack of contacts and networks. It was only possible to collect information from three doctors. Most of the secondary information were available in Norwegian Language and thus were difficult to interpret. Similarly, no data were available on some of the

issues especially in market study and financial estimation part. That led to the need of assumptions for the cases.

The author of the master thesis is a student from the academic side of the business. The product is a telemedicine device that is a combination of Information Technology and Health Care system. As such the knowledge of the technicality of the product is mostly dependent upon the knowledge provided by the inventor and publications made in the field. Thus, the thesis might not be able to sufficiently explain the product from technical point of view.

1.6 Conclusion

This main objective of the thesis topic is to find out a suitable commercialization strategy for a research based telemedicine product Erdusyk. The main research question is formulated as per the objective. The question is further divided into three sub-questions in order to provide the comprehensiveness to the question. Using both the qualitative and quantitative research methods, the paper answers the questions. The paper begins by defining the innovation, its values, the market, and the industry the innovation will compete in. Based on the information from the initial section, market study is conducted. Data on market study were gathered from a questionnaire survey, semi-structured interviews and secondary data. Finally, the business plan on how to actually enter the market is proposed based on the market study and innovation study. The three sections are interrelated and collectively propose a strategy for moving the innovation forward and entering the market.

The innovation study is carried out based on the idea evaluation model of Alänge & Lundqvist's (2014). The sub-research question of finding out the innovation level of Erdusyk and the value propositions for potential users is answered using the innovation classification proposed by Garcia & Calantone (2002) and by Thomond, Herzberg & Lettice (2003) and Dosi (1982). In response to the sub-question for the section, the innovation was categorized as a really new innovation and as an Incremental-Disruptive based on the framework of Garcia & Calantone (2002) and of Thomond, Herzberg & Lettice (2003) and Dosi (1982) respectively. It spares patients of the difficulty of travelling to doctor's office when ill, and fulfills their need for epidemiological information about disease. Many people do not like to waste a lot of time at

clinics, wait in the queue, and perform physical transportation when they are unwell. By substituting unwarranted physical consultations by electronic ones, it eliminates the problems thus creating the customer value. Similarly, it has some values for the society as well such that people might be able to detect epidemics early and thus treat them early. That might lower the health expenses for government and better health security of local people. Similarly, the idea has a business value so as to develop monetary benefits for investors. Though, the idea will need substantial investment in initial few years, it has a potential for significant income in the future creating a good prospect for investors to invest their money in.

The sub-research question for the market study was whether there was a real market potential for Erdusyk and which market strategy will lead to successful commercialization. Based on the results from the questionnaire survey, a significant proportion of people are found willing to try the service out and pay for the technology. Out 145 respondents, 112 were willing to try electronic-consultation and 89 said they were ready to pay. Also, 63% of respondents were interested in knowing whether other people had similar problems at that particular point of time when they were sick. The statistics shows that people are willing to try the product thus proving the market potential. The market entry strategy is influenced by the innovation type the innovation represents. Moore's (2014) idea of crossing the chasm is used in selection of the target customers. Handicapped and Chronic patients will be the initial target customers for the idea. After the competitive scenario evaluation, PEST and SWOT analysis are used for the environmental analysis. The economic status of Norwegian population is well off to use the product and the technological aspect is equally as favorable. Though there are some skeptics, the social context is favorable too. The rule regarding the salary of doctors is one of the ingredients in political environment that negatively affects the idea though there are ways to work around the rule. Hence, real market potential was found to exist and that chronic and handicapped people should be targeted as a target group for safer market entry.

The business plan employed here is a customization of many different frameworks available. Overall, it consists of the problem and the solution, value propositions, the team, market forces, business model, market strategy, action plans, financial evaluation, risk analysis and an exit strategy for the proposed business. It was found out that the doctors are the important members of value chain and thus there is a need to make collaboration with them. The product is offered to

patients as a subscription or as a stand-alone product. People pay for the service charge in excess to the normal consultation fee that they pay to the doctors. The technology was devised by the research institute based in Tromsø and has already begun the infrastructure installation process in Tromsø. Due to the geographical proximity, existing networks, and significant population, Service will be first offered in Tromsø. The service will then be offered in Troms and Finnmark and then in Oslo followed by the counties with highest population. The service will be developed full-fledged in five year's time. The company has a significant business value but lacks sufficient capital to start and run for first few years where the cash flow is negative. For the company to stay cash positive and make necessary investments for the infrastructures in the initial years, capital is needed. The investment capital of 15 million is summoned in exchange for 30 % ownership of the firm.

2. Innovation Study

The aim of this chapter is to present and analyze the technical aspects of the invention. This chapter is guided by the following sub-research question "*What is the innovation level of Erdusyk and what value propositions does it provide to the potential users?*" Following the idea evaluation model of Alänge & Lundqvist (2014), this chapter describes the technical details of Erdusyk and discusses the values it will provide to the market. After that, assessment of the utility potential as well as discovery of the innovativeness of the invention is done. First, the description of Erdusyk provides insights into its functional capabilities and technical characteristics. Then the utilities of the innovation are discussed. The technical description and the utilities will provide provide information on the nature of innovation involved. Finally, the innovation is positioned on a scale of innovativeness based on its significant attributes.

2.1 Innovation Theory

"Innovation is an iterative process initiated by the perception of a new market and/or new service opportunity for a technology based invention which leads to development, production, and marketing tasks striving for the commercial success of the invention" (OECD, 1991). According to Garcia & Calantone (2002), this definition addresses two important distinctions: 1) the 'innovation' process comprises both the technological development of an invention and the market introduction of that invention to end-users through adoption and diffusion, and 2) the innovation process is iterative in nature and thus, includes the first introduction of a new innovation and the reintroduction of an improved innovation.

There has been a large amount of research on innovation and as much number of innovation typologies has been introduced. Radical, incremental, disruptive, sustaining, revolutionary, continuous, discontinuous, imitative are some of the typologies used in the research that have often created confusion in the innovation literature. Due to the different constructs used by different researchers, inconsistencies often take place while comparing firms. Garcia & Calantone (2002) have made it easier by associating the forms of innovation with correct typologies. They categorize the innovation types as radical, really new, discontinuous, incremental and imitative.

Radical innovations have been defined as innovations that embody a new *technology* that results in a new *market infrastructure* and results in discontinuities on both *industry or market level* (macro level) and *firm and customer level* (micro level). Radical innovations often do not address a recognized demand but instead create a demand previously unrecognized by the consumer. This new demand cultivates new industries with new competitors, firms, distribution channels, and new marketing activities. According to Garcia & Calantone (2002), *radical innovations* are innovations that cause marketing and technological discontinuities on both macro and micro-level. In contrast, *incremental innovations* cause a marketing and/or technological discontinuity on micro level but not on macro level. *Really new innovations* consist of the largest frequency of innovation and cover the combinations in between these two extremes except the discontinuity in both marketing and technology in macro level. *Discontinuous innovations* refer to the innovations that cause discontinuity in the *technology* irrespective of the market (O'Connor, 1998; Tushman & Anderson, 1986). So, a discontinuous innovation can yet be a radical or a really new innovation based on whether the technological discontinuity is caused at macro or micro level together with the position of market discontinuity. Finally, *imitative innovations* are those innovations that rival the innovation of the first company to develop R&D and successfully commercialize it. These are usually incremental innovations and rarely really new (Garcia & Calantone, 2002). The invention will be evaluated based on these classifications.

2.2 The Invention "Erdusyk?"

Erdusyk.no is primarily a disease query engine (DQE) with epidemiological search equipped with a platform for e-consultation. The invention was done by a research group called Snow at Norwegian center for Integrated Care and Telemedicine (NST), Tromsø, Norway. The disease query engine (DQE) provides people with a search engine where people enter their symptoms and get suggestions on possible disease they might have caught. The general concept behind this service is to provide people who get ill with relevant and quality information in order to assist in decision making regarding the treatment of illness and the doctor's visit. It makes use of the epidemiological database for retrieval of information of diseases based on symptoms elicited by patients and provides facility for e-consultation for the people who need it. The epidemiology contains information from patient's EHR (electronic health records) at General Physician's

offices, from search hits at DQE itself and from Lab Information System at Microbiology labs. The e-consultation will be in the form of text, audio or video interaction between the doctor and the patient. Currently it is a website and will also be designed as a phone application. ‘Er du syk?’ means ‘are you ill?’ in Norwegian and for now the DQE is targeted for the Norwegian market. The product is available at https://www.erdusyk.no. The invention has following features;

2.2.1 Disease Query Engine

Disease query engine as the name implies is a search engine that serves for disease detection. Disease Query Engine, often abbreviated as DQE, matches the sets of symptoms elicited by the users to the disease information stored in a database and informs the possible disease caught by the user with that set of symptoms.

Bellika, Marco & Wynn (2014) have developed a prototype of a disease query engine (DQE), that matches symptom sets (technically known as query vector) to diseases (technically known as disease vectors) based on the daily updated data about communicable diseases in some of the municipalities of Nordland, Troms and Finnmark counties in Northern Norway. The prototype of the DQE is available at Erdusyk.no. Using Bayes’ theorem, the DQE calculates the disease likelihood based on the symptoms set and disease vectors (see appendix for Bayes’ theorem).

2.2.2 Electronic Consultation

Commonly an electronic consultation is the process of using the internet to ask the public their opinion on one or more specific topics while also allowing for discussion between participants (E-consultation.org). In telemedicine process, e-consult refers to a mechanism that helps primary care providers (PCPs) to obtain specialist’s inputs for a care treatment of patients eliminating the need for the patients to have a face-to-face visit.

However, the scope of e-consultation extends more than the interaction between primary care providers and the specialists. In this case the use of e-consultation is being proposed for the primary care the patients receive from their general physician (GP). Erdusyk will, in addition to the Disease Query Engine, provide infrastructure for e-consultation with the GP. The

consultation can be in the form of text, audio or video form. It will supposedly spare patients with the hassle of having to physically travel to doctors since it is especially inconvenient to do that when they are sick.

2.2.3 Epidemiological Model

According to Porta et al. (2014), epidemiology refers to the study of the distribution and determinants of health-related states or events in specified population, and the application of this study to the control of health problems. Erdusyk provides, to users, medical information relevant to their disease search based on the distribution of similar problems in specific population group in specific geographical area. For example, if somebody shows symptoms of a particular flu, then Erdusyk will detect the population that have reported with similar problem and the preventive measures taken by them. That way, several communicable diseases can be detected early and also users will have access to medical information that assist in decision making related to the treatment. The epidemiological model makes a huge impact on the disease diagnosis process and thus is an important part of the disease query engine.

2.3 Technology Underlying the Invention

2.3.1 Mini Computer (Appliance Box)

For the possibility of existence of disease query engine based on epidemiological model with e-consultation, there is a need to set up an infrastructure that links all the doctors and microbiology labs and the users. The infrastructure needs to be such that it collects epidemiological data from all the health institutions, does the statistical processing and creates epidemiological information regularly. Also, the infrastructure needs to be able to create contact between patients and doctors for e-consultation. To do all that, minicomputers (often known as appliance box) containing special software as well as virtual ones is used.

The minicomputer (or the appliance box) is basically a barebone, small form factor Personal Computer. It is basically a computer. It is pretty small, about the size of an external hard drive, although some are even smaller. Despite its size, it has as much power and capability as a regular desktop. The computer only comes with the case, motherboard, and the CPU. Everything else

needs to be purchased separately and then installed. It is referred to as the appliance box in this paper.

Figure 1: A typical microcomputer used by Erdusyk

All the Software that are responsible for doing the actual work will be pre installed in the appliance boxes. The boxes are then shipped to the GP offices and health institutions. The GP offices and other health institutions have to plug the device into their Information Technology system. The more health institutions set up the device, the better is the epidemiological information and disease query engine and larger is the scale of e-consultation. The target is to set up the boxes in as many institutions as possible. Once the device is plugged into the system, it will automatically start to extract the necessary information and generate epidemiological information. There are two software installed in the appliance box viz. Snow and Emnet. Snow is clinical informatics software created by SNOW research group at NST. It performs tasks of extracting information from the local server at GP offices and health institutions, storing the epidemiological information on appliance boxes and coordinating the computations across appliance boxes from many health institutions. Similarly, Emnet is statistical processing software that performs the statistical calculations to yield the epidemiological information.

2.3.2 Technical Architecture

The technical architecture of the process of data extraction and use for the creation of epidemiology and the functioning of disease query engine is depicted hereby;

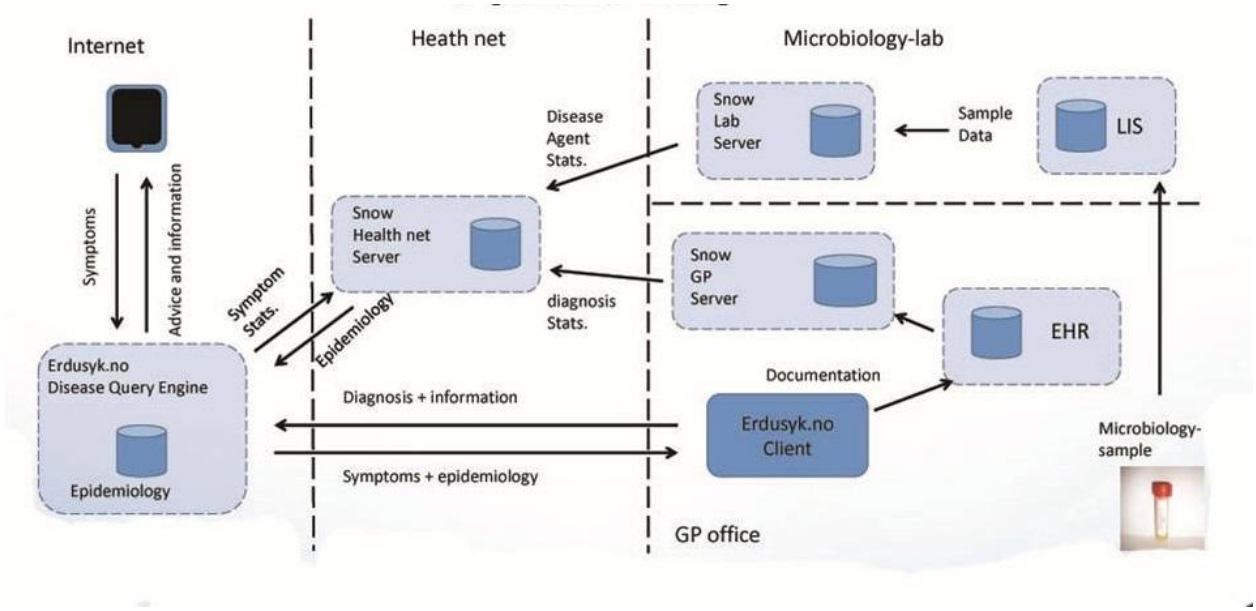

Figure 2: Technical architecture behind the functioning of Erdusyk

The figure above shows a GP office, a microbiology lab, the internet and the health net separated from one another by firewalls. Appliance boxes with snow server are installed in both the GP office and the lab. Snow server inside the appliance box extracts data from the Electronic Health Records (EHR) in GP offices and from the Lab Information System (LIS) in microbiology labs. The data from GP offices provides statistics about disease diagnosis while that from lab provides statistics of disease agents (eg. bacteria, virus, etc.). Similarly, the disease queries made by people through the disease query engine provide the statistics of symptoms from general public. The combination of the three statistics forms epidemiological information at health net server. That epidemiological information about disease diagnosis, disease agent and the disease symptoms are provided to the users who perform the disease search through the disease query engine. Similarly, for the e-consultation, people send in their symptoms as well as epidemiological information to doctor and get back diagnostic information. Every individual diagnostic case, irrespective of whether or not it is an e-consultation, is documented and stored as EHR by doctor. Similarly, the microbiology lab stores information of disease agents for every microbiology sample taken from patients. The epidemiological information computed by health net server is updated with increasing number of cases.

Thus, when someone puts in a disease query through Erdusyk.no, the disease query engine automatically searches the updated epidemiological information from previous symptom searches, disease agent statistics and disease diagnosis statistics and provides the information on how many other people performed search with similar problems, what actions did they take and the most possible diagnosis for the set of symptoms.

2.3.3 The Graphic Interface

The home page of Erdusyk consists of a panel on the top that gives information about Erdusyk and directs to the page for health personnel. The main body consists of tabs that help to create a new disease search or to retrieve a disease search done by the user in the past. The home page looks like as follows;

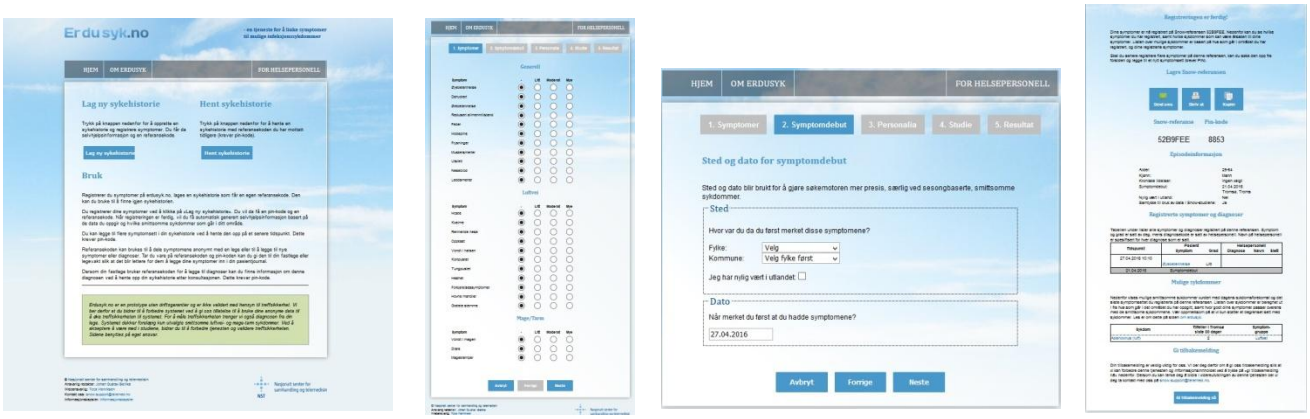

Figure 3: Erdusyk pages

The first figure above is the home page. The symptom checking page, the second figure, consists of a list of many symptoms related to different parts of the body. Users choose, from the list of symptoms, the symptoms that they are experiencing. After confirming the date and the place of the occurrence of the symptoms, the page with the confirmation of registry appears. The page consists of a snow reference code and a pin code so as to trace the search history by the same user. There is an option to receive the code through SMS or print out the page. The page consists of the symptoms searched for, the information put in, the disease predictions and the epidemiological information about the disease. The confirmation page looks like the last figure above.

2.4 Limitation of Invention

The main drawback of the innovation is the need to collaborate with the doctors and other healthcare institutions. The appliance boxes need to be set up in healthcare institutions for the production of epidemiological information and for e-consultation. Similarly, there's a need to set up as many boxes as possible for better epidemiological results and substantial market. The entire idea is dependent upon the consent of those institutions. They own the data that is required for the creation of epidemiology. Whether or not they want to provide the data is a serious question. Also, a question of trust arises such that the healthcare institutions need to trust the firm so as to allow it to connect the appliance box to their information technology system and extract data from it.

The service needs internet connection for the users to be able to use the product. The technical architecture puts the data as close to the owners (GP offices) as possible. Unlike a single server for entire data, this method is much safer but it requires the use of the data extraction and processing tool at every data source. That makes it necessary to install the computer boxes at every healthcare institution.

2.5 Intellectual Property Protection

Software is non-patentable in Norway. Erdusyk needs a domain name protection as it is a web-based product to be available under the same name. Design rights protect the design of any aspect of the shape or functional elements of design or configuration. Design protection is obtained automatically as soon as the design is published and thus there is no need to register the design (Davis, 2008). Another option for the structural control is trademark. Trademark is usually a sign that indicates the origin of goods or services that it is assigned to. It is quite valuable for quality as it provides competitive advantage and differentiation for the company (Davis, 2008). Trademark contributes significantly to the product differentiation for Erdusyk and strengthens the company values.

2.6 Current Status of the Technology and Next Steps

Currently, the Disease Query Engine contains the disease vectors for respiratory and gastro-intestinal diseases. There is a need to create the disease vectors for all the existing diseases and

link the symptom sets to the vectors. There is a need to debug the software with every change made to ensure that it is free of problems. Similarly, the computer boxes have already been set up in some of the GP offices in Tromsø and Finnmark. The next step is to try to set up the boxes in as many GP offices as possible throughout Norway.

2.7 Value Visions

According to Alänge & Lundqvist (2014), identification of customer, societal and business utilities is an important step towards determining the value visions of a technology for its different situations of use. The utilities of a technology from the three perspectives set the overall value of the technology. The three utilities of the technology are discussed hereby.

2.7.1 Customer Utility

People may have considerable difficulty in travelling to doctor's office when ill. Many times, people have to travel to the doctor's clinic for meetings just to get little information or for follow-ups that can be done through telephone or an email or through video conferencing. Many people do not like to waste a lot of time at clinics, wait in the queue, and perform physical transportation when they are unwell. It is not always necessary to visit the doctor physically for minor disease confirmations, referrals, sick leave, medicine prescription and the likes. The pain is even larger for handicapped people and chronic patients because they have considerable difficulty in movement and that is even more so when they are sick. This pain is alleviated by the e-consultation service. The chance of transmission of diseases from people to people at hospital's lobby is decreased as well. Similarly, when people get sick, they want to know whether other people are having similar problem or not, and what measures are they taking. That information is much helpful for people when they develop some symptoms for the first time and want to know how they got it and what to expect from it. That way they can take some immediate decisions on their case; from what remedies to take to whether or not to see the doctor right away.

The epidemiological information provides GPs with diagnostic decision support system which is quite important for doctors. It also disseminates procedural information among doctors which are

are of significant value to doctors. Also, the chances of disease transmission are lowered from patients to doctors.

2.7.2 Societal Utility

The installation of box and extraction of epidemiological information could help create disease surveillance system and epidemic outbreak detection system so that major epidemic outbreaks could be detected timely and preventive measures could be taken. This way the impact of huge epidemics could be mitigated and in some cases even avoided. That would mean lower health expenses for government and better health security of local people. People have better medical information at their disposal. The epidemiological information is useful for many research organizations that are working in philanthropic directions concerning people's health. It also decreases wastage of resources in healthcare activities that can be done economically; for example an electronic consultation in place of a physical consultation. The commercialization of a telemedicine research, leads to creation of funds for further research in improving healthcare.

2.7.3 Business Utility

The invention has been seen to have utility for customers. The market study showed that people have difficulty travelling to doctor's office when sick and are willing to try e-consultation and also want to know whether other people have similar problem or not (see market study section 3.2.1). People are also willing to pay for it and have the technology required to do so. The Disease Query Engine and epidemiological data extraction and computation infrastructures are already developed. The programs have been installed in appliance boxes and tested. The idea has a business potential and ability to create value for investors. The business utility is comprehensively explained in the business plan section 4 below.

2.8 Competing Technologies

This section compares the needs of the people and the competitive offerings made in the market. Based on the study, there is no other technology around the globe that provides the combined service of health information, disease query engine and e-consultation. There are some world leaders in medical information providers in the competitive scenario such as mayoclinic, webmd and drugs.com but they do not offer epidemiological information for the disease query. None of

the disease query engine provides epidemiological search. The epidemiological information that Erdusyk.no has is unprecedented and it is updated in daily basis that makes it quite useful and makes the diagnosis more meaningful. Also, there is no service that provides e-consultation in the form of text, audio and video with the personal GP. Some of the GP offices have telephone query facility but that is not too appreciated by doctors. Some of the websites provide the facility only in the form of text. The consultation that they provide is not with the personal GP that makes it even undesirable. Helsenorge.no is one online health service provider that provides information on booking appointments, receiving prescriptions, conducting an e-consultation and having contact with the GP office if the GP provides such facilities and has made the information available at helsenorge.no. Under Helsenorge.no, the government is trying to build a central database called 'kjernejournal' that stores every person's health records in a single server. However, that approach is vulnerable to misuse and might jeopardize the security of people's private information. It needs doctors to store every patient's information in the server per every consultation. Similarly, storing in a single server needs some encryption of data and it is not possible to reuse the data for other purposes in the future.

Table 1: Comparative analysis of some competitors of Erdusyk

	Symptom checker	Epidemiology search	Daily updated epidemiology model	Electronic consultation	Meeting with own GP	Free health information
Erdusyk.no	✓	✓	✓	✓	✓	✓
Nettlegevakt.no	✗	✗	✗	✓	✗	✓
NHI.no	✗	✗	✗	✗	✗	✓
Onlinelege.no	✗	✗	✗	✓	✗	✓
Legehandboka.no	✗	✗	✗	✗	✗	✓
Helsenorge.no	✗	✗	✗	✓	✓	✓

As shown in the figure above, none of the firms provide the entirety of services as Erdusyk. Conclusively, it can be said that the offerings made by Erdusyk is quite original and the competition is quite weak. No other firm is offering the entirety of service that erdusyk is offering. In that respect, Erdusyk is more of a first mover and can enjoy the significant market occupancy and technological leadership if successful.

2.9 Positioning of the Innovation

Not all innovations are of similar nature and intensity. Some innovations are quite shallow and are just marginal improvements to existing technology/market while others are rather radical and develop new technologies and markets much different than the existing ones (Garcia & Calantone, 2002). The different innovations have different impact on the market and the industry and are perceived differently by the customers. So, there is a need to build different infrastructures for successful commercialization of these innovations. That demands for different actions and orientations. Consequently, there is a need to follow different strategies for commercialization of different innovation types (Kassicieh et al., 2002). This section attempts to determine the type of innovation involved in Erdusyk. This will help to further identify the challenges and opportunities in the market involved with the product.

According to Thomond, Herzberg, & Lettice (2003), disruptive innovations allow organizations to transfer the demand and needs of markets. So, disruptiveness depicts the degree of market discontinuity. According to Dosi (1982), radical innovation breaks the continuity of existing technological paradigms and sets the stage for new technological trajectories. So, the measure of how radical an innovation is, in this perspective, the degree of technological discontinuity. Following this construct innovations are classified as radical or incremental based on the discontinuity brought by the innovation on technology or knowledge and as sustaining and disruptive based on the discontinuity brought on the market. That way an innovation typology matrix was created classifying the innovation as radical-disruptive for high discontinuity in both technology and market, radical-sustaining for high discontinuity in technology but low in market, incremental-disruptive for low discontinuity in technology but high in market and finally incremental-sustaining for low discontinuity in both technology and market.

The above architecture could, however, be included within the classification of Garcia & Calantone (2002) as described in section 2.1. The radical-sustaining in this case is quite similar to the radical innovation illustrated in the above paragraph since it depicts higher degree of discontinuity in both technology and market. Similarly the incremental-sustaining mentioned here is similar to incremental innovation above since the discontinuity is quite low in both the cases. Finally, the other two radical-sustaining and incremental-disruptive are similar to really new innovations discussed above since there is discontinuity in only one of market or technology component.

The technology that the appliance box uses for performing the disease query and the epidemiological computation is quite innovative. But the technological expertise that is required for the e-consultation is not a big innovation. On the technology front, the innovation lies somewhere in the middle of incremental-radical innovation scale weighing higher towards the *incremental* side. The innovation requires acquiring a group of people who are willing to use the technology and pay for using it. There are people using technology in Norway to make health related inquiries and there are very few GP offices in Norway that provide similar service. So, there is a large group of potential customers who have not used the technology for such purpose nonetheless has little information about such possibility. There is a need to formulate a business model to target that market that does not have significant prior knowledge or concern towards a technology like this. So, the innovation in market is slightly *disruptive.*

Similarly the e-consultation and epidemiological disease query practice hasn't been applied in the GP offices in Norway. The innovation brings about discontinuity in technology and market infrastructure at micro level i.e. in the firm and customer level. Most of the customers and firms have not used it yet and thus it will be quite new experience for both. However, the innovation also is expected to bring in some discontinuity in market infrastructures in industry level. Its utility is going to be a new endeavor for Norway in health industry since it has very few users until now. According to Garcia & Calantone (2002)'s classification, the innovation falls under *really new innovation* type due to the discontinuity it brings in the marketing infrastructures at micro and macro level. Considering all the information, the innovation involved in Erdusyk can be positioned as shown in the innovation chart below;

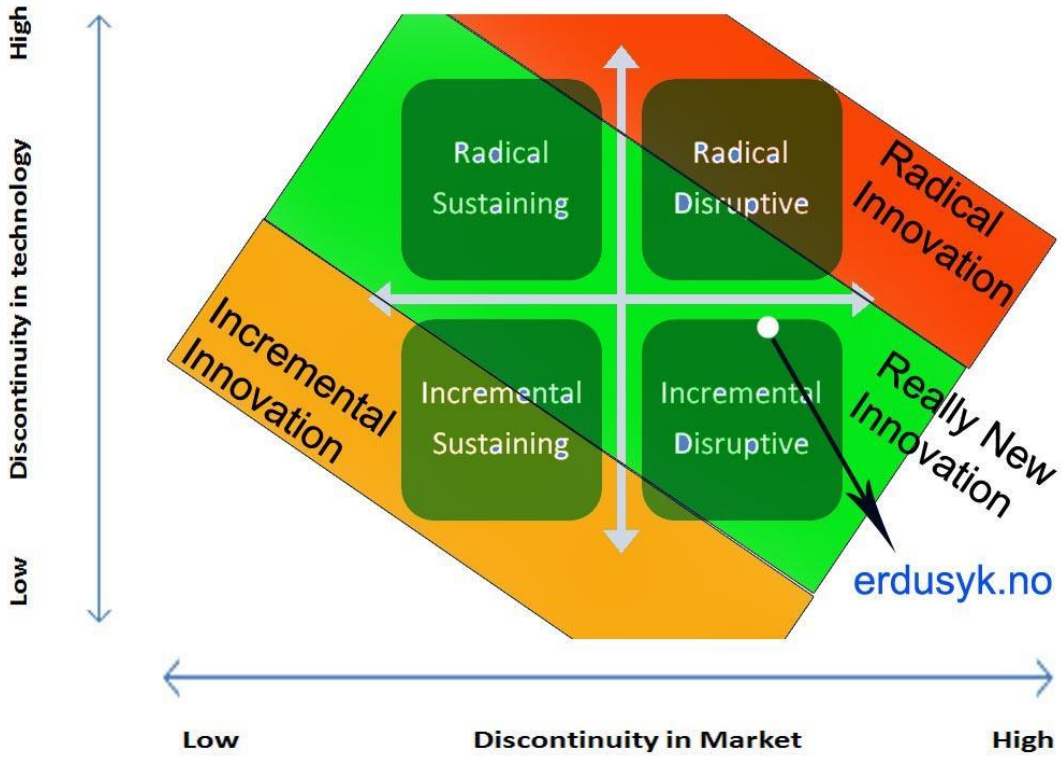

Figure 4: Positioning of the innovation

When a new disruptive target enters the market, it follows a certain pattern of adoption by the customers. The old technology adoption life cycle model consists of a smooth bell curve having customers of high-tech products, progressing from Innovators, Early Adopters, Early Majority, Late Majority, and Laggards. Moore (2014) has revised the old curve with a new model that has cracks between the customer groups. The largest crack is between the early adopters and early Majority which he also calls "the chasm". (See appendix for the technology Life Cycle Model). According to him, many companies fail to cross the chasm while trying to sell a disruptive product to the mainstream customers. Erdusyk is a really new product and has a bit of disruptiveness and thus will struggle to make the leap over the chasm. The early adopters are visionaries and might accept the product. But there are really few early adopters and thus the chasm needs to be crossed to reach the mainstream market.

According to Moore (2014), to target that group, one must be patient and be familiar with the issues that dominate their particular business. They should know about the availability of the

product and the utilities and the product should be present at industry-specific conferences and trade shows such customers attend. Thus, Erdusyk needs to be mentioned in articles that run in magazines that such people read. There is a need to have partnerships and alliances with the ones who serve them already (GPs in this case). To cross the chasm, Moore (2014) suggests focusing on a single smaller market, dominate over it and then attack the adjacent segments. Following the same premise, the initial target of Erdusyk is to focus on the handicapped and chronic patients first and then move on to offer the service to adjacent groups.

2.10 Conclusion

Erdusyk has been developed from years of research. The disease query engine and the epidemiological model have already been created. The two make use of the clinical informatics software 'SNOW' and the statistical tool 'Emnet' for the data extraction and computation. The epidemiology is created from the data from disease queries made by patients, health records at GP offices and the disease agent information from the microbiology labs. The interface for e-consultation is yet undecided and there is a need to create a link between the diseases and the information about the diseases for the disease query once the commercialization is started.

The sub-research question for the innovation study is, *"What is the innovation level of Erdusyk and what value propositions does it provide to the potential users?",* and the chapter answers that question.

The technology has values for customers and society and has a business value as well. The technology will eliminate the need for people to physically visit the doctor when the physical consultation is not warranted by substituting physical consultation with an electronic one. That will spare people with the discomfort of travelling when sick, wastage of time, and other problems associated with visiting doctors physically. The epidemiology model will provide the information about other people with similar problem which is of interest to many people. The epidemiological information can be used as a disease diagnosis support system for doctors, disease outbreak detection system useful for doctors, society and government as well.

The technology can be positioned as an *incremental-disruptive innovation* based on Thomond, Herzberg, & Lettice (2003) and Dosi (1982)'s classification. Similarly, it can be positioned as *Really New innovation* under Garcia & Calantone (2002)'s classification based on the technological and market discontinuity brought by the innovation at micro and macro level. The product will strive to increase the proximity with the early majority group through collaboration with GPs and awareness programs through internet and publications. Also, the initial target will be the handicapped and chronic patient group. After that group is captured, offer will be made to other groups in closer proximity to the group. The target groups and the promotional endeavors are elaborated in the following market study chapter.

3. Market Study

3.1 Introduction

The financial success of a company often depends upon the ability of a business to assess market information and use it in order to create leverage or an opportunity in the market (Kotler & Keller, 2009). Thus, to create that leverage and the opportunity, this market study will strive to obtain and assess the market information. This market study will answer following sub-research question: "*Is there a real market potential for Erdusyk and which market strategy will lead to successful commercialization?"* This market study will deal with performing an analysis of the market the company will operate in find out the market potential for Erdusyk. That, in turn, will provide an idea on how to enter the market in best possible way leading to development of a market strategy. This paper will first briefly describe the innovation, and then go for an analysis of the market the innovation will operate in. The analysis will determine the market size, growth potential and an understanding of customers, competitive scenario, market trends and the environmental impact. After the analysis is done, market strategies are formulated based on all the position of the product in the market.

3.1.1 Description of the Innovation - Erdusyk

Erdusyk is primarily a disease query engine (DQE) equipped with a facility for e-consultation. The disease query engine (DQE) provides people with a search engine where people enter their symptoms and get suggestions on possible diseases they might have caught. The general concept behind this service is to provide people who get ill with relevant and quality information in order to assist in decision making regarding the treatment of illness and the doctor's visit. It makes use of the epidemiological database for retrieval of information of diseases based on symptoms elicited by patients and provides facility for e-consultation for the people who need it. The epidemiology contains information from patient's EHR (electronic health records) at General Practitioner's offices, people's searches at DQE and Lab Information System at Microbiology labs. The e-consultation can be in the form of text, audio or video interaction between the doctor and the patient. Currently it is a website and will also be designed as a phone application. 'Er du syk?' means 'are you ill?' in Norwegian and for now the DQE is targeted for Norwegian market.

3.1.2 Healthcare System in Norway

The Norwegian healthcare system is well portrayed as a decentralized national health service (NHS). The fundamental aim of NHS is to provide all the residents with equal access to health services, irrespective of their location, gender, age, or financial status, and also to prioritize those who have the greatest need (Mørland, Ringard, & Røttingen, 2010).

All the people in Norway are assigned to general physicians. Everybody is assigned to general practitioners who become their personal doctor. They are commonly referred to as GPs or personal doctors. When people are unwell they usually book for an appointment with their personal doctor first. So, the patient's first contact with the health care system is usually through a GP (Bellika, Hasvold, & Hartvigsen, 2007b). General practitioners and nursing care are referred to a primary care services for patients. The 430 municipalities in Norway take responsibility for providing all the residents with these primary cares.

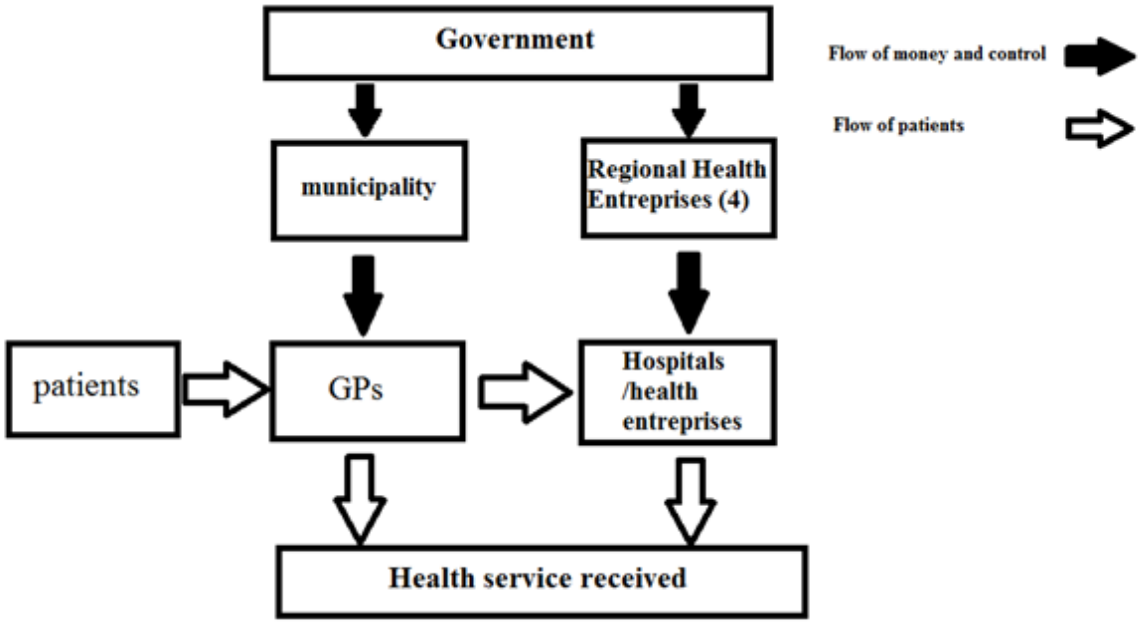

Figure 5: Structure of Health care system in Norway

The GP performs all the diagnosis and takes measures to cure it. However if the GP determines that a person needs further tests or deeper attention then the person is sent to a specialized doctor, a laboratory or a regional hospital based on the case at hand. After the reforms in 2002, it has

also been a responsibility of the state to provide the specialist care. This responsibility has been delegated to four regional health authorities (RHAs). They control all the hospitals and health enterprises in their corresponding regions (Mørland, Ringard, & Røttingen, 2010). According to Mørland, Ringard, & Rottingen (2010), there are 23 health enterprises and hospitals under the control of the four regional health enterprises.

3.2 Market Study

3.2.1. Customer Analysis

Customer analysis identifies target customers, ascertains the needs of these customers, and then specifies how the product satisfies these needs. Customer analysis is a critical part of the market study that pinpoints exactly who the customers are, what they need, what drives their decision-making and how the product meets their needs. According to Kotler & keller (2009), the aim of marketing is to meet and satisfy target customer's needs and wants better than competitors. Through customer analysis, we look for the customer trends that suggest newer marketing opportunities. Customer analysis deals with understanding customers i.e., gaining a 360-degree view of both their daily lives and the changes that occur during their lifetimes so that right products are marketed to the right customers in the right way (Kotler & Keller, 2009).

The medical system in Norway is a gatekeeper system. It is so in the sense that the admission to the system is gained normally through the personal doctor or GP who acts as a gatekeeper. A patient enters into the system through his/her GP. About 800-1200 people are assigned to a GP whose responsibility is to take care of the health of those people. The responsibility of so many people's health to limited GPs can sometimes make it harder for many people to get health service in time. In the study of seven countries of Europe, Andreassen et al, (2007) found that 46% of people use information on internet to decide whether or not to see a doctor. The study suggests that the information that people read on the internet might influence the number of patients visiting the doctor thus making it harder and easier for other people to receive timely health service.

Many people feel it uncomfortable to physically travel to doctor's office when they are sick. The questionnaire study conducted for this study shows that almost 53% of the respondents felt it

uncomfortable and 9% very uncomfortable to travel to the doctor's office when they are sick (Refer to appendix. 2). Similarly, substantial population (about 40%) believes that they are dissatisfied with the late appointment date they receive for consultation. Similarly, 34.8% people have concerns about the time consumed during the treatment process. People are concerned about having to spend a lot of their time from booking the appointment, to travelling up to the GP office and waiting for their turn. So a need for a service that could eliminate the difficulty of travelling and wastage of time waiting in the clinic's lobby exists. Similarly, substantial population of Norway seeks health information available in the internet while it is sick. However, many people have concerns over the authenticity of the information and credibility of the service provider. It is also common for people to try to know if there are other people at the moment who have got similar problem as them. It is also backed up by the response received from the study that shows about 63% of people wanting to know if other people have caught similar diseases.

Erdusyk will provide a DQE as well as an e-consultation facility to the users. So information was collected from patients chiefly relating to their search of health information and their perception towards e-consultation. 145 people were asked whether or not they used internet to read medical information when they were sick. 75.9% of the respondents replied affirmatively further justifying the previous findings. So it is safe to assume that a lot of people would be willing to get access to the information that serve their requirements related to health. It was also seen that for almost 76% of the population, there was no specific source of health information search. A few of them used Google to search for diseases and few others had two or three websites that they chose to obtain the information from. Almost 62% said they were somewhat satisfied with the services and information they were receiving in the internet followed by 18% who were not so satisfied. It was also reported that almost 70% of respondents were skeptic towards the information provider. They had some qualms about the credibility of the information provider. 45.6% people have doubts about the validity of the information and 36.7% of people believe that a large share of information displayed on the screen is irrelevant.

Based on the above information, it is safe to assume that people value a service that provides precise health information based on their disease condition, that provides information on whether

other people have similar condition at the moment and that provides facility for e-consultation. Erdusyk combines all those services in a single bundle and offers the complete service to the people. The service is unprecedented in the market. Considering the amount of discontinuity the product brings in the market and the technology, the innovation involved in the product is classified as *really new* or *incremental-disruptive*.

When a high-tech product disruptive to the market is introduced, the adoption of the product is done by Innovators, Early Adopters, Early Majority, Late Majority, and finally Laggards in that order. Moore (2014) suggests that there is a huge gap between early adopters and early majority. Early adopters are visionary and very few in number. Early majority are more skeptic and large in number. Early majority group is where the real dollars are and thus there is a need to cross the gap. The gap is quite huge and a lot of companies fail to cross it. Moore (2014) refers to the gap as "the chasm". To cross the chasm, Moore (2014) suggests targeting a single smaller market segment first, dominate over it and then attack the adjacent segments. During the data collection process, some degree of skepticism was observed in a certain number of people about Erdusyk. Based upon the questionnaire survey, about half the respondents are not ready to substitute a regular consultation with an e-consultation when they are sick. Some people were found to be much critical of the use of such technology in health care system (refer to section 3.2.4.3). In an attempt to cross the "chasm", there is a need to focus on the people in the other side. The research points towards a need to initially focus on smaller groups who might be easy to target and have greater degree of utility for the product. The initial focus would be to satisfy some of their pains. This gives a breakthrough for the product in the market and develops avenues for acceptance of the product by overall market who would want to try e-consultation (77% of the respondents were interested in e-consultation). That way in few years time, Erdusyk could gradually incorporate the 'Early Majority' group.

Some of the patient groups who might have better utility based on the suggestions from my interviews are listed hereby;

- **People needing sick letter from the doctor**: When people are sick and they need a sick letter for the sake of alibi for not coming to work or school, they need to go to emergency

doctors and wait for hours. When people are actually sick, it is inconvenient to go to the doctors and wait for hours to actually get sick letter. In such cases, Erdusyk could play an important role is connecting doctor and patient virtually from home or work.

- **Handicapped people**: These are the people who have trouble with physical movement. The trouble is even bigger when they are sick. Erdusyk can eliminate that difficulty by connecting them to the doctors as well.
- **Chronic patients**: These are the people who need to visit doctors frequently and make frequent reports and consultations. Frequent visits to doctor is difficult physically and even more so when people are sick. Erdusyk can help them by helping exchange information and also render e-consultation.
- **People with social anxiety**: This is a group of people who have an excessive and unreasonable fear of social situations; something that results from a fear of being closely watched, judged, and criticized by others. A person with this problem is afraid that he or she will make mistakes, look bad, and be embarrassed or humiliated in front of others ("Social Anxiety Disorder", 2016). These people do not want to visit to clinics and would be willing to connect to doctors from internet.

There could be many more niches than listed above. Use of Erdusyk for some private doctors, psychologists, research institutes, microbiology labs, etc. were also some suggestions that I received during my study. Initially, the general public was targeted before the market study was done. However, after the data collection and interviews, the bottlenecks and dead-end in the commercialization process begin to appear. The idea seemed to fall apart when it was known that the remuneration system of the GPs would be affected by the use of e-consultation. After expending a considerable time in further research, it was discovered that there was a way to work around the remuneration issue. Selecting a target market needed a good amount of further research on the target market's pains, behaviors, requirements, regulations and the healthcare system for them. Due to a lot of time spent on the remuneration issue, further study on these target segments was not feasible for the project due to time limitations. So, based upon some of the accessible secondary data, chronic and handicapped people were selected as target market for the initial breakthrough. The significant population and potential high value of the technology for

them was the reason for their selection as the target market. The ultimate market however is the entire population having the pain.

There is substantial population with chronic illness all around the world and in Norway. They have a need to visit the doctor frequently and also have needs for frequent tests. Often they also need to carry out some medications or smaller tests at home (for example taking insulin injection at home by diabetic patients) and provide the information to doctors frequently. In doing so, they have to travel to the doctor's clinic for many minor concerns. Doing so is, in itself, an inconvenience they are believed to be willing to get rid of. Communication of minor issues that might occur as often as every day is a huge problem at the moment. For such people, the availability of e-consultation could be of a great value. Similarly, it is quite difficult for handicapped people to move around physically. Having to go to doctor's office when they are sick is even difficult task. The population of handicapped and chronic patients is not too large and not too less and they have quite good utility for Erdusyk service. Hence, these two groups of people will be targeted as the initial target group. They will be the pilot group that will give Erdusyk a good insight about the service. This target group will provide the breakthrough to the service and will open up the avenues to offer service to general public in few more years.

Across 59 countries in various parts of the world, the average prevalence rate of handicapped people in the adult population aged 18 years and over derived from the World Health Survey was 15.6% in 2004 ranging from 11.8% in higher income countries to 18.0% in lower income countries (World Health Organization, 2011). The figure refers to adults who experienced significant functioning difficulties in their everyday lives. Norway being the high income country, the realistic percentage of disabled could be 11.8% of population. Similarly, approximately 4 per cent of the Norwegian population is estimated to have been diagnosed with diabetes (Dzidzonu et al., 2015). Similarly for COPD, most estimates from large-scale studies are between 5% and 10% ("Epidemiology - ERS", 2016). There are many forms of chronic diseases and it is not feasible to access the data at the moment. There is no available data on the population of handicapped and chronic people. Based on the above information, it is believed to be safe to assume the population of handicapped and chronic patients to be about 15%-20% of total population of Norway. For the convenience, it is taken that the total population of

handicapped who have significant difficulty in moving and chronic patients having to visit doctor 10 times or more in a year to be about 18%. That is the target market for the beginning.

3.2.2. Competitor Analysis

Competitor analysis is an assessment of the strengths and weaknesses of current and potential competitors for a certain product or service. It is important for every firm to know its competitors. It is imperative for a firm aiming to provide certain value to customers to know what other firms are providing for that particular need or other similar needs of customer. That way, the firm can formulate a strategy to create an appeal for the customers that is much different from what others are providing. According to Kotler & Keller (2009), building a strong brand in the market requires a keen understanding of competitors and only then marketers can best manage their own brands depending on the market position. The customer analysis involves identifying primary competitors and then ascertaining their strategies, objectives, strengths and weaknesses (Kotler & Keller, 2009).

Based on the market potential review, it has been found out that significant proportion of people are interested to consume a service that has the capability of performing a disease query, providing health information and e-consultation. The next step now is to find out the main players in the market that are providing similar values to the customers. The two main services viz. Disease Query engine and e-consultation will be dealt with in the sections below.

3.2.2.1 Disease Query Engine

There are a lot of websites and phone applications that people are using to obtain medical information. There's a huge amount of information available for people in the internet. However, only a handful of disease query engines exist at the moment. Some of the most popular disease query engines are presented hereby;

Webmd.com: It is a US based health information provider. It has information about almost every disease existing at the moment. Present both as a website and as a mobile application, it has symptom checking facility. It is quite interactive, graphical and easy to use. It also has facilities such as pill identifier, family and pregnancy health news, and forum for people with certain disease to meet and share, and also opportunity for patients to book an appointment with

the doctor. It does not perform the epidemiological search and does not present the epidemiological information however.

Drugs.com: It is a New Zealand based, basically, a Drug information provider hosted from the US. It provides people with a symptom checker, pill identifier, drug interaction checker and some other. Chiefly it provides information about drugs and that is its stronghold. It does not provide the epidemiological information that Erdusyk does.

Isabelhealthcare.com: It has been dubbed as a diagnosis decision support solution for physicians. It is best known for Isabel, a web-based Diagnosis Checklist System, designed to assist clinicians that may have diagnostic doubt or want reassurance on a particular diagnosis. Doctors usually have the diagnostic procedure and a symptom checker does not have a huge value for doctors. It differs from the disease query engine function of Erdusyk which is focused on patients. Along with the symptoms, it also needs patients to enter their geographical areas that modifies search according to the area the patient lives in or has recently travelled from. That way the search is more narrowed. However, the epidemiological information is not provided by it either.

Mayoclinic.org: Mayo is a foundation for medical education and research. It is a huge non-profit organization that has many medical campuses in the US. They have a huge quantity of information about large span of health issues. It contains information about diseases, healthy lifestyles, drugs and supplements and a symptom checker. It also has options for people with certain disease conditions to meet together and share their experiences. It also has a feature for booking appointments online with doctors near the locality of patients. Overall it is a huge service organization that strives to provide as much medical information to general people as possible. It has comprehensive information about various health issues. It does not however, have epidemiological information either.

Healthline.com: It contains information about the diseases, drugs, healthy living, drug identifier and many more. It has option for symptom checking and also connects cancer patients with cancer specialists for a fee. The symptom checker however is not too interactive. It has a list of

symptoms to choose from and provides a long list of possible diseases that follow the symptom. It is hard for patients to know the closeness of the symptom and the diseases. It is not too advanced and interactive in disease query and it does not provide epidemiological information.

Everydayhealth.com: Just like other health information websites, it contains information about several diseases and health conditions, drugs, supplements, healthy living and food and nutrition. It also provides a symptom checker and also searches for medical personnel around the locality of patients for appointment. It provides a pre-recorded video of a doctor who speaks to the users performing symptom check. It does not provide the epidemiological information either.

3.2.2.2 E-consultation

There are several online sites those provide e-consultation in Norway and internationally. Not all health information sites have facility for e-consultation. Some of the most popular websites offering e-consultation are presented hereby.

Telephone/text services in GP offices: Some of the GP offices in Norway provide patients with options to connect to doctors through telephone or through emails. Patients express their problems to doctors through telephones and emails. Patients who need extra tests are summoned to the GP offices, and those who don't, receive the prescription right back.

Helsenorge.no: It provides information about the GP, GP offices and has all the features to choose and change one's personal doctor. It is a government hosted website dedicated to serve people by helping people select desired personal doctor for them. It is known to be trying to set up an interface to store every individual's health records. It is also trying to gather infrastructures for e-consultation. Competitiveness between Erdusyk and Helsenorge.no is discussed further below

Nettlegevakt.no: It provides an internet based doctor service as it proclaims. It is dedicated to treatment of urine infection in women of age group 16-55. For normal doctor's fee, they look at patient's symptoms sent to them via internet and decide on the medication. They create an eResept for pharmacies in the same way as ordinary Doctors. They do not provide any service

for other cases and the doctors are private ones. They only provide e-consultation in the form of text. People do not receive health care from their own GP.

Onlinelege.no: This is a website that is quite dedicated to providing e-consultation. E-consultation is their primary offer to the customers. Paying a fee, people text their problems and conditions to doctors and the doctors respond back with suggestions. The fee depends upon the promptness of the response and privacy of the response. Here, too the people do not get consultation from their own GP. They provide only text form of e-consultation.

Lommelegen.no: In addition to the health information, it provides an option for e-consultation. People can send in their questions to doctors who will respond back for a fee. Both the GPs and experts are available for the consultation. It also however, does not connect the patients to their own GP and they too provide only text form of consultation.

Healthline.com: Has option for getting a second opinion from a top, independent oncologist in an attempt to offer peace of mind, and potentially even save patient's life. It provides, to a paid member of the group, an option to get second opinion about the patient's case from cancer specialists for a fee. It is dedicated for only cancer patients.

Healthanswer.com: It is a website that deals with getting patient's questions up to the doctor for a fee. It provides an option for e-consultation with a doctor where doctors provide answers to different queries of people from all around the world. It is an international internet site and it is probably tougher for doctor to understand the epidemiological information if a patient from different location calls. There's also no own GP involvement there.

3.2.2.3 Competitive Scenario

Some of the players mentioned above will be evaluated on whether or not they provide symptom checker (a Disease Query Engine tool), epidemiological search, facility of e-consultation, updated epidemiology and health information services. These are some of the services that customers are known to value and that make the service better. Some of the major health care service providers and their offerings are compared below.

Table 2: Competitor Comparison

	Symptom checker	Epidemiology search	Daily updated epidemiology model	Electronic consultation	Meeting with own GP	Free health information
Erdusyk.no	✓	✓	✓	✓	✓	✓
Helsenorge.no	✗	✗	✗	✓	✓	✓
Nettlegevakt.no	✗	✗	✗	✓	✗	✓
NHI.no	✗	✗	✗	✗	✗	✓
Onlinelege.no	✗	✗	✗	✓	✗	✓
Legehandboka.no	✗	✗	✗	✗	✗	✓
Webmd.com	✓	✗	✗	✗	✗	✓
Drugs.com	✓	✗	✗	✗	✗	✓
Isabelhealthcare.com	✓	✓	✗	✗	✗	✗
Mayoclinic.org	✓	✗	✗	✗	✗	✓
Healthline.com	✓	✗	✗	✓	✗	✓
Everydayhealth.com	✓	✗	✗	✗	✗	✓
Uptodate.com	✗	✗	✗	✗	✗	✓
NHS.uk	✗	✗	✗	✗	✗	✓
Healthanswer.com	✗	✗	✗	✓	✗	✗

As it can be seen that there are a number of health information providers in the market and each of them has their own forte, it is wise to see which of the competitive players have been offering the values that we aim to offer. There is no other website or an application that provides the combined service of disease query, epidemiological information and e-consultation. As we know, people have need for credible source of precise disease information, people want to know if other people have similar cases and people want to try e-consultation. Erdusyk is the only product that provides all the service. It has been observed that no other competitors are providing the combined service of health information, disease query engine and e-consultation.

There are some world leaders in medical information providers such as mayoclinic, webmd and drugs.com but they do not offer epidemiological information for the disease query. None of the disease query engine provide epidemiological search. Thus, they do not provide information if other people around have similar cases as inquired or not. People would like to know if there are other people searching with similar cases, and what measures they are taking. That information is not available anywhere at the moment. Even though few of them have epidemiological approach in the search, the epidemiological information that they have isn't up-to-date (e.g isabelhealthcare.com). The epidemiological information that Erdusyk has is unprecedented and it is updated in daily basis that makes it quite useful and makes the diagnosis more meaningful.

Also, there is no service that provides e-consultation in the form of text, audio and video with the personal GP. Some of them provide it only in the form of text. The consultation that they provide is not with the personal GP that makes it even undesirable. A private GP needs to understand the patient's history first before the treatment can begin and the process repeats with every consultation with new doctor that makes the consultation even more complicated.

Helsenorge.no is a Norwegian online health service provider that provides information on booking appointments, receiving prescriptions, conducting an e-consultation and having contact with the GP office if the GP provides such facilities and has made the information available at helsenorge.no. It is trying to build something that is closest than the other competitors to what Erdusyk is trying to do. However, Erdusyk has a better infrastructure and efficient ways of performing. Under Helsenorge.no, the government is trying to build a central database called

'kjernejournal' that stores every person's health records in a single server. GP offices own the information of the patients. That approach of storing information in a single reservoir and away from the information owners might be vulnerable to misuse and might jeopardize the security of people's private information. Also, it needs doctors to store every patient's information in the server per every consultation. Similarly, storing in a single server needs some encryption of data and it is not possible to reuse the data for other purposes in the future. It is for these reasons, many GPs might not agree on providing their private information. Under Erdusyk however, the data remains at the owner's location. There is also no need for the doctors to store the data in any external server. Doctors have all the rights over their data and thus the data are more secured.

For the target group, handicapped and chronic patient, it is necessary to have information exchange with their personal doctor without the hassle of travelling to their clinics frequently. E-consultation is the best alternative for them. They could spare the trouble of travelling up to the clinic until the actual need to travel occurs. There is nobody providing that service in Norway for the handicapped and chronic patients.

3.2.3. Market Analysis

Market analysis describes the market for the service as it exists today. Through the market analysis a company can minimize its uncertainties and can lay down the foundations for decisions on market strategy (Burns, 2007; Kotler, Armstrong, Wong, & Saunders, 2008). This section focuses on the macro-level market dynamics such as market size, market growth, and future trends. It describes the electronic health service in Norway at the moment and how it is evolving. Also, this section provides perspective about how favorable the overall market conditions are for Erdusyk at the moment.

Internet has been an important part of life nowadays. Internet has slipped itself into a lot of aspects of daily life. Communication, entertainment, education, health are just some of the aspects of life internet has influenced by a substantial degree. Internet has in the same way created many novel and promising opportunities that wouldn't have been realized otherwise. This shift towards the use of internet in various aspects of life is soon to be diffused in the health service as well. Many entrepreneurs are of the idea that digitization of healthcare service is going

to happen for sure in next 5-10 years. The question is who is going to do it and how. Erdusyk is making an endeavor for the inception of that digitization process.

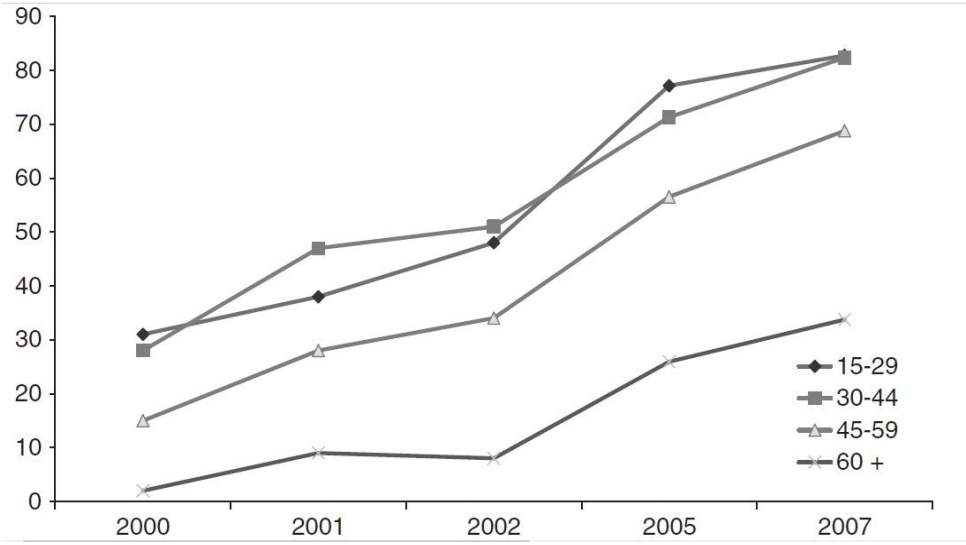

Figure 6: Increase in use of the internet for health purposes in the Norwegian population by age groups (Wangberg et. al. 2009).

A lot of people use internet to collect information about a lot of things and health is not any different. It was also found out that about 80% of the population in Norway uses internet. That is a substantial portion of the overall population. A study by Andreassen et al. (2007) has revealed that almost 74% of internet users in Norway seek health information through the internet. As shown by the figure above, there is an increasing trend of using internet for health related services in Norwegian population. That represents a significant opportunity for internet based health related products that could provide value to people.

The information is also verified by my research where 77% of the respondents have verified that they seek medical information from the internet when they are sick. Almost 3.85 million people in Norway look for medical information when they are sick. There are 63% of respondents wanting to know if other people have caught similar diseases, a need fulfilled by epidemiological data. If that data is to be followed with the assumption that the responses are unbiased, that makes almost 3.15 million people in Norway. A fascinating 77% of respondents are interested in a service that allows them to have an electronic-consultation with their GP. That is 3.85 million people. That includes 3.1 million people (62%) who are willing to pay for that service.

Also, a meager calculation of the population of the handicapped and chronic patients done in the customer's section above is of about 18%. It is assumed that they have greater pains in physical consultation and thus the greater needs for e-consultation. That accounts for 0.9 million people in Norway. SEDA report concludes that just a little under 50% of consultations in Norway have diagnosis of a chronic disease (Brøyn, Nina, Elin, & Inge, 2007). That is a significant number of consultations. However, not all the consultations of chronic patients can be substituted by e-consultation at the moment. When asked about how many consultations can be substituted by e-consultation, a doctor replied, *"It would vary greatly according to the GPs experience and taste how many could be substituted, perhaps 10 to 20%. Only a proper study involving many doctors will give a proper answer."* It is believed that about 20% of all consultations involve those handicapped and chronic patients, whose consultations can be substituted by an e-consultation.

This is a quite novel concept and there is not too much data available on the perception of market. The internet and the communication technology have been more accessible to people now more than ever before. More and more people are using mobile phones and computer for many activities that was previously done physically or in some other way. According to Wangberg et al. (2009), use of the internet for health purposes is growing in the Norwegian population, and so it the importance of the medium as a source of health information. The study by Wangberg et al. (2009) also shows a trend towards a more positive attitude towards future uses of the internet channel for health-related communication and also trading for health-related products. There have been many ideas in the past, some even considered for master's thesis that made use of technology and the internet but were cut short by some technical limitations. Now, such technological hurdles have been crossed and the ideas seem more realistic now. Since, technology and internet are increasingly at customer's disposal, the idea of digital health care is possible now. With the trend of online transaction and online services increasing, electronic consultation is just another click away.

3.2.4. Environmental Analysis

Environmental analysis is a critical tool for strategic marketing. It is a process to identify all the external and internal factors that can affect the performance of an organization. The market changes every day and new things develop over time so that the whole scenario is frequently

changing. Businesses are greatly influenced by the environment they operate in and those environmental factors are quite unpredictable. So, businesses must constantly analyze the environment and the market. According to Kotler & Keller (2009), marketers find many opportunities by evaluating trends and megatrends (changes in the environment that have long-lasting influence).

The primary health care process chiefly involves two parties viz., the patient and the doctors. The utility of Erdusyk can be seen for both the parties. Some of the pains of the patients are eased by Erdusyk but doctors have some benefits from it too. Access to epidemiology is something that helps doctors in diagnostic decision making. Similarly, incidences of transmission of diseases from patients to doctors are substantially low. For that reason, one would assume that doctors would be happy to utilize Erdusyk in treatment process. However, there are some factors that discourage doctors in using Erdusyk. We will have a look at those through an analysis of political, economic, social and technological environment.

3.2.4.1 Political Environment

The regulatory and the remuneration system of GPs in Norway are not conducive enough for the doctors to adopt e-consultation. Doctors receive a certain portion of income from municipality, some portion from the state and rest from the patients per consultation depending upon the nature of consultation. They earn much lesser amount from the state for the e-consultation rather than the normal consultation. Also, there are different regulations for different forms of e-consultation for doctors. One of the doctors who was interviewed had this to say,

It's very odd! If you send me an e-mail and I reply you back then you'd have to pay! If I talk to you on phone then you wouldn't have to pay! But if you send me an e-mail and you want me to send you a letter back then you wouldn't have to pay!

Concerning the video consultation however, there is a different requirement. The doctor said, "*If you and I were in my office and we were talking to a nurse on a video, then it's okay! Or if you were home with the nurse and I was in the office, then that's okay! But if it's only you and me or you, me and another doctor! Then it's different! It's crazy!!.....If I as a GP want to get*

paid for my video consultation, I need to make sure that there's somebody else beside you...could be a nurse, a physiotherapist!"

The consultation performed only between the doctor and patient through video is not included officially in e-consultation and thus in not paid by government. So for the payment of such consultation there needs to be agreement between patient and the doctor on who is going to pay. *"If we decide, you and I, that we do it on video and you pay me, that's okay",* said the doctor.

The political system in Norway is not favorable for the service yet. Even though the government is trying its best to provide medical information through internet and it's actually doing good in that part, it hasn't been aware about the pains of patient who need to travel to doctor's office for cases that they don't have to. The regulation about the e-consultation puts this service into jeopardy.

The doctor further says, "*The reason why is it so is because the government thought that the video consultation would be used when we have meetings with other professionals……what we are working on now is to tell government that this is crazy."*
For that reason, doctors are not quite excited about the use of e-consultation. Without that, the idea will suffer. There is a way to work around the remuneration issue. If a video consultation is summarized in the form of text and an e-mail is used, it will count as a consultation in the form of text and the remuneration issue will not be a problem. For the idea to stand, it is assumed that the way to work around the remuneration issue is possible and accepted.

3.2.4.2 Economic Environment

Norway is one of the richest countries in the world. Government has a welfare fund that takes care of all the residents of the country. Norway has a high per capita income and people have more resource at their disposal for health service than elsewhere. That is even favored by the health service being subsidized by state. People have greater affordability for the newer health service offers.

Medical facility in Norway is to a substantial part state funded. The government of Norway pays almost half the doctor's fee for patient's each consultation with the personal doctor. Patients have to pay about 140 NOK per meeting with doctor. The fee for specialist's service is a bit more at about 310 NOK per meeting. The medical service is free only for children below 16 years of age and pregnant women while the rest have to pay. However, after the patients have paid about 2040 NOK in a year they receive an exemption card for the year and they do not have to pay any more medical charges that year. Economically, the product has little concerns.

3.2.4.3 Social Environment

There was a bit of skepticism noticed in some of the respondents that I talked to during the data collection about e-consultation and the bundle of service that I propose. One person, in particular, was quite vocal about it and said, "*Probably such sensitive health issues should not be touched and not made a business out of*." The person even declined to participate in the questionnaire survey. So, even though there are a significant number of people who have trouble with the current healthcare system in Norway, not everyone is ready to adopt electronic health care system as proposed by Erdusyk. Reports also show however that there are almost half the people who would want to substitute a real consultation with a virtual one. People in Norway are particular touchy about their privacy issues which Erdusyk has no problem taking care of. All in all people are more inclined towards accepting such service.

3.2.4.4 Technological Environment

The technological development at the moment makes Erdusyk more possible now than ever before. Due to the high per capita income in Norway, people have quite high and rapid adoption of new technologies. It is believed that the mobile phone penetration in the Norwegian market is almost close to 100%. Similar percentage of population owns a computer. Regarding technological development within the healthcare system, it is found out that 98% of the Norwegian GP uses a computer and 87% have a disposal to Internet connection (International telecommunication union, 2004). That data is quite old and the disposal to internet and the fact of owning a computer could be as close as 100% now. Technologically, this space-time is well furnished for the idea to be implemented.

SWOT

From all the factors related to the product, it is now quite important to locate where Erdusyk is and what is the way forward. The first step in the process is to create a SWOT analysis. SWOT analysis is a tool that helps us to recognize business' strength and weaknesses as well as the opportunities and risks posited by the environment upon the business. The strengths and weaknesses are identified by an internal appraisal of the organization and the opportunities and threats by an external appraisal. After identifying these factors, strategies are developed which will build on the strengths, eliminate the weaknesses, exploit the opportunities and counter the threats (Dyson, 2004). SWOT map is illustrated in the figure below.

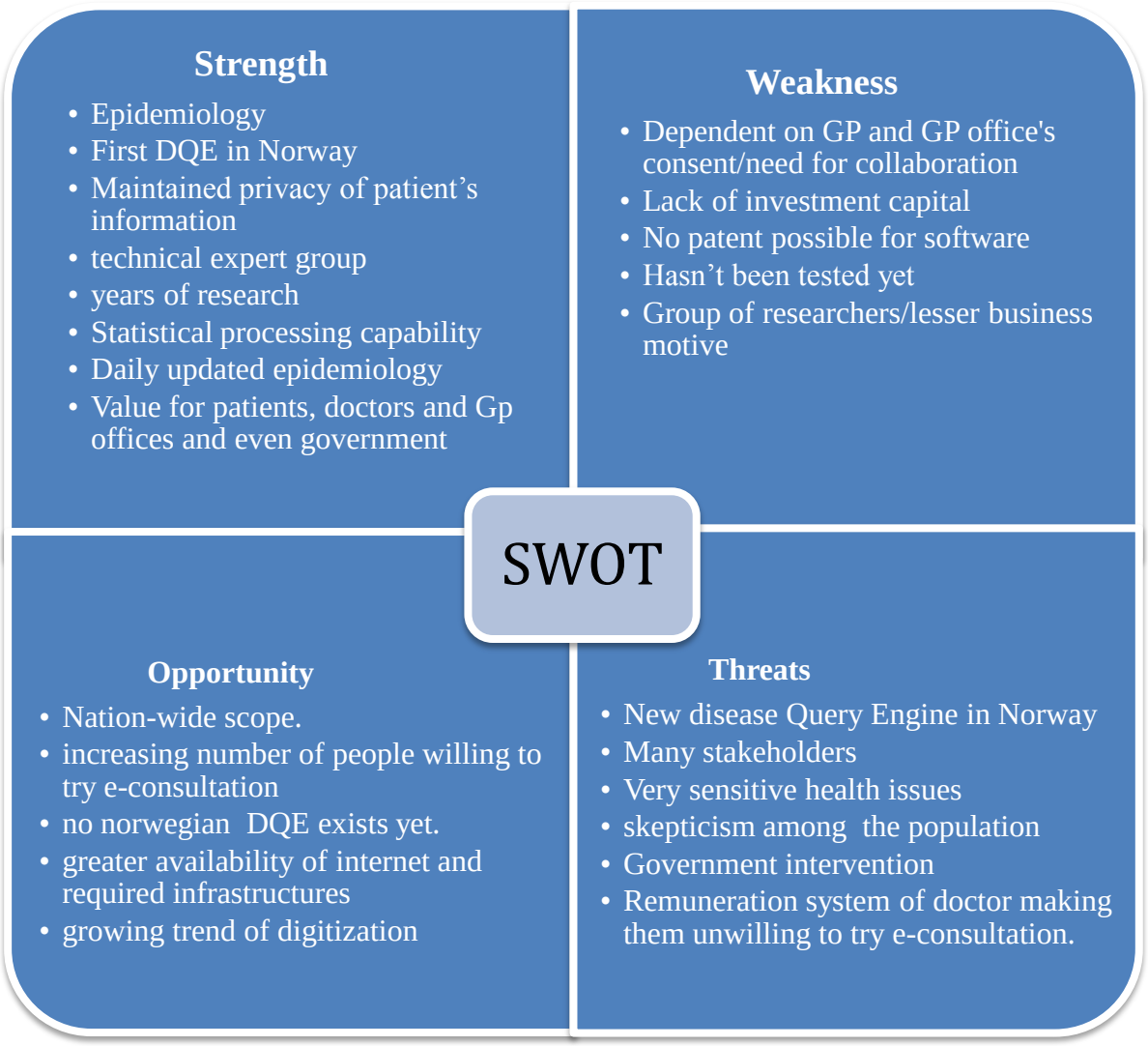

Figure 7: SWOT analysis

Development of exclusive infrastructure through research capable of generating epidemiological information that could be updated in a daily basis is one stronghold for the developer. The concept of Disease Query Engine in Norwegian is first in Norway. The Snow research team has been conducting research in the sector for a long time and has strong technical group. The appliance box set up in the GP offices has a good statistical processing capability that generates epidemiology and other medical information based on disease incidences over relevant geographical area.

For Erdusyk to perform, the appliance boxes need to be set up in GP offices and microbiology labs. So, consent from GP offices is required and collaboration with them is required for the product to work. For setting up the appliance boxes and starting the company up, initial investment is needed that is lacking at the moment. The software inside the computer boxes is what makes the DQE and e-consultation worthwhile. The software is developed with years of research and could be vulnerable to property right infringements. However, in Norway a software cannot be patented that might increase the intellectual property risks. The device hasn't been tested yet and the effectiveness of Disease Query Engine to provide Diagnostic Decision Making for patients is not known for sure yet. The developer group is a team of technicians and researchers having lesser motivation and means for commercialization.
The environment that the product will be operating in posits some opportunities for the product. First of all, the epidemiological information is useful for both doctors and patients. Since everybody is precarious to health problems in their lives, it has a huge scope. The language being Norwegian, the website could be used by all in Norway. There is an increasing willingness, particularly in young people, to try out e-consultation. Growing trend of digitization in different avenues of life opens up possibility for digitization in health service and hopefully easier acceptance of the digitized health service by the people. Also, the internet and all other infrastructures needed for the product to operate are better now than ever before. That makes it possible and much easier for the product to operate.

However, the disease query engine for diagnostic decision assistance for patients is a rather new concept. For such a new idea, there's always a lot of skepticism in public. Health issue is a very sensitive issue and any product that is involved with health issue is countered with a lot of

skepticism. The product is supposed to provide patients with information in order to make simpler disease related decisions. In extreme cases, this might lead to dangerous results. The subtleties of the influence have to be measured and necessary measures taken to avoid such situations. There are a lot of stakeholders in this product and that increases the unpredictability of the product. Withdrawal of support from any one party could fail the product. Government remuneration rules, as already discussed above discourages doctors to use e-consultation. That being the case, the current regulation discourages the idea even though there is a way to work around the case.

Conclusion of SWOT

The strong weakness lies in the fact that there is a need to collaborate with GPs and GP offices. If the GP offices are unwilling to set up the box, then the idea of generating epidemiological information will suffer and also so will the e-consultation. GPs and GP offices should be informed about the values they are going to receive from the installation of the box. Also, a lot of people are skeptic towards a new product, especially when it concerns the health of the people. There should be a strategy to introduce it into the market and see how effective it is. Starting with chronic and handicapped patients is a good way to break through the market as they have the stronger need for e-consultation. That way the possibility of acceptance of the technology by other patients and the doctors could be evaluated. There are some GP offices already providing consultation through telephone. So, e-consultation should not be a problem. The effectiveness of Disease Query Engine is however relatively unpredictable. Starting with few pilot tests would help us to assess that condition and opt for a future strategy to extend the patient group. The biggest threat however is the payment system of GPs. There would be no way around it. So, we would assume that the payment system is not significantly unfavorable for the doctors and they are quite indifferent towards it.

3.3 Marketing Strategy

According to Baker (2000), the strategy is needed to bring the focus to our actions. Similarly, the aim of a market strategy is to develop a long-term vision that will shape our immediate tactical decisions (Moore, 2002). This section will first present the long term vision of the company. That will help in shaping up the short term objectives for the achievement of the vision.

The long term marketing objective is to develop a full-fledged epidemiology and possible e-consultation from all the GPs and GP offices in Norway. Only then, all the patients can receive an effective disease query engine and possibility for e-consultation with their GP. The development of epidemiology and e-consultation is dependent upon one condition that the computer box is set up in the GP offices and hospitals. So a full-fledged epidemiology refers to setting up the computer boxes in all the GP offices, hospitals, and microbiology labs in Norway.

Short term objectives are to set up the computer boxes in most possible GP offices in Troms and Finnmark County within a year. That way the DQE and e-consultation can be possible for all the people residing in that area. Also, within that time span, all the chronic patients and handicapped people in that area will be able to receive e-consultation from their doctors. Health issue is so complicated and it is difficult to create a demand for a technology like this. It is found that doctors are unwilling to break the conventions and patients are afraid of trying new technology. So the usefulness needs to be manifested slowly and subtly focusing on smaller group and then creating demand for others. That group of people has greater need for e-consultation and we are going to provide that in the beginning.

Marketing Mix Decisions

To achieve the marketing objectives, a company should have certain strategies regarding its marketing activities. The term “marketing mix”, often referred to as the “4Ps”, is a means of translating marketing planning into practice (Bennett, 1997). It is a mix of marketing procedures and policies used by marketer in an effort to realize a successful market vision. The marketing mix can be defined as the set of tactical marketing tools that the firm blends to produce the response it wants in the target market” (Kotler & Armstrong, 2013). Hereby the strategy for four marketing mix components is discussed to achieve the marketing long term goals;

3.3.1 Product

The product is known as Erdusyk which is a disease query engine that includes facility for e-consultation. It provides customers with information about the diseases based on the symptoms of that particular person and the epidemiology of the place around. The disease query engine gives; (i) information on what disease the person might have caught (ii) data on how many other

people have caught the disease recently and (iii) information on what actions other people have taken for the cure. The action, here, refers to what percentage of the people consulted their GP and what percentage did not. The product works such that people get suggestions, based on their symptom, on what disease they might have caught. They also get information about those possible diseases. Then, they are offered an option for e-consultation for whosoever might want to receive a consultation through computer or mobile phone. Generally people with minor issues are believed to use the e-consultation service.

The epidemiology and e-consultation service are provided under premium subscription scheme. Here the people pay the subscription fee and get the service for free. Or, for people who do not want a premium scheme, e-consultation is available as a stand-alone product. People pay for the doctor's fee and the service charge. The disease query engine is available for all for free. Disease query gives information on what disease the person might have caught and epidemiology model on how many other people have caught the disease recently and where, and information on what actions other people have taken for the cure. The action, here, refers to what percentage of the people consulted their GP and what percentage did not. Then, they are offered an option for e-consultation for whosoever might want to receive a consultation through computer or a phone. For the initial target group, the main product is e-consultation. These people have, at times, higher utility for e-consultation than any other group. The product is basically the same for the initial target group and the ultimate group. The emphasis is more on e-consultation for the initial target since they have higher difficulty in movement. However, they also need general medical information as everybody else which Erdusyk will provide. The benefits for the people from Erdusyk are reduced convenience, reduced wastage of time as well as the epidemiological information.

Erdusyk is available as a website and also as an application for mobile phones and tablets. People can do the disease query without any identification. For, epidemiology and e-consultation however, they will need to set up an account in Erdusyk first. Disease query and the health information will be available for free. However, they will need to pay for the epidemiological information and e-consultation.

3.3.2 Promotion

The value of Erdusyk will be mostly for patients and thus it will be paid for by the patients. The promotional activity is basically targeted towards the patients. However, since the computer devices need to be setup in GP the offices, promotional activities need to be directed as well towards the GP offices and GPs.

First, the managers at GP offices need to be contacted individually by the company manager. It is important to let them know about the benefits of setting up the appliance boxes in GP offices for them. The knowledge of epidemiology is much helpful for doctors for diagnostic decision making and that benefit should be hyped. Besides the access to epidemiological data, lower number of waiting patients in the queue and lower transmission of diseases through or among the waiting patients are some of the benefits the GPs and GP offices can have. These benefits need to be communicated comprehensively to them. Similarly, they should also be assured that the device for the Erdusyk will not in any way impinge the privacy and integrity of their database. Similarly, Erdusyk will present the importance of epidemiological data and its influence on diagnostic decision making in health conferences obtaining service of some telemedicine personnel from the Snow group. This is a way to make the doctors more aware about what Erdusyk is planning to do and make them more acceptable for the installation offers.

For initial customer target, the e-consultation facility of Erdusyk will be introduced through GPs. Handicapped people and several chronic disease patients have unions and interest groups. People will be made aware about the availability of such service through promotional campaigns at union meetings. Also, a new study reveals that health marketing dollars might be better spent targeting the caregivers of the consumer group, rather than marketing to older and handicapped group themselves ("Healthcare Marketing and the Internet: To Reach Older Adults, Target Caregivers", 2016). As such, the caregivers will also be made aware of the product through advertisements through the internet and social media. Caregivers can influence the healthcare decisions made by handicapped and chronic patients and thus they should be considered for the promotional activities as well.

After the initial target has been achieved, the internet, news media and social media will be used to promote Erdusyk to the general public. The stories of patients receiving the benefits will be shared through newspapers and television and radio. Similarly, advertisements will be posted in the most popular health websites such as NHI.no and elite health websites in Norway.

3.3.3 Place

The appliance boxes are bought from a wholesaler supplier and the program is installed in them by the technical staff of Erdusyk AS. The appliance boxes are shipped to the GP offices which agree to connect the devices in their system. It is so easy that anybody from the GP office can plug the box into the system and it will start functioning on its own without anybody even noticing any change in their system. The assistance, if needed, will be provided by our technical staff.

As soon as the box is set up, it becomes able to extract electronic health records (EHR) anonymously for the statistical calculation as per the disease query. The epidemiology extracted by the device keeps on updating itself with the recording of new EHRs by doctors. There is a factor of trust from GPs that plays an important role. They should trust that the appliance box does not impinge the privacy and integrity of their data in any way. Contractual agreement between the GP offices and Erdusyk will be done regarding the extraction and use of HER which might help alleviate the problem to some extent.

As soon as the computer box is plugged in, the disease query engine and the e-consultation facility will be available at https://www.erdusyk.no. It is a Norwegian website and people get access to the service through the website. However, it will also be developed as a mobile application for those who want to use it in their mobile phones. The website is available for access by everyone and the application is downloadable through the app store.

3.3.4 Price

There are few existing online services that provide e-consultation. People enquire doctors through texts and doctors reply their queries. They charge 200-260 NOK per enquiry, a 100 NOK extra for swift reply within a day and 100 NOK extra for private reply. Some of them have

feature where doctor even write electronic receipt with which patients can buy medicines from pharmacies. The medical information is however free of cost and there are a number of websites providing that. NHI.no for instance has comprehensive information about almost all the diseases and healthy living and many other health aspects. However, nobody has the epidemiological information and that is quite valuable.

With Erdusyk people will have an option to read general medical information and symptom search. However, for comprehensive search and epidemiological comparison, people need to have a premium membership account at Erdusy. People with the premium account are able to fetch epidemiological data and be able to connect to the doctor. People can buy a yearly premium account for 200 NOK. A monthly account will cost 50 NOK and a semi-annual 100 NOK. It will allow them to acquire epidemiological information and an option for e-consultation through the account. Every e-consultation will cost equivalent to doctor's fee. For people who do not want to have a premium account, they will have to pay 30 NOK in excess to the doctor's fee for each consultation.

3.4 Conclusion

The study focused on identifying the product and the service and the market segments that had the biggest potential of the product leading to commercial success. Additionally, it gave insights on the competitive scenario, market conditions and the environmental factors affecting the commercialization. The process eventually led to providing important insights into making the best possible market strategy and business plan for launching Erdusyk in the commercial market. The sub-research question for the market study "I*s there a real market potential for Erdusyk and which market strategy will lead to successful commercialization?"* is finally answered.

Based on the analysis it was found that the utility of the product would be for the patients, doctors and GP offices. The utility was much higher for patients and they are the ones who would be ready to pay. The questionnaire survey showed that 77% of respondents want to try out electronic consultation and about 63% are willing to pay for it. The competitive scenario is quite favorable too as there is no other service that provides the complete offer as done by Erdusyk. The competition is not too significant. Increasing number of people opts to use internet for health

related issues, and almost entirety of population in Norway has access to a mobile phone or a computer. Internet access is no different. The economic status of Norwegians is quite well with most of the people having affordability for health related services. The market, competitive, and environmental scenario were quite favorable. However, there was also a bit of skepticism seen in some of the respondents about the technology. That reflected the characteristics of people on the other side of the chasm as in Moore's (2014) technology adoption cycle. Following Moore's (2014) premise, a smaller group is being targeted first as the technology is quite new and disruptive. For the initial breakthrough, chronic and handicapped patients from Tromsø would be targeted. The reasons for that target group were the greater need of e-consultation for that group and the technological convenience at the moment.

The product will be accessible through a website of through a mobile phone application. The product will be available in the form of a subscription or as a single transaction. The medical information, epidemiological information and e-consultation charge will be exempted for subscriptions while they will be charged for single transactions. The price of the service was derived from competitive pricing method based on what other parties are charging for e-consultation in the market. However, for greater market penetration, the price will be quite lowered. Subscription will be available for 200 NOK for a year, 100 for half a year and 50 for a month. The promotional activities will first include introduction of the service through doctors. The pilot group will be used to endorse the utility of the service to other customer groups. Finally, extensive promotion through advertisements in the internet, health websites, social media and public media such as TVs, radios, etc. will be done.

4. Business Plan

4.1 Executive Summary

Erdusyk is a disease query engine with a facility of epidemiological disease search and e-consultation. It was developed by a university based research group called ‘Snow’. It has been found out that many people have difficulty in travelling when ill and that many consultations with doctors can be electronic. It is also known that significant number of people use internet for health related searches and want to know if there are other people around having similar problem at the same time. Since, the product caters to a big problem that people are ready to pay to get rid of, it has a business utility.

Being a disruptive product, the product will first be offered to chronic and handicapped patients. That group constitutes of 15-20% of the total population and will serve as the pilot target group for Erdusyk. After that, related customer groups will be targeted until eventually increasing the focus to include the entire population.

E-consultation and epidemiological search needs doctors and information from doctor’s clinic respectively. Thus, doctors are an important member of the value chain activity. Besides the value of diagnostic support system and some other information, doctors will receive certain percentage of revenue from the consultations made electronically in excess to their normal consultation charge.

The services will be offered at https://www.erdusyk.no where customers will get two options to use the product. First, customers can buy a monthly, semi-annual, or annual subscription allowing them to get epidemiological information for free and e-consultation for doctor’s ordinary consultation fee. Or, customers can opt to use e-consultation as a stand-alone product where they will pay certain amount in excess to doctor’s consultation fee as a service charge.

The service needs an infrastructure to be built first. A minicomputer with special software installed by the inventor group will have to be installed in the doctor clinics. Starting from

Tromsø, the devices will be installed to Finnmark and then other counties starting from the one having the highest population. The business is valuated at 46 million NOK and needs an investment of 11 million from potential investors in return to 30% ownership of the company.

4.2 The Pain

As weak as illnesses make people, they have considerable degree of discomfort in visiting their personal doctor when they are sick. The way the health care system in Norway currently is, people need to visit the doctors physically for all diagnostic and treatment process. But there are many cases that do not necessarily warrant the physical consultation between the doctor and patients. Many follow-up consultations, cases of minor flues, visits for some confirmations, and need for sick leave are some of the cases that do not necessitate physical contact between doctors and patients every time. This business plan will serve to assess the commercialization potentiality of Erdusyk. For that purpose, a market research was done in order to find market behavior (Refer to chapter 3 for the market study). Based on a questionnaire research conducted on 145 people, it was found that 62% of respondents said they felt uncomfortable to travel to doctor's office when they are sick, including almost 10% of people who felt very uncomfortable. Almost 77% of people are interested in a service that allows them to have consultation with their personal doctor online i.e., in text, audio or video forms through the phone or a computer. An emphatic 47% of people would actually prefer to consult their doctor virtually from their home rather than physically go to the doctor's office when they're sick. It is believed that the problem is even grave for people with physical disability and chronic patients.

Almost 78% of respondents said they seek medical information from internet while they are sick confirming previous studies that suggested that the figure was close to 80% for Norway. However, people are skeptic about the information on the grounds of credibility of the information provider, authenticity of the information and the volume of information available in the internet. There is a need for a reliable medical information provider that furnishes to the people the most relevant information based on their case when they are sick. Also, many people are interested in knowing whether there are people around them that have similar cases at the moment when they are sick. About 63% of the respondents want to know whether they are a part of a group of people who is having the sickness at the moment or do they stand alone.

4.3 The Solution

Erdusyk is a disease query engine that provides people with epidemiological information and a facility for e-consultation with their doctors. The disease query engine is currently available at https://www.erdusyk.no and will also be developed as software application for mobile phones and tablets. The facility for e-consultation enables people to meet their personal doctor through their phones, tablets or computers in the form of e-mails, audio or video interaction. This has the possibility of eliminating the physical discomfort and the time consumption during the consultation that has been problematic for some people as depicted by the research. With this, people who don't necessarily need to travel to the doctor's office can consult with their doctor from wherever they want through email, audio or video. The disease query engine has symptom checker function where people get diagnostic suggestions based on the symptoms they elicit. People know the probable disease they might have caught and information about that particular disease. The disease suggestions increases the degree of relevance of the information content since the patients will look out for the probable diseases diagnosed based on their symptoms. However, the most unique feature about the product is that it provides epidemiological information of the disease situation. This information contains how many people have elicited similar symptoms and disease cases and from which part of the country. It fulfills another need of the people that has been verified by the study. This information hopefully helps people to decide on the immediate course of action they want to take for the sickness they have got.

4.4 Value proposition

In addition to the customers, GPs and GP offices are the important members of the value chain. The values for the value chain components are stated hereby;

4.4.1 Customers

Customers, as stated above, will have access to the health information they aspire. The online health information will be provided based on their symptoms and thus will be more relevant than the ordinary searches. The most unique value is the epidemiological information. Erdusyk provides the information about the frequency of incidence of similar cases all around Norway. This provides people with much more information so that they can take some immediate decisions on their case; from what remedies to take to whether or not to see the doctor right

away. Similarly, the value of e-consultation that the survey has articulated does not need reiteration. People are spared of the discomfort of traveling, cost of traveling, cost of the time wasted in wait for appointment and the wait in queue for the consultations that do not necessarily need to be physical.

4.4.2 General Physicians (GP)

GPs are the gatekeepers for people's admission into the healthcare system in Norway. People usually go to their GPs when they are sick. The use of e-consultation needs participation of doctors in the system. Similarly, the infrastructure for the service needs installation of a computer device in every GP offices. They are thus an important member of value chain. They will receive 10 NOK for every electronic consultation made in excess to their consultation fee. The epidemiological information provides GPs with diagnostic decision support system which is quite important for doctors. Similarly it also disseminates procedural information among doctors which are are of significant value to doctors. Similarly, the chances of disease transmission are lowered from patients to doctors in cases of transmittable diseases.

4.4.3 GP Offices

GP offices are usually group of doctors. The values for GPs are the values for GP offices as well. Additionally, this service could mean lower number of people waiting in the lobby. That's why there are low waiting queue management costs and low chances of transmission of diseases among the people.

4.4.4 Municipality/Nation

The installation of box and extraction of epidemiological information could help create disease surveillance system and epidemic outbreak detection system so that major epidemic outbreaks could be detected timely and preventive measures could be taken. This way even the impact of huge epidemics could be mitigated and that would mean lower health expenses for government and better health security of local people.

4.5 The Organization

Erdusyk was created by a research team named 'Snow' at Norwegian Center for Integrated care and telemedicine (NST). Erdusyk is developed from years of research at the telemedicine department at UiT - The Arctic University of Norway(UiT). A spin-off company named Erdusyk AS will be formed with the objective of commercializing the product. The organizational structure is depicted hereby;

CEO: Dipesh Sigdel is currently a master's degree student at UiT studying Business Creation and Entrepreneurship. He also holds a Bachelors degree in Business Administration with specializations in finance and marketing. He is a young guy full of energy for a start-up and is looking for a breakthrough in his professional career. Good communicational skills, strategic management, marketing management, financial management and business development are some of his core competencies. He will handle all the operational tasks for the organization such as development and execution of the strategic goals and objectives of Erdusyk AS.

Technical Staffs: They will work on the development, maintenance and support of the technical infrastructure required for the operation. Installation of the required software in computer boxes, installation support of the box in GP's local system, continuous maintenance of the box and software, update of the software and many other technical works are needed which needs to be performed by the technical staffs. One technical staff is hired in the beginning with one more to be added on in the later years in response to the scaling rate.

Marketing staffs: Marketing staffs will be hired who will perform all the promotional activities of the organization. The commercialization of the product means the need to make people aware of the product and its values.

Board of Directors: The Board is critical for providing knowledge and relevant information related to technology and market to the management team. The needed market expertise and experience within the field of commercialization is also crucial for the CEO and management staffs. Following board members are proposed;

Johan Gustav Bellika is a chief researcher at Norwegian Center for Integrated Care and Telemedicine (NST). He is also the project leader for the Snow, M3, and Erdusyk development projects at NST. He is also a professor at department of Clinical Medicine, Faculty of Health Sciences in UiT. He is a highly respected scientist with over 40 publications. Majority of his publications are about telemedicine and Health Informatics.

Wenche Poppe has worked with innovation and commercialization of innovative projects originating from UiT and UNN since 1998. Currently positioned as vice director at Norinnova Technology Transfer, she has been working extensively with development of innovative projects in IT and e-health innovations since 2005.

Nils Kolstrup is a GP by profession. He has been in the profession since 1985. He is also a medical advisor at Norwegian Center for Integrated Care and Telemedicine. He has a good knowledge about the health care system in Norway and can reflect on the project from a doctor's perspective.

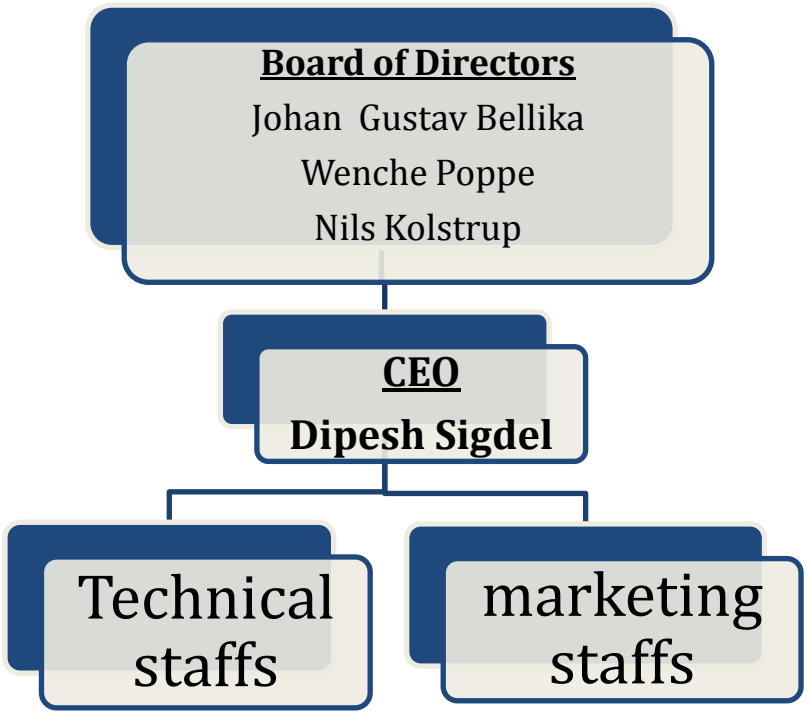

Figure 8: Organizational structure

4.6 Market

Huge portion of the population in Norway uses internet to collect information about many and health is not any different. A study by Andreassen et al. (2007) has revealed that almost 74% of internet users in Norway seek health information through the internet. The information is also verified by the market research conducted for this case where 76% of the respondents have confessed so (refer to chapter 3 for more information). Almost 3.8 million people in Norway look for medical information in the internet when they are sick. There were 63% of respondents willing to know if other people have caught similar diseases, a need fulfilled by epidemiological data. If that data is to be followed with the assumption that the responses are unbiased, that makes almost 3.15 million people in Norway. An emphatic 77% of respondents are interested in a service that allows them to have an electronic-consultation with their GP. That corresponds to 3.85 million Norwegians. That population includes 3.1 million people (62%) who say they are actually willing to pay for that service.

The ultimate target customers are all the people in Norway who seek online health care service. However, for a market breakthrough, focusing on a smaller group of customers having larger utility for e-consultation was seen as the viable approach. Since the epidemiology and disease query engine will only become effectively functional after the appliance boxes (see section 4.7 or section 2.1.1 for appliance box) are set up in large number of GP offices, e-consultation needs the focus first. The initial target market for this case is the handicapped and chronic patients' group in Tromsø. That is one of the smaller groups known to have huge utility for e-consultation service. The data about the number of handicapped and chronic people is quite scattered and difficult to assemble. The assimilation of scattered information suggests that the population of such people is 15-20% of total population. That is the pilot segment that will be targeted first.

It is believed that the mobile phone penetration in the Norwegian market is almost close to 100%. Similar percentage of population owns a computer. Regarding technological development within the healthcare system, it is found out that 98% of the Norwegian GP uses a computer and 87% have a disposal to Internet connection (International telecommunication union, 2004). Thus the market conditions are much favorable for the execution of such service.

4.7 Competitor Analysis

Table 3: comparative analysis of competitors

	Symptom checker	Epidemiology search	Daily updated epidemiology model	Electronic consultation	Meeting with own GP	Free health information
Erdusyk.no	✓	✓	✓	✓	✓	✓
Nettlegevakt.no	✗	✗	✗	✓	✗	✓
NHI.no	✗	✗	✗	✗	✗	✓
Onlinelege.no	✗	✗	✗	✓	✗	✓
Legehandboka.no	✗	✗	✗	✗	✗	✓
Helsenorge.no	✗	✗	✗	✓	✓	✓

Comparing the needs of the people and the competitive offerings made, there is no other website or an application around the globe that provides the combined service of health information, disease query engine and e-consultation. There are some world leaders in medical information providers in the competitive scenario such as mayoclinic, webmd and drugs.com but they do not offer epidemiological information for the disease query. None of the disease query engine provides epidemiological search. The epidemiological information that Erdusyk.no has is unprecedented and it is updated in daily basis that makes it quite useful and makes the diagnosis more meaningful. Also, there is no service that provides e-consultation in the form of text, audio and video with the personal GP. Some of the GP offices have telephone query facility which is not too appreciated by doctors because they make lot less money and a lot of patients call making their work even cumbersome. Some of the websites provide the facility only in the form of text. The consultation that they provide is not with the personal GP that makes it even undesirable. Helsenorge.no is one online health service provider that provides information on

booking appointments, receiving prescriptions, conducting an e-consultation and having contact with the GP office if the GP provides such facilities and has made the information available at helsenorge.no. Under helsenorge.no, the government is supposedly trying to build a central database called 'kjernejournal' that wants to get patient's health records from GP offices and store it outside the GP offices. The healthcare institutions own the records and that new approach stores data outside the healthcare institutions. First and foremost, healthcare institutions do not want to give away their property. Secondly, the new method needs doctors to store every patient's information in the server per every consultation. Also, storing the data outside the health institution is not too safe and it also might need some encryption of data which make it impossible to reuse the data for other purposes in the future. Such an approach is also not as safe as the Erdusyk's approach where the data owned by the healthcare institutions are kept by the healthcare institutions themselves. It extracts only the necessary data from the health records at healthcare institutions for making statistical calculations.

4.8 Business Model

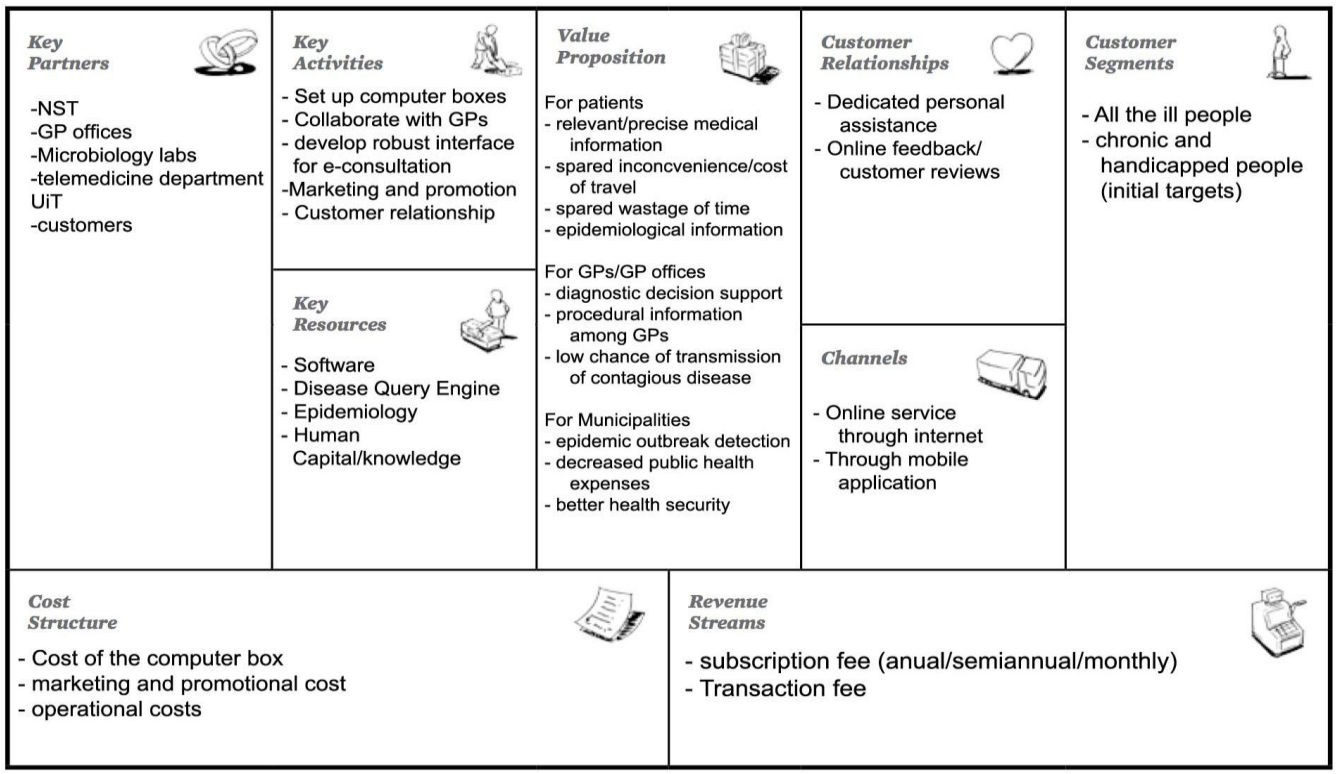

Figure 9: Business Model Canvas

The actual services provided by "Erdsusyk" are e-consultation facility and disease query with epidemiological information. A prototype of disease query engine (DQE) has already been developed. The DQE and an interface for e-consultation will be installed in minicomputers. The minicomputer (also called appliance box) is a type of small personal computers (refer to section 2.1.1). The boxes will be bought and the software be installed by Erdusyk AS. After the installation, they will be provided to those GP offices who agree to set the boxes up in their information technology system for the connection. The appliance boxes will be paid for by Erdusyk. Once the device is connected to the system, it will automatically start to operate. The disease query, e-consultation and epidemiology service becomes instantly available through Erdusyk website or mobile application after that (refer to chapter 2. innovation study for details). After the device is connected to the system in GP offices, it will extract relevant information from GP offices and conduct statistical processing and present the information to the users. The patient's electronic health records in GP offices are properties of the GP offices. The device will not extract any personal information of the patients or the GPs. The medical information will be anonymous and used for collective data analysis and statistical processing. A contractual agreement will be done between Erdusyk AS and GP offices regulating the terms of use of data and regarding the protection of privacy of data.

Since the consultation service is provided by doctors and a section of epidemiological information is based on data from GP offices, it is imperative to have collaboration with GPs. During the market study, doctors weren't found too willing to provide e-consultation primarily due to regulatory obstacles that affect their incentive system to some extent. There are, however, ways to work around those hurdles. The epidemiological information, on the other hand, is much valuable for doctors. So, they are believed to be willing to allow the setup of those devices in their offices in exchange of epidemiological information, the extra income from e-consultation and other values discussed in the value proposition section above.

People will have access to Erdusyk through the internet and also will be downloadable as an application for phones and tablets. Users will be provided with two options for the product. They can have e-consultation with ordinary free accounts or they can buy a premium membership with features of e-consultation and free epidemiological information. With free accounts, people pay

for doctor's consultation as well as some extra fee for Erdusyk's service, use disease query but won't have access to epidemiological information. While with a premium membership (which can be monthly, semi-annual or annual), people only pay for doctor's consultation fee and get all other services for free. The e-consultation service will be ready for those GP offices that have the device connected in their system. Some income will start to flow from some of the GP offices from the second year. The income will be used further to finance the purchase and installment of more devices in more GP offices.

4.9 Market Strategy

The long term objective of Erdusyk is to develop a full-fledged epidemiology and possible e-consultation from all the GPs and GP offices in Norway. Only then, all the patients can receive an effective disease query engine and possibility for e-consultation with their GP. A full-fledged epidemiology refers to setting up computer boxes in all the GP offices, hospitals, and microbiology labs in Norway. Short term objectives are to set up the computer boxes in all the GP offices in Troms and Finnmark County within a year. That way the e-consultation can be possible for all the people residing in that area and the DQE can be tested. Also, within that time span, all the chronic patients and handicapped people in that area will be able to receive e-consultation from their doctors. Health issue is so complicated and it is difficult to create a demand for a technology like this. It is found that doctors are unwilling to break the conventions and patients are afraid of trying new technology. So the usefulness needs to be manifested by focusing on smaller group with larger need and then creating demand for others. Handicapped and chronic patients have greater need for e-consultation and Erdusyk is going to provide that for them in the beginning.

4.9.1 Product

The product is known as Erdusyk which is a combination of an epidemiological disease query engine and a facility for e-consultation. The epidemiology and e-consultation service are provided under premium subscription scheme. Here the people pay the subscription fee and get the service for free. Or, for people who do not want a premium scheme, e-consultation is available as a stand-alone product. People pay for the doctor's fee and the service charge. The disease query engine is available for all for free. Disease query gives information on what

disease the person might have caught and epidemiology model on how many other people have caught the disease recently and where, and information on what actions other people have taken for the cure. The action, here, refers to what percentage of the people consulted their GP and what percentage did not. Then, they are offered an option for e-consultation for whosoever might want to receive a consultation through computer or a phone.

For the initial target group, the main product is e-consultation. These people have, at times, higher utility for e-consultation than any other group. The product is basically the same for the initial target group and the ultimate group. The emphasis is more on e-consultation for the initial target since they have higher difficulty in movement. However, they also need general medical information as everybody else which Erdusyk will provide. The benefits for the people from Erdusyk are reduced convenience, reduced wastage of time as well as the epidemiological information.

Erdusyk is available as a website and also as an application for mobile phones and tablets. People can do the disease query without any identification. For, epidemiology and e-consultation however, they will need to set up an account in Erdusyk first. Disease query and the health information will be available for free. However, they will need to pay for the epidemiological information and e-consultation.

4.9.2 Promotion

The product will be used by patients and paid by them. The promotional activity is basically targeted towards the patients. However, since the computer devices need to be setup in the GP offices, promotional activities need to be directed as well towards the GP offices and GPs.

First, the managers at GP offices need to be contacted individually by the company manager. It is important to let them know about the benefits of setting up the appliance boxes in GP offices for them. The knowledge of epidemiology is much helpful for doctors for diagnostic decision making and that benefit should be hyped. Besides the access to epidemiological data, lower number of waiting patients in the queue and lower transmission of diseases through or among the waiting patients are some of the benefits the GPs and GP offices can have. These benefits need to

be communicated comprehensively to them. Similarly, they should also be assured that the device for the Erdusyk will not in any way impinge the privacy and integrity of their database. Similarly, Erdusyk will present the importance of epidemiological data and its influence on diagnostic decision making in health conferences obtaining service of some telemedicine personnel from the Snow group. This is a way to make the doctors more aware about what Erdusyk is planning to do and make them more acceptable for the installation offers.
For initial customer target, the e-consultation facility of Erdusyk will be introduced through GPs. Handicapped people and several chronic disease patients have unions and interest groups. People will be made aware about the availability of such service through promotional campaigns at union meetings. Also, a new study reveals that health marketing dollars might be better spent targeting the caregivers of the consumer group, rather than marketing to older and handicapped group themselves ("Healthcare Marketing and the Internet: To Reach Older Adults, Target Caregivers", 2016). As such, the caregivers will also be made aware of the product through advertisements through the internet and social media. Caregivers can influence the healthcare decisions made by handicapped and chronic patients and thus they should be considered for the promotional activities as well. After the initial target has been achieved, the internet, news media and social media will be used to promote Erdusyk to the general public. The stories of patients receiving the benefits will be shared through newspapers and television and radio. Similarly, advertisements will be posted in the most popular health websites such as NHI.no and elite health websites in Norway.

4.9.3 Place

The appliance boxes are bought from a wholesaler supplier and the program is installed in them by the technical staff of Erdusyk AS. The appliance boxes are shipped to the GP offices which agree to connect the devices in their system. It is so easy that anybody from the GP office can plug the box into the system and it will start functioning on its own without anybody even noticing any change in their system. The assistance, if needed, will be provided by our technical staff. As soon as the box is set up, it becomes able to extract electronic health records (EHR) anonymously for the statistical calculation as per the disease query. The epidemiology extracted by the device keeps on updating itself with the recording of new EHRs by doctors. There is a factor of trust from GPs that plays an important role. They should trust that the appliance box

does not impinge the privacy and integrity of their data in any way. Contractual agreement between the GP offices and Erdusyk will be done regarding the extraction and use of HER which might help alleviate the problem to some extent. As soon as the computer box is plugged in, the disease query engine and the e-consultation facility will be available at www.”Erdusyk”.no. It is a Norwegian website and people get access to the service through the website. However, it will also be developed as a mobile application for those who want to use it in their mobile phones. The website is available for access by everyone and the application is downloadable through the app store.

4.9.4 Price

There are few existing online services that provide e-consultation where people enquire doctors through texts and doctors reply their queries. They charge 200-260 NOK per enquiry, a 100 NOK extra for swift reply within a day and 100 NOK extra for private reply. Some of them have feature where doctors even write electronic receipt with which patients can buy medicines from pharmacies. The medical information is however free of cost and there are a number of websites providing that. NHI.no for instance has comprehensive information about almost all the diseases and healthy living and many other health aspects. However, nobody has the epidemiological information and that is quite valuable. With Erdusyk.no people will have an option to read general medical information and symptom search. However, for comprehensive search and epidemiological comparison, people need to have a premium membership account at Erdusyk.no. People with the premium account are able to fetch epidemiological data and be able to connect to the doctor. People can buy a yearly premium account for 200 NOK. A monthly account will cost 50 NOK and a semi-annual 100 NOK. It will allow them to acquire epidemiological information and an option for e-consultation through the account. Every e-consultation will cost equivalent to doctor’s fee. For people who do not want to have a premium account, they will have to pay 30 NOK in excess to the doctor’s fee for each consultation.

4.10 Milestones

Some important milestones for next four years are presented hereby;

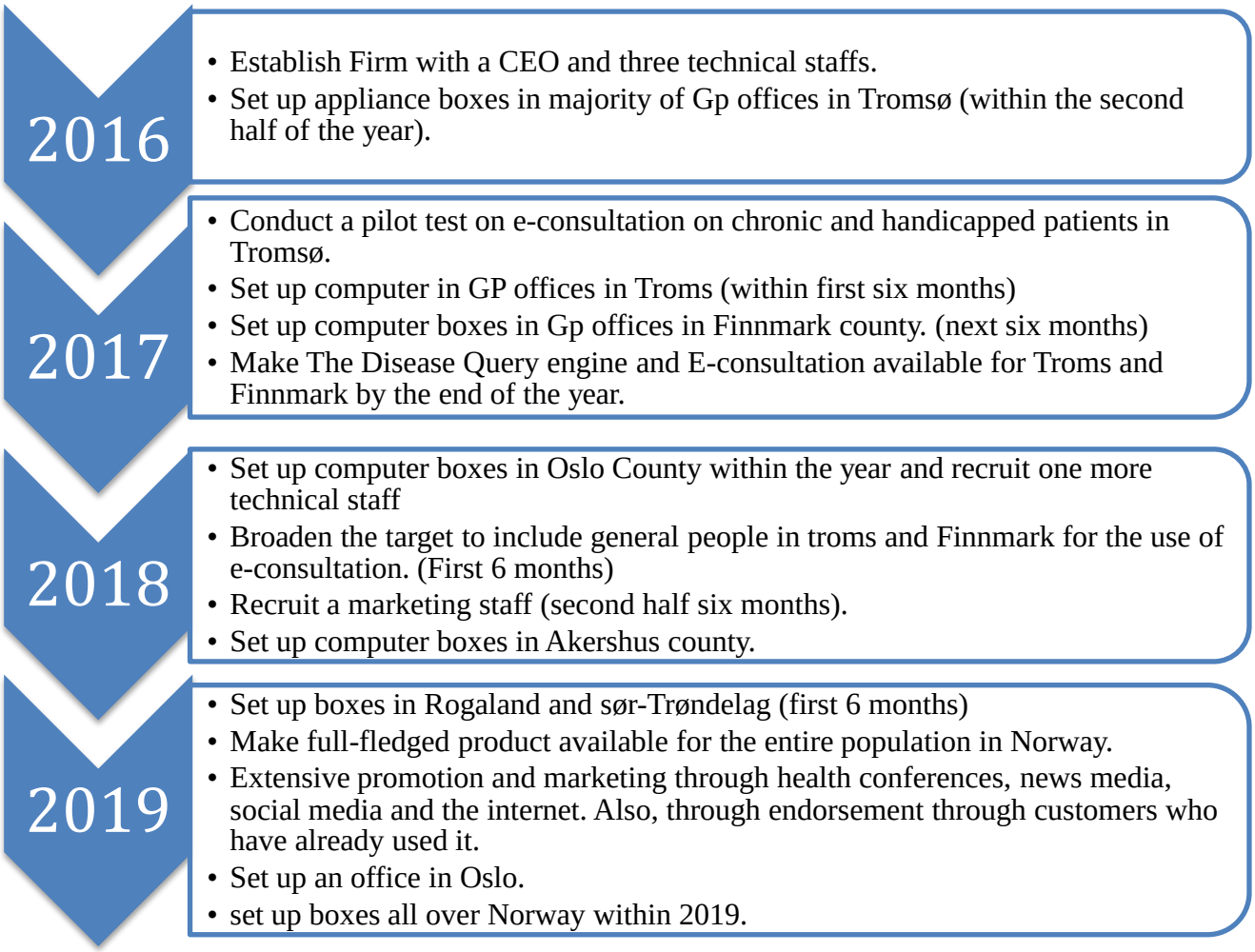

Figure 10: Milestones for next 4 years

4.11 Financial Evaluation

The expansion of Erdusyk's service market will be done according to the milestones listed above and thus the cost of setting up the computer devices and possible number of customers will be gradually increasing with the expansion. The computers will first be set up in Tromsø in the first year. Both Troms and Finnmark counties will be the targeted the next year moving on to Oslo and Akershus the next year. Installation in Rogaland and Sør-Trøndelag and then the entire Norway in the fourth year will make the services fully functional. Installation of appliance boxes has some values for doctors and thus it is believed that 70% of GP offices will allow the installation. There are two revenue sources viz. premium subscription fee and e-consultation.

The variable cost for stand-alone e-consultation is the doctor's fee while there is no significant variable cost for the subscription.

The estimation of cost and revenue is based on several assumptions. Observation of overall pattern of GP offices, it was seen that there were in average, 4 GPs in each GP office. In average, a GP is assigned for 1150 people. Thus, one GP office provides service to about 4600 people. The number of GP offices in each county is thus calculated based on the population of that county, i.e., dividing the population by 4600. For revenue, stand alone e-consultation will be ready for people in Tromsø from the beginning of 2017 since the installation of box is done in 2016. Each doctors makes about 20-24 consultations per day and about 20% of the consultations can be electronic which equals to about 4 consultations per day (based on interview with a doctor, refer to section 3.2.3). The initial target is handicapped and chronic people that comprises of 18% of population (refer to section 3.2.1). It is assumed that about 50% of the target group will be willing to use e-consultation for the cases that can be electronic. So, for one doctor, there can be 4*0.18*0.5 = 0.36 electronic consultations per day. That value multiplied by number of doctors in Tromsø and number of days in a quarter of a year will yield the number of quarterly e-consultations. Similarly, the installation of box proceeds to other counties and the respective e-consultations follow the following half year in that county. Similarly, it is assumed that at least 70% of the GP offices will agree to set up the boxes. The setup of 70% of the boxes will be finished in year 2019. And, from the start of second half of 2019, the sale of subscription starts. The sales forecast is very difficult to make and thus the financial calculations will deal with mere assumptions. However, a scenario method is used in cash flow statement so that the cash flow will be known for 10% higher or lower sales than assumed.

The assumption is that people would first like to try only the monthly and semi-annual packages about 1.25% and 0.1% of people from the counties where the boxes' set up is completed. It is not known for sure how many people would subscribe for the packages, so the values are mere assumption. There will be a gradual increase in sales in the following year when the set up will be completed in all the counties in Norway. However, the sales of monthly subscription will decrease with many people favoring a semi-annual or an annual one. About 0.1% of population is estimated to subscribe the annual subscription for the first time in 2020. The number of

subscription is believed to increase by additional 0.1% every quarter for the year for annual and 0.2% for semi-annual and saturate at the end of the year. The increase in subscription revenue will decrease the stand-alone e-consultation revenue. Revenue from stand-alone e-consultation is much higher but the margin is much low as a huge amount of revenue (approx. 82%) is paid out to the doctors for the consultation. The revenue tables and chart are available in the appendix 6, 7 and 8.

Table 4: Income statement

Income Statement (All figures in thousands)					
Particulars	**2016**	**2017**	**2018**	**2019**	**2020**
Revenues					
Number of e-consultation sales	0	4.08	36.67	113.78	353.64
E-consultation revenue (a)	0	694	6,233	19,342	60,119
number of subscription sales	0	0	0	10.39	102.23
subscription revenue (b)	0	0	0	668	12,260
Total revenues (a+b)	**0**	**694**	**6,233**	**20,134**	**72,835**
Cost of goods sold					
E-consultation	0	569	5,111	15,861	49,297
subscription	0	0	0	24	296
Total Cost of goods sold	**0**	**569**	**5,111**	**15,884**	**49,594**
NET Contribution					
E-consultation	0	125	1,122	3,482	10,821
Subscription	0	0	0	644	11,964
A. Sum NET contribution	**0**	**125**	**1,122**	**4,125**	**22,785**
COST OF OPERATIONS					
B. Salary & Personnel cost	**1,047**	**2,238**	**3,613**	**4,055**	**4,160**
C. Other Operating Costs	124	309	379	924	831
D. TOTAL OPERATING	**1171**	**2547**	**3992**	**4979**	**4990**
E. EBITDA (E=A-D)	**-1,171**	**-2,422**	**-2,870**	**-854**	**17,795**
Depreciation	-6	-40	-239	-652	-989
F. NET INCOME	**-1,177**	**-2,462**	**-3,110**	**-1,506**	**12,100**

The yearly income statement looks like above. It is estimated that the computer will cost 6,500 NOK and last for 5 years. Using straight line depreciation method the estimated depreciation was 1,300 NOK. For cutting up the cost, the office space will be used at the incubation center. Only on the 4th year, a proper office space will be rented. 5% of last year's net profit will be invested

in parent company for research and development from year 6. Similarly, marketing costs is allocated at 1.5% of last year's net income. Quarterly net income is available in appendix 9. Most of the expenses and revenues are supposedly paid and collected within the same quarter as incurred. So, the cash flow is quite similar to the income statement.

Cash Flow, Firm value and the Capital Requirement

Quarterly cash flows for the firm without capital funding under normal scenario are shown below;

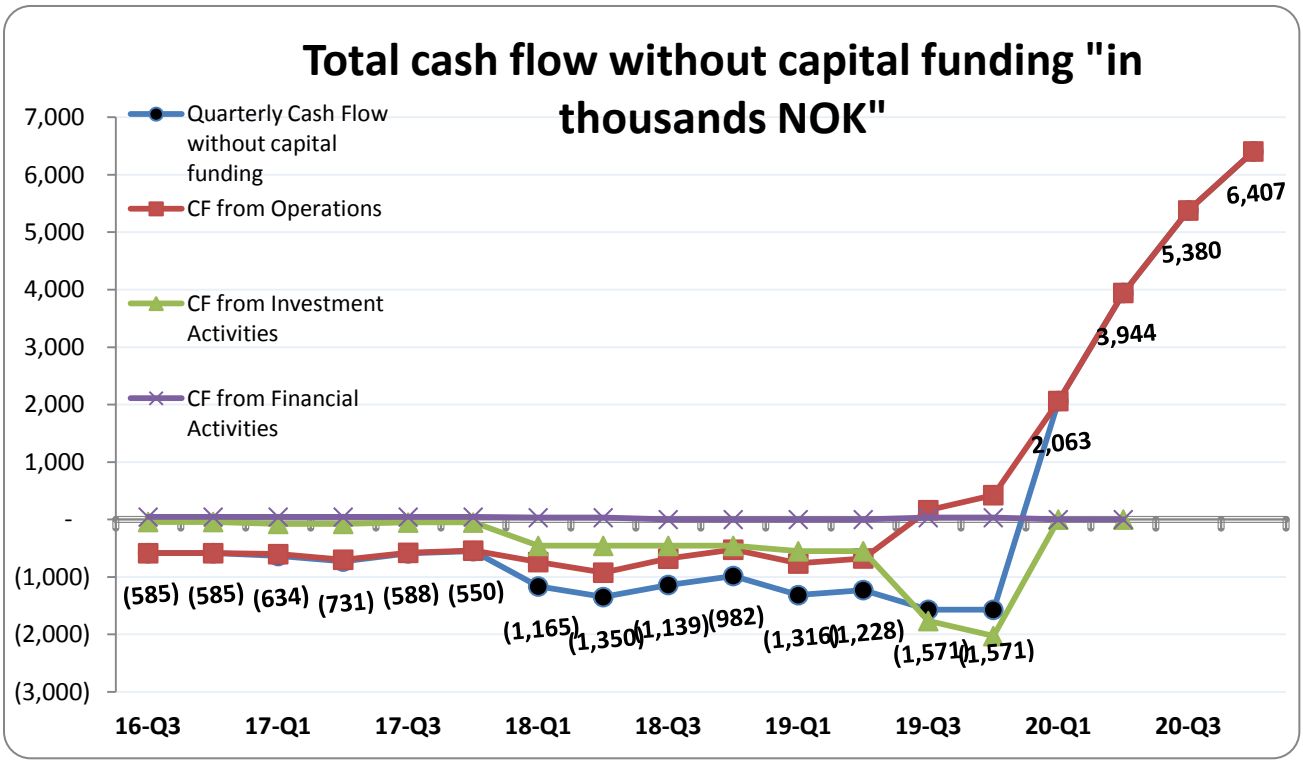

Figure 11: Quarterly cash flow for next five years under normal case scenario

As seen in the figure above, the cash flows for next three years are negative under the normal case scenario. Significant amount of cash is invested in the installation of appliance boxes and paying the human resource. It denotes a need for capital at the inception. The cash flow trend follows a much similar pattern for scenarios with both 10% higher and lower sales case than assumed. Total cash deficit results to about 13.9 million till the end of the 3rd year. The value for lower sales scenario is 14.5 million. Based on the deficit, it is believed that an investment capital of 15 million is needed for the company. See appendix 10 for the cash flows under different

scenarios. We expect to get 4 million NOK from Innovation Norway. There is a need of capital financing of 11 million NOK. Erdusyk is looking for the investment in exchange of 30% ownership of the firm.

The value of the firm is calculated through Net present Value method. The summation of discounted present value of all future cash flows is the net present value. The discounting rate is calculated to be around 18%. The return on government 10 year bonds is used as risk free rate and the market risk premium is about 5% (Fernandez, P., et al. 2014). Beta value is the measure of systematic risk of a firm. Beta value of 1 denotes that a company's systematic risk is equal to that of the market. A start up is always a risky business so it is believed that a Beta value of 3 is reasonable in this case. Using Capital Asset Pricing Model, the discounting rate is evaluated. This way the net present value of firm is calculated to be approximately 46.06 million NOK. See appendix 11 for the details.

4.12 Critical Risks

The probable risks with their probability and methods to prevent or eliminate the risks are presented hereby;

1. Lack of adoption of the product by Market: 'moderate probability and huge impact' The market study has gathered enough evidence that people want to use such service. However, there might still be a bit of probability that people will not adopt the product due to poor understanding of the product value. That being the case, product will be discarded and that will have massive impact on the firm. This risk is taken care of by making people aware about their pains and how they can be eliminated without jeopardizing their well-being. Promotion of the service through GPs and through campaigns at handicapped and chronic patient's union meetings is the most viable option. Once, the pilot group uses the product, paid endorsement through the initial users will be done to make other people aware about the adoption.
2. Regulatory hindrance: 'low probability and moderate impact'

The product and the technology do not impinge the regulatory statutes in any way. There could be, in least possible cases, some changes in regulations in the future that might affect the way the project moves further. The use of epidemiology as disease outbreak detection system and the thousands of dollars that the information can save for the government will be let known to government. Similarly, the patient's health records are the properties of GP offices and they have exclusive right over the data. The software in the appliance box is created so that it can only extract that part of health record data that does that does not include the personal information of any individual. The information is purely epidemiological and impersonal.
3. Reluctance of some GPs or GP offices to install the box: 'moderate probability and high impact' The value of diagnostic decision support system which can be created from the epidemiological data for the doctors needs to be well relayed. The need to install computer box for the epidemiological data must be emphasized. Also, doctors receive extra bit of allowance for e-consultation service. Similarly, the exclusive right of their data is preserved. The value for doctors is quite significant and that should be let known.
4. Competitive values: "moderate probability and moderate impact' There could be competing solutions offered to people. Investment in R&D and continuous improvement based on the people's current and emerging pains and feedbacks will be done.

4.13 Exit Strategy

After the full fledged service is developed in the fourth year, the returns are maximized and the market will be matured. The market value of Erdusyk will be the highest at the point. It is believed that many companies will be interested to buy Erdusyk. Erdusyk will most probably be developed as an indispensable part of health care service system in Norway. The multitude of benefits it can provide to people, doctors and the state will warrant its adoption in the health care system by government. The government of Norway is taking initiatives to store the health

records of all the patients in a single server for creation of epidemiology. ‘Kjernejournal’ is the government’s initiative for that cause. However, it raises concerns of sensitive data and privacy issue of patients. The EHRs are private information of patients and property of GP offices. GPs are not willing to provide their patient’s private information. The security of data stored in such manner is one huge concern as such servers are prone to hacking. Similarly, the data is accessible to people who create the central reservoir of data. Also, the data need to be encrypted in a way that makes it difficult for the data to be reused. The infrastructure that the appliance box has solves all the issue by putting the patient’s records at GP offices itself and extracting only the epidemiological information from the GP office’s records. All the problems above is solved by this method. It has all the infrastructures that fulfill the need the government of Norway has been trying to fulfill. It is believed it is something that the government of Norway will want to acquire. Thus, the company will be sold most probably to the government of Norway.

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Appendices

Appendix 1: The Questionnaire

Erdusyk.no

Thank you very much for your willingness to participate in this study. The purpose of this study is to discover people's perception about the current general medical service in Norway in an attempt to devise a better service that will be valuable to both the patients and the doctors. This study attempts to generate insights about the feasibility of using telemedicine technology in GP consultation and creation of disease query engine. The study is also a vital part of a master's thesis leading to the creation of a business plan. Your responses will be anonymous and your participation is voluntary. Please tick the favorable responses from below. Thank you for your cooperation.

---

1. What is your age?
Mark only one oval.

- 18 to 24
- 25 to 34
- 35 to 44
- 45 to 54
- 55 to 64
- 65 to 74
- 75 or older

2. What is your gender?
Mark only one oval.

- Female
- Male

3. What part of the country do you live in?
Mark only one oval.

- City
- Suburban area
- Countryside

4. About how many times a year do you visit your personal doctor to get care for yourself?
Mark only one oval.

- None
- 1
- 2
- 3
- 4
- 5 to 9
- 10 or more

5. How far is the GP (personal doctor)'s office from where you live?
1 mile = 1.6 kilometer (approximately)
Mark only one oval.

- less than a mile
- 1-2 miles
- 2-5 miles
- 5-10 miles
- more than 10 miles

6. How satisfied are you with the overall medical system in Norway?
Mark only one oval.

- Extremely satisfied
- Very satisfied
- Somewhat satisfied
- Not so satisfied
- Not at all satisfied

7. What are the things you find most inconvenient when visiting a doctor?
(you can select more than one options)
Check all that apply.

- late appointment date
- long queue
- doctor's fee
- clinic location
- parking difficulty
- physical discomfort (while sick and waiting in a queue)
- time consumption (a lot of your time is wasted in the process)
- Other:

8. What is your perception about having to travel to doctor's office when you're ill?
Mark only one oval.

- HIghly uncomfortable
- Uncomfortable
- Comfortable

9. Would you prefer to consult your doctor virtually from your home rather than physically go to the doctor's office when you're sick?
Mark only one oval.

- Yes
- No

10. Do you seek medical information from the internet while you're sick?
Mark only one oval.

- Yes
- No

11. If you do, is there a particular website or a mobile application that you use?
Mark only one oval.

- No
- Yes

If yes, please specify the name of the website/application
12. About how much money do you spend on obtaining online medical information in a year?
Mark only one oval.

- 0
- 0-50 NOK
- 50-100 NOK
- 100-500 NOK
- 500 and above

13. How satisfied are you with the medical services and information available online?
Mark only one oval.

- Extremely satisfied
- Very satisfied
- Somewhat satisfied
- Not so satisfied
- Not at all satisfied

14. If not satisfied, is there any particular feature that you are dissatisfied with? (multiple selection possible)
Check all that apply.

- Credibility of the information provider
- Price
- privacy issues
- authenticity of the information
- quantity of content present on the pages and apps
- too large number of search results
- large part of information is irrelevant
- Other:

15. When you/your family member is sick, would you be interested in knowing whether or not other people have similar problems during that period?
Mark only one oval.

- Yes
- No

16. Would you be interested in a service that allows you to have a consultation with your personal doctor online (in text, audio or video forms through your phone or a computer)?
Mark only one oval.

- Yes
- No

17. Would you be willing to pay to be able to use such service?
Mark only one oval.

- Yes
- No

18. If yes, how much would you be willing to pay for such service per consultation (meeting with the doctor) ?
Mark only one oval.

- less than 50 NOK
- 50 -100 NOK
- 100 - 200 NOK
- 200 NOK or more

Appendix 2. Responses from the Questionnaire Survey

1. What is your age?

18 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 to 74	75 or older
34	68	23	14	5	0	1
23.40%	46.90%	15.90%	9.70%	3.40%	0%	0.70%

2. What is your gender?

Female	Male
81	64
55.90%	44.10%

3. What part of the country do you live in?

City	Suburban area	Countryside
84	14	11
57.90%	9.70%	7.60%

4. About how many times a year do you visit your personal doctor to get care for yourself?

None	1	2	3	4	5 to 9	10 or more
29	55	33	15	7	4	2
20%	37.90%	22.80%	10.30%	4.80%	2.80%	1.40%

5. How far is the GP (personal doctor)'s office from where you live?

less than a mile	1-2 miles	2-5 miles	5-10 miles	more than 10 miles
37	28	30	6	8
33.90%	25.70%	27.50%	5.50%	7.30%

6. How satisfied are you with the overall medical system in Norway?

Extremely satisfied	Very satisfied	Somewhat satisfied	Not so satisfied	Not at all satisfied
11	74	45	12	0

7.70%	52.10%	31.70%	8.50%	0%

7. What are the things you find most inconvenient when visiting a doctor?

late appointment date	57
long queue	46
doctor's fee	31
clinic location	3
parking difficulty	8
physical discomfort (while sick and waiting in a queue)	9
time consumption (a lot of your time is wasted in the process)	49
Other	17

8. What is your perception about having to travel to doctor's office when you're ill?

HIghly uncomfortable	Uncomfortable	Comfortable
10	58	40
9.20%	53.20%	36.70%

9. Would you prefer to consult your doctor virtually from your home rather than physically go to the doctor's office when you're sick?

Yes	51	46.40%
No	59	53.60%

10. Do you seek medical information from the internet while you're sick?

Yes	110	75.90%
No	35	24.10%

11. If you do, is there a particular website or a mobile application that you use?

No	103	76.30%
Yes	32	23.70%

If yes, please specify the name of the website/application

helse.no
google
webmed
Webmd
mayo clinic
http://nhi.no/pasienthandboka
Medscape, NHS.uk
NHI, lommelegen

Legehåndboka, uptodate
uptodate.com
google.com
nhi.no WebMD.com
onlinelege.no
Helsenorge.no
I just google it, and offcourse look for credible sources.
I just google after the information I need
http://www.nhs.uk/pages/home.aspx

12. About how much money do you spend on obtaining online medical information in a year?

0	135	93.10%
0-50 NOK	3	2.10%
50-100 NOK	3	2.10%
100-500 NOK	3	2.10%
500 and above	1	0.70%

13. How satisfied are you with the medical services and information available online?

Extremely satisfied	5	3.70%
Very satisfied	20	14.70%
Somewhat satisfied	84	61.80%
Not so satisfied	22	16.20%
Not at all satisfied	5	3.70%

14. If not satisfied, is there any particular feature that are you dissatisfied with?

Credibility of the information provider	63	70%
Price	3	3.30%
privacy issues	3	3.30%
authenticity of the information	41	45.60%
quantity of content present on the pages and apps	11	12.20%
too large number of search results	12	13.30%
large part of information is irrelevant	33	36.70%
Other	10	11.10%

15. When you/your family member is sick, would you be interested in knowing whether or not other people have similar problems during that period?

Yes	29	63%
No	17	37%

16. Would you be interested in a service that allows you to have a consultation with your personal doctor online (in text, audio or video forms through your phone or a computer)?

Yes	112	77.20%
No	33	22.80%

17. Would you be willing to pay to be able to use such service?

Yes	89	61.80%
No	55	38.20%

18. If yes, how much would you be willing to pay for such service per consultation (meeting with the doctor)?

less than 50 NOK	19	17.80%
50 -100 NOK	27	25.20%
100 - 200 NOK	19	17.80%
200 NOK or more	12	11.20%

Appendix 3: Baye's Theorem

Bayes' theorem describes the probability of an event, based on conditions that might be related to the event. Bayes' theorem is stated mathematically as the following equation:

$$P(A|B) = \frac{P(B|A)\,P(A)}{P(B)},$$

where A and B are events and $P(B) \neq 0$.

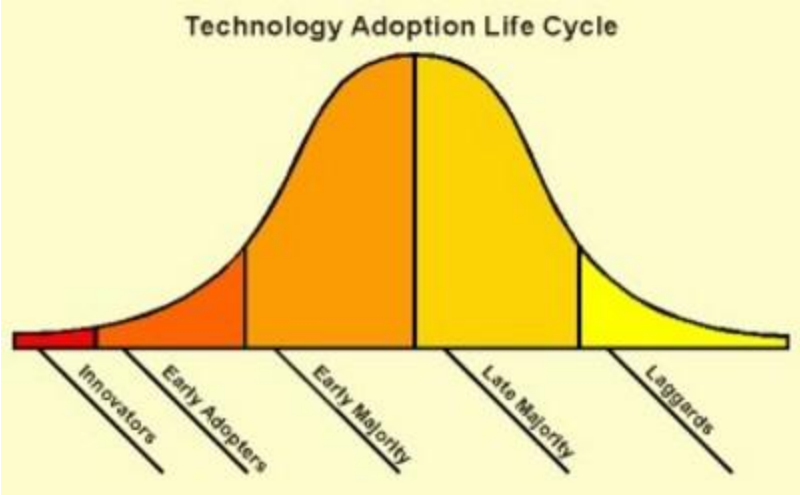
$P(A)$ and $P(B)$ are the probabilities of observing A and B without regard to each other.

$P(A \mid B)$, a conditional probability, is the probability of observing event A given that B is true.

$P(B \mid A)$ is the probability of observing event B given that A is true.

Appendix 4: Early Technology Adoption Cycle

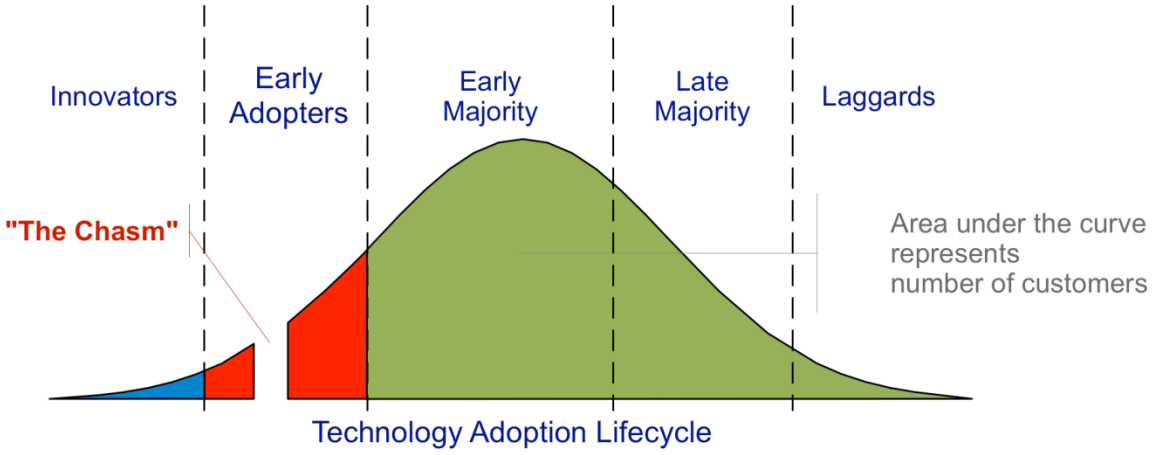
The conventional technology adoption cycle is portrayed herey;



Source: http://edbrenegar.typepad.com/leading_questions/images/technology_adoption_life_cycle_1.jpg

Appendix 5: Moore (2014)'s Revised Technology Adoption Cycle

Moore (2014) revised the old technology adoption cycle and depicted the gap between the early adopters and early majority known as "the chasm".



Source: https://upload.wikimedia.org/wikipedia/commons/d/d3/Technology-Adoption-Lifecycle.png

Appendix 6: Revenue Table for E-consultation

Here, number of e-consultation = no of GP offices*percentage of appliance box installed GP offices*number of feasible e-consultations per day*percentage of people using e-consultation*days in a month*no of months in a quarter

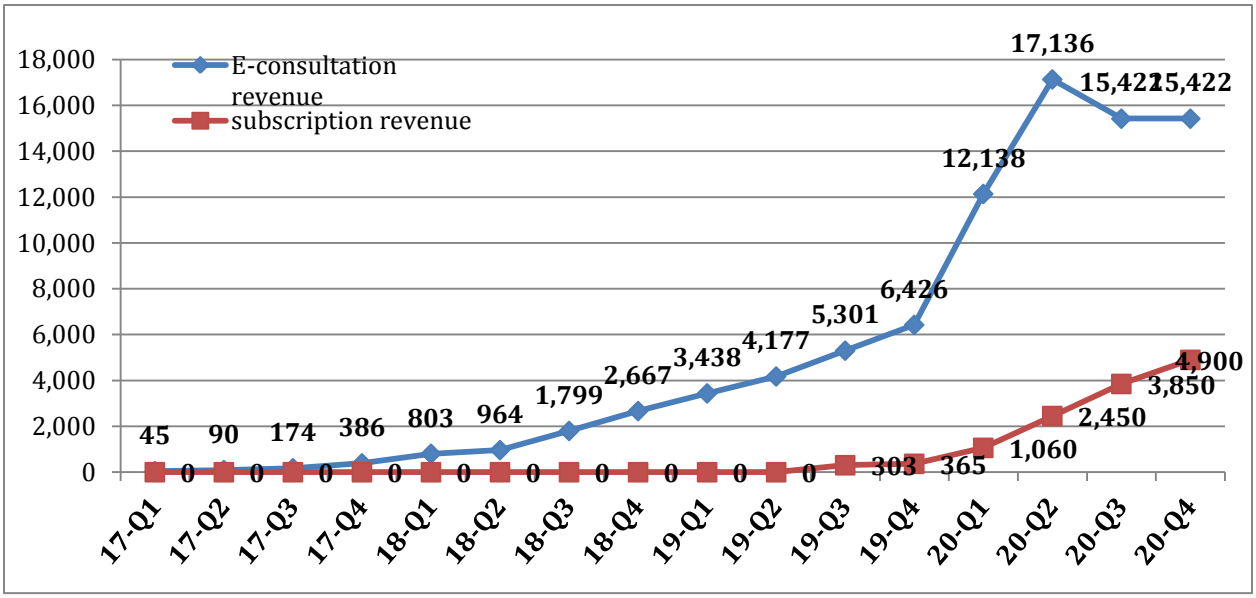
Time (Quarterly)	Number of e-consultation (in thousands)	Revenue from e-consultation (in thousands NOK)
16-Q3	0.00	0
16-Q4	0.00	0
17-Q1	0.2646	45
17-Q2	0.5292	90
17-Q3	1.02	174
17-Q4	2.268	386
18-Q1	4.73	803
18-Q2	5.67	964
18-Q3	10.58	1,799
18-Q4	15.69	2,667
19-Q1	20.22	3,438
19-Q2	24.57	4,177
19-Q3	31.19	5,301
19-Q4	37.80	6,426
20-Q1	71.40	12,138
20-Q2	100.80	17,136
20-Q3	90.72	15,422
20-Q4	90.72	15,422

Appendix 7: Revenue Table for Subscription

The epidemiology will only have some value from 2019, so the subscription sale will start from the 3rd quarter of 2019. It is believed that about 70% of GP offices will accept to install the appliance box and hence the only 70% of people will have access to the subscription.

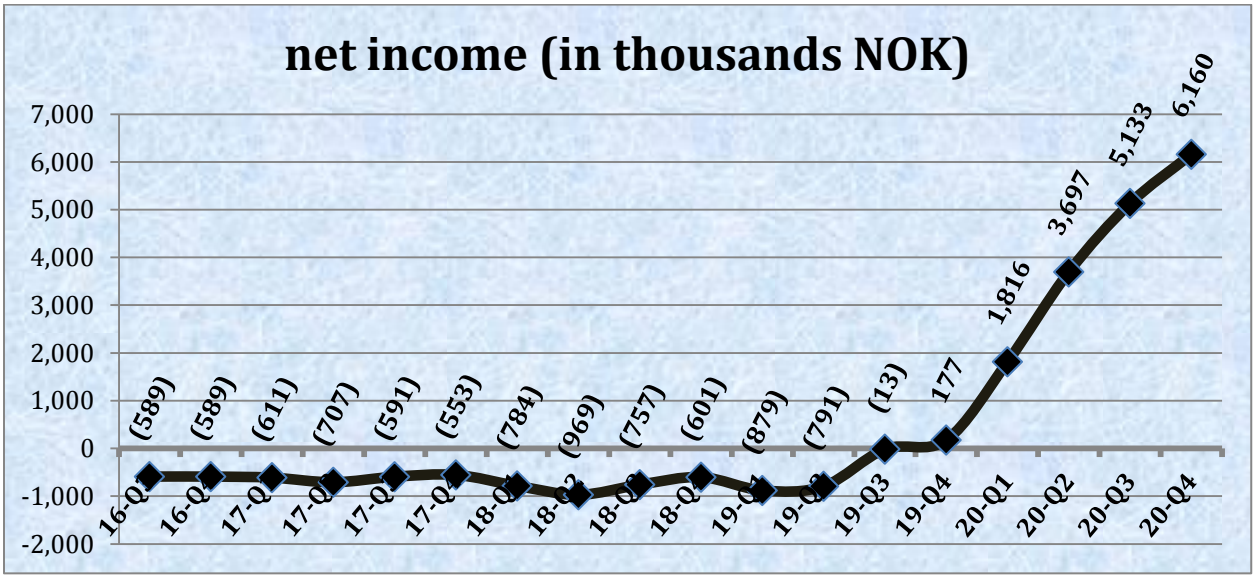
Time (Quarterly)	Population able to access Erdusyk subscription (in thousands)	premium account subscription (% of population)				revenue from subscription
		annual	semi-annual	monthly	total	NOK (in thousands)
19-Q1	0	0%	0%	0%	0%	0
19-Q2	0	0%	0%	0%	0%	0
19-Q3	1,347	0%	0.1%	0.25%	0.35%	303
19-Q4	1,620	0%	0.1%	0.25%	0.35%	365
20-Q1	2,495	0.1%	0.1%	0.25%	0.45%	1,060
20-Q2	3,500	0.20%	0.20%	0.20%	0.60%	2,450
20-Q3	3,500	0.3%	0.4%	0.20%	0.90%	3,850
20-Q4	3,500	0.4%	0.5%	0.20%	1.10%	4,900

Appendix 8: Revenue Chart

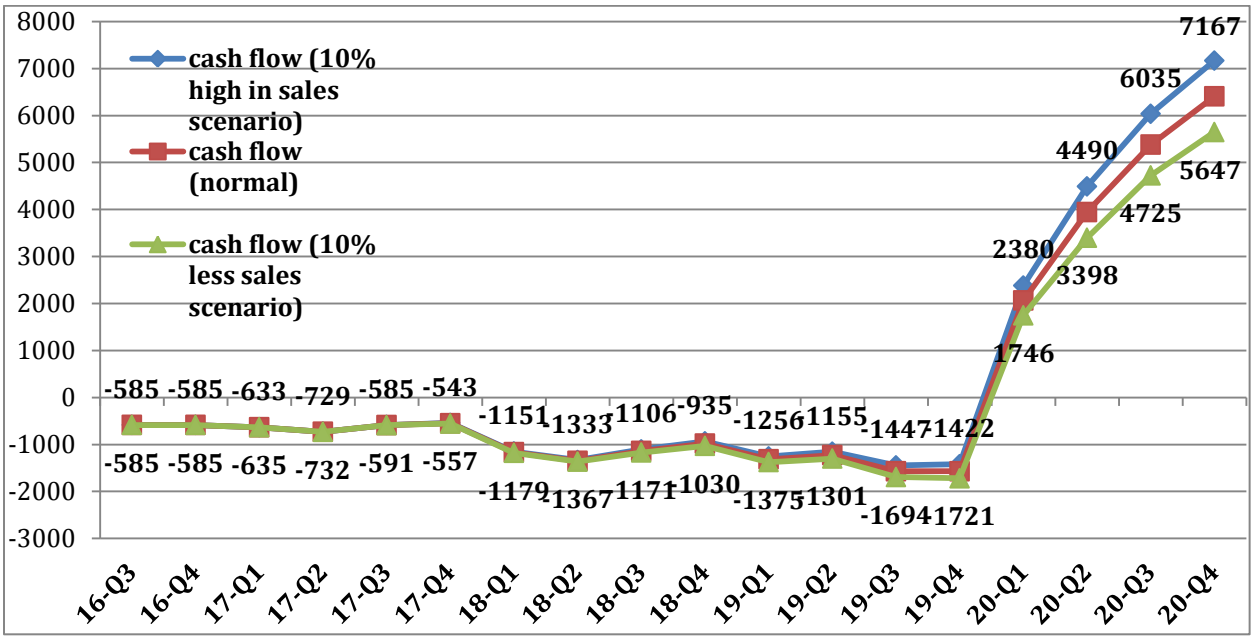


Appendix 9: Quarterly Net income

Time (Quarterly)	Net Income (in thousands NOK)
16-Q3	-588.546
16-Q4	-588.546
17-Q1	-610.65
17-Q2	-707.385
17-Q3	-591.149
17-Q4	-552.979
18-Q1	-783.575
18-Q2	-968.515
18-Q3	-756.811
18-Q4	-600.659
19-Q1	-879.206
19-Q2	-791.042
19-Q3	-13.2714
19-Q4	177.3893
20-Q1	1816.095
20-Q2	3696.914
20-Q3	5132.818
20-Q4	6160.068
sum	**8550.948**



Appendix 10: Cash Flow Under Different Scenarios



Appendix 11: Value of Firm

Valuation of the business "in thousands NOK"

year	expected cash flow	present value of the cash flow (as of Jan 2016)
2016	12,831	10874
2017	-2,398	-1722
2018	-3,824	-2327
2019	-2,806	-1447
2020	14,000	6120
cash flows after 2019 valued at 2019	111,111	48568
TPV		60,064
Initial Investment		14,000
NPV		46,064

expected annual average cash flow after 2019	20,000

expected rate of return	**18%**

expected rate of return = risk free rate (3%)+rmarket risk premium(5%)*Beta(3)= 18%