Acronyms

NFF Norsk Fysioterapeutforbund

SDK Software Development Kit

FTE Full Time Equivalent

FaME Falls Management Exercise

DDR Dance Dance Revolution

BBS Berg Balance Scale

FES-I The Falls Efficacy Scale - International

EE Energy Expenditure

ASCM American College of Sports Medicine

NOK Norwegian Kroner

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Chapter 1

Introduction

1.1 Scope

1.2 Problem Definition

Games are becoming more and more important in the health sector. One specific genre of games is exercise games (exergames). In this assignment we will focus on the business opportunities and economics of games in the health sector, with special focus on exergames for rehabilitation and elderly. The work has been done in collaboration with Cyberlab, a company focusing on serious games for education and training. The work will provide input to an EU funded project focusing on elderly afraid of falling.

In particular, the following studies will be done:

- A background study of exergames in general and exergames for rehabilitation and elderly in particular.
- A description of specific business cases.
- Analyzing the business potential of this type of games in the health sector using Osterwalder business model.
- Miscellaneous aspects to consider about this type of game

1.3 About the Project

This project assignment is based on an EU-funded project called "GameUp". The purpose of "GameUp" is to use technologies that are proved to improve motivation to encourage elderly to be more physically active. The goal is to sustain and enhance mobility in older people so they can live longer at home which may result in a better quality of life. "GameUp" wants to increase motivation and self-efficacy towards mobility by focusing on physical activity capabilities. They will make convenient and easy to use exercise games and social games using low cost motion sensors and commercial modules and products [1].

This project is a European cooperation with different partners involved. One of these partners is Cyberlab, a small company located in Trondheim. They are working with development of simulators and simulation-based games primarily for technical education and training, but also for promotion and exemplification of technical products and services (nesten avskrift fra deres hjemmeside, [2]. Their work in the "GameUp" project is to develop a exercise game using Microsoft Kinect as a platform. (Tor-Ivar).

1.4 Limitation of Scope

The game has not been developed yet. Immature marked. Hard to predict demand.

1.5 Outline

Hvordan kapittelene henger sammen..

Chapter 2

Motivation

For us to be able to understand this game, why it is made and where it will fit in, we have to understand the problems the "GameUp" project is founded on.

This chapter describes the problems of fall which is the main motivation for the "GameUp" project and why Cyberlab will develop this game. We will describe the game, and to understand how this game would used in the real world we will describe a example case.

2.1 The Problem of Falls

Falls are very common in the older population. Even though it does not necessarily seems like a very serious event, it is actually the leading cause of injury in older people. Fall is considered a public health problem because of the serious consequences for the person falling and their considerable cost to the country [3]. It is estimated that around 30 percent of people over 65 years old and almost 50 percent of people over 80 years old fall at least once a year. 1/10 of these falls results in fracture and one-fifth needs medical treatment. Other serious outcomes of a fall includes pain, trama and impaired function [3]. The worse outcome of a fall is death. 25 percent

of elderly getting hip fracture after a fall, dies within a year [4] [5]. It is shown that after a fall one-third will be afraid of falling again. Being afraid of falling could make them insecure which can result in an even bigger risk of falling. For many elderly, the fair of falling can result in being less active and loss of confidence in carrying out everyday activities. This can result in fear of leaving their house, which can lead to total inactivity. The latter is a serious problem because a long time of inactivity will result in disabilities and increased risk of falling. Therefore, it is important to find ways to activate the elderly and to offer a service that can prevent the elderly from developing disabilities [4]. Another issue is that missing the ability to carry out everyday activity can result in loneliness and even depression (site dette?). Falls are also resulting in an increase in economic costs for the government, including both the acute treatment after a fall and often also in long-term care. [3]

2.2 The Game

The product Cyberlab is going to develop is an exergame for the Kinect sensor for Windows. Kinect is a motion sensor device that can track human motions, so the player do not have to hold on to any controllers. The game will be used for prevention and rehabilitation, where the focus on the exercises will be on improving physical strength and balance. The idea is that the game will have one regular workout version for prevention and one version for rehabilitation, with ability to customize the exercises.

2.3 Example Case

To be able to understand how this exergame can be used as a tool for exercise, prevention and rehabilitation, we will provide the reader with an example case.

78 year old Olga lives in her own apartment in central Trondheim. Everything she might need is situated in the area, but lately she has started to feel unsteady and has trouble keeping her balance, making sure she does not go out more than necessary. Trondheim is also very icy most of the winter, which increases Olga's fear for falling. Basically, Olga is a very social person, but lately there has been little contact with friends and other people in general because of the fear of going out. Olga has no close family nearby. Beside the unsteadiness, Olga is well and without any physical pain, and thus has no need for physiotherapists. Olga has a great desire to be more steady on her feet so that she can gain an increased social contact, and particularly increase her confidence.

Olga has a grandson who is very into video games. Once a year he is visiting her and every time he tells her about the different games he is playing. Sometimes he also brings games to her house to play there, and she is watching enthusiastically. One time he told her about a new game he got for his birthday, a game where he did not need any controllers, but could only stand in front of the TV screen making movements that would appear on the screen. He also told her about how you could get different exercise games for the controllers and that this is starting to get very popular in the general population. Olga thinks this sounds very interesting, but at the same time it is too intimidating for her to even consider to buy.

Two months later, Olga feels that she has become weaker after being inactive for so long. Her daughter recommends her visiting a physiotherapist. The clinic is only a couple blocks away from her house, but everyday before her appointment she is worrying about how she will get there. When the day arrives, she is so anxious that she ends up ordering a taxi.

The physiotherapist meets her in the door, and follows her to his office. After being examined the physiotherapist introduces her to a new project they have just started at his clinic. He tells about an exercise program as a video game that is specially made for elderly people. At first it will just be provided at the clinic, but eventually, if the use of the game is a success,

they plan to offer it for patients to rent or buy. The program will contain one playing session a week, and will be played by up to four players. At first, Olga is very sceptical, but then she suddenly remembers her grandson playing a similar game in her living room a couple of months ago. She is thinking that even though the game looks very intimidating at first sight, here she will at least get some assistance. She decides to sign up, but has one concern. How will she get to the clinic? The physiotherapist tells her that as part of the program, they will offer the participants transportation to the meetings until they feel confident getting there themselves. The main goal for the game is to strengthen muscles and improve balance, so after a while the participants should see improvements.

One week later, Olga visits her first meeting. None of the participants in her group have tried the game before, so everyone gets an thoroughly introduction. Then they start playing. Olga thinks the game is self-explanatory and very easy to understand, and she get through the first level without any problem. A physiotherapist is watching them at all times and is guiding them through the game. After the session is over, Olga is tired, but she feels good. What she liked most about the game was how fun it was to compete with the other participant, who motivated and engaged each other. Olga likes the way the Norwegian health care system is heading, when she now feels more seen and better taken care than she have ever felt before. She is already looking forward to the next session.

Chapter 3

Health Politics in Norway Today

The government states that it is a public responsibility to promote health and prevent diseases to make sure that the population get the care they need. The goal is to overall get a healthier population. Good health is necessary for an individual to acquire the quality of life they wish for. It is also important for the society, especially economically. We are awaiting a boost of elderly in a couple of years, and it is important to prepare for that. In Norway there is a goal to offer everyone in the need of it, a place in care homes by 2015. To be able to meet all the requirements set, there is a need for a change in the health sector in Norway.

In this chapter we will describe some of the goals for the future of the Norwegian health sector. This is done for us to be able to see the potential of this game. It is also necessary to look at different offers existing today, which will help us understand how Cyberlab's exercise game can be used. This will be provided in the last section.

3.1 Samhandlingsreformen

"Samhandlingsreformen", from now called "the reform", started 1. January 2012, presents a new way to organize the health service in Norway. In the reform there is an increased focus on prevention, early intervention and close collaboration between different entities. The health services should be offered closer to where people live and they should be offered more comprehended and coordinated treatment. Welfare technology shall support these strategies where possible (described in the next section). Technical solutions and methods can make it possible to treat more patients in a better way. Every 75-year old are offered supervision to promote health and own coping. Every person who is in need of health care services that can be deployed in their own house, should be provided this. The services offered in the private home needs to be improved. If the services in the private home could be improved to the level where it helps the user being able to live in their own home for three more months, it will be equal to 10 percent of the capacity in care homes. This will depend on better offers outside the clinics.

The main focus now should be "hverdagsrehabilitering", from now on called "everyday rehabilitation". This means that a person will get health care first after an evaluation that proves that he or she actually has a need for rehabilitation. The target group are the ones with moderate limitations in functional level. The goal is to postpone their need for extensive help and help them to achieve a dependent everyday life. "Everyday rehabilitation" has the home care staff as a basis and physio-and ergotherapy as an "engine". If a patient is considered to be in the need of help and support in their own home, they will first meet with a physio- or ergotherapist, who will examine them. The new strategy for the health care system just described is based on the "Fredericia-model". This model is developed in the Danish municipal "Frederica" and is about how physical, social and cognitive capabilities can be maintained and improved, so that functional disabilities in the older generation will be postponed. The experiences from this model have been very positive. 30 percent receive "everyday rehabilitation" instead of ordinary home care. Approximately 45 percent of these

ended the rehabilitation process with no need of any further help, and 40 percent ended the rehabilitation process with need of less help than one can assume they would need. [6] [7]

3.2 Welfare Technology

As a part of the new reform, welfare technology should be implemented if possible. Welfare Technology can be defined as: "Technological assistance that contributes to increased safety, social interaction, mobility, and physical and cultural activity. In addition welfare technology can help to strengthen an individual's ability to be independent despite sickness and social, mental or physical disabilities. Also it can work as technological support for relatives, as well as contribute to improving the services offered, when it comes to utilization of resources, availability and quality. In many cases welfare technology can prevent the need for health services or admission to an institution" [Translated from Norwegian from [8]].

Today there is huge attention around the topic of welfare technology in Norway. It is seen as an important tool in the future demographic challenges and in the health promoting work. The goal is that the need for health services will be decreased and that people can take care of themselves longer. This means that there is a need for services that can be implemented in people's home. An example can be a technological tool for preventing falls and loneliness. The use of welfare technology can improve the services offered, increase the flexibility and make it easier to interact with different actors. Welfare technology introduces a new arena for innovation, value creation, and can give rise to positive socio-economic effects.

The market for welfare technology is very immature. There are no initiators that can make sure it will be established public and private demand. It will be the different municipals' work to establish a public demand. There is a need for robust solutions when it comes to customization, entry level, support and maintenance. Development of actual products, as well as test-

ing of the solutions, is needed.

The Public Health Department in Norway,"Helsedirektoratet", recommends that laws for the use of welfare technology should be established. There are some new aspects that have to be taken into account when integrating technology into systems containing detailed personal information. The use of technology introduces some privacy issues, where for instance some systems will contain sensitive information about the patients. This suggest that there should be a focus on making secure systems that will preserve people's privacy. [8]

The new reform together with the increased focus on the use of welfare technology suggest that an exergame can serve as a tool in the health promoting work. We will now look closer into, where the game could be implemented.

3.3 Fall Prevention and Rehabilitation Today

As one of the first steps towards finding where this game will fit, we see physiotherapy as an interesting area. The reasons for this comes what we have learned from the previous sections. We see that physiotherapists are the main actors in the area of prevention and rehabilitation. Therefore, we will look a little deeper into the subject of physiotherapy.

Physiotherapy is a science related to the medical field and central to this subject is body and movement. The theoretical basis for this subject is grounded in knowledge about science and society, and the recognition that different factors contribute to the maintenance of health. In addition to injuries and diseases, quality of life, experiences as well as social and cultural factors leads to pain and disability. This understanding along with practical and clinical knowledge form the basis for evaluation of how injuries and pain can be treated and prevented. Included are manual techniques, exercises and possible use of technical methods. Physiotherapists are tradi-

tionally working in municipalities, hospitals and in private institutions, and they are working with both individual treatment and treatment in groups. The goal for physiotherapists is to make their patients' daily activities easier to manage [9] [10].

Elderly people consult physiotherapists in terms of rehabilitation after surgery, after a fall, stroke or other injuries, or when they feel health problems make it hard to perform everyday tasks. Physical therapy usually includes exercise with focus on increasing the patients' flexibility, endurance and strength. Physiotherapists set up customized training for each patient according to what kind of needs they have. Unfortunately, the time a patient spends with the physiotherapists per week is not sufficient in order to become stronger or to recover from injuries. Therefore, one sees the need for patients to practice outside of these hours at the physiotherapists. Physiotherapists may give their patients exercises they can practice at home. However, not everyone is motivated to exercise on their own and many skip the weekly exercise that is scheduled for them. [10]

3.4 Existing Prevention Programs

To prevent developing disabilities elderly should regularly perform a training program that strengthen their muscles, improve balance and coordination, endurance and mobility [4]. These kind of training programs are offered in Trondheim. There has been established various fitness groups; do you want to get back in shape and become physically stronger? do you feel unsteady and see the need for better balance? Do you manage less now than you did a year ago? Do you find it difficult to go outside? These fitness groups find place at various locations around Trondheim and are offered 1-2 hours one day a week. In addition there exist senior dance, walking groups and water gymnastics [11]. These activities are good initiatives, but when the main problem is that elderly are afraid to go outside, how will they manage to engage in these fitness groups? It is also shown that 2 hours a week with physical activity is not nearly enough to increase

physical strength [4]. Regular physical activity is the key to become physically stronger and obtain better balance.

Trondheim municipality did a study where they provided a once a week group training program for elderly. Their study showed that training once a week did not improve physical function for the participants, but the participants expressed that they were less afraid of falling after starting with the group training. The study suggests that this kind of program should be combined with home training programs or other extra physical training offerings [4].

We found that there are already some offered training programs for elderly that can be implemented in their home:

The *"Otago"-program* is a program developed as a home training program for elderly to prevent falls. It consists of exercises that take about 30 minutes to complete which should be performed three times a week in addition to a walk twice a week. Each customer receives a booklet with instructions for the individual exercises prescribed in addition to ankle cuff weights. The participants needs to record the days they complete the program for follow-up purposes. For follow-up an instructor should do home visits every six months and telephone them every month. The instructor can then increase the difficulty in the prescribed exercises for each individual. The program has been tested and evaluated for 1016 home living people aged 65 to 97. The program was shown to reduce falls and fall related injuries with 35 percent, with the highest effect on those over 80 years old and those that have had a previous fall. The participants experienced improved strength and balance, as well as they maintained their confidence so it was easier for them to do everyday activities without being afraid of falling. [3] [4]

Falls Management Exercise (FaME) is an exercise program consisting of tailored group and home-based exercises and builds on the core exercises from the "Otago"-program. There are a total of three group training sessions per week, in addition to two home-training sessions. The exercise

intervention is designed to improve participants dynamic balance and core and leg strength. In the United Kingdom a study was done where they examined the effectiveness of this program for home-living women aged 65 or older who had already fallen 3 or more times within the previous year. After using FaME for 36 weeks the fall rate was reduced by one-third. The conclusion was that the exercise program should last for at least 36 weeks including at least 2 hours of training per week. For progression it is important that the intensity, resistance, and weight are continually increased. [12]

Øvelsesbanken is a Scandinavian project providing a user profile with different training programs. The different exercises are developed from the two previous described concepts and other relevant studies on balance and exercising for elderly. The program gives an idea on how you can put together an exercise program customized for each individual. It is primarily made as a tool for physiotherapists for putting together training programs for their patients to do at home. As we see it, it can also be used as a tool for each individual to make their own program, because you can also log in as a private user and make your own program. The program offers the user a choice of different exercises that can be added to a exercise program. When all exercises are chosen PDF-files can be printed with pictures and descriptions of the exercises, or the user can read them from the computer screen. It is an easy, self-explanatory and straightforward program to use. Øvelsesbanken is in use in Scandinavia and the summer of 2012 it had reached 4300 users. [13]

As we have learned from this chapter, there already exist projects and training programs with focus on elderly and their physical health. It is shown that exercise only once a week is not sufficient to improve physical health. However, with a supplement for example with additional training at home, it has been seen improvements. In addition, the new focus on prevention and early intervention with use of welfare technology, suggest that there is a potential for an exergame.

Chapter 4

Technological Aspects

To be able to understand the technological aspects of this game and the game's potential, we have to learn more about the technology it will be build upon. The purpose of this chapter is to get a fundamental understanding of what video games, and in particular exergames, are, and how these type of games are being used today. We will look into different types of technologies related to exergames, as well as examples of exergames used for exercise an rehabilitation. Based on this, we will provide a brief evaluation of Cyberlab's choice of technology and its potential a tool for exercise and rehabilitation.

First, we will describe video games and exergames. Second, we will provide a brief description on different video game providers. Third, We will look at some related work where training and video gaming are brought together. Finally, we give our evaluation and recommendation.

4.1 Computer and Video Games

"Video games are electronic, interactive games known for their vibrant colors, sound effects, and complex graphics" [14]. Characters or objects are controlled by hand held game controllers, or by pure body movement captured by sensors or motion controllers. Since the first computer game was developed in 1952 there has been a tremendous evolution in the computer and video game market. Todays market consist of an endless amount of various computer games, video games and video game consoles, and this type of technology are widely used all over the world. It has been developed a game for almost every need and interest, and video games are used for many different purposes, like education and learning, exercising or just pure entertainment. In this section we will describe the history of computer and video games, and gaming statistics.

The first graphical computer game was created by A.S. Douglas in 1952. This single-player "game" was based on a version of Tic-Tac-Toe and the title of the game was "OXO". "OXO" was designed for academic purposes. Douglas wrote a PhD degree on Human-Computer interaction, and used feedback from the electronic "OXO" in his work [15]. Ralph Baer, a German-born television engineer, designed in 1967 the first video game console for use on standard television. "Chase" was the name of the game, and here two players were connected to a television where they controlled two squares which they used to chase each other [16]. Various features were added to this idea, and this ended up in 12 games known as the Brown Box. Baer introduced his idea to Magnavox, and in 1972 the first commercial video game called Magnavox Odyssey was produced. TV dealers did not see the potential in the Odyssey, so it did not get very popular, and the market experienced low sales numbers. In 1985 the first Nintendo Entertainment System was released. Retailers were sceptical to marketing a new console soon after the video-game crash, but the games Nintendo introduced got popular, and soon Nintendo broke sale records and become the best-selling console in video-game history [17].

The Nintendo Wii is one of many gaming consoles, and it is worldwide very popular. It has sold over 30 million units in the US and in Japan there has been sold almost 10 million. These numbers combined with the international market gives a total sale of Nintendo Wii of 65.32 million units. However, the bestselling console ever is the Sony PlayStation 2, with over 138 million units sold. The bestselling video game series is the Mario franchise, with a sales number of over 225 million games [18]. DFC Intelli-

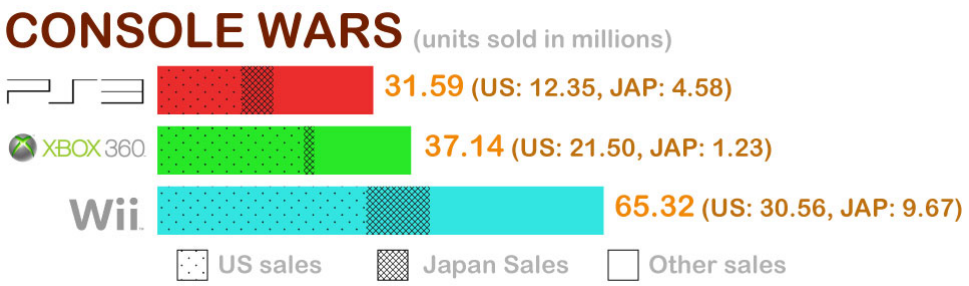

Figure 4.1: Console war 2012 [18]

gence is a marked research and consulting firm which focus on interactive entertainment and game markets. The global market for video games experienced revenue of 67 billion dollars in 2012, and in DFC Intelligence's new reports they forecast that the global video game market is expected to reach 82 billion dollars in 2017. This number includes revenue from console hardware and software, PC games and games for mobile devices [19] [20].

In the last 30 years there has been a great evolution in video games. Video games have become widespread entertainment, and in the US 65 percent of all households play video games. The majority of these gamers are players in the age of 18-49, and today the average age for a US gamer is 32 years old. In 2010 the average gamer played video games 8 hours during a week, and in 2012 this is more than doubled, when gamers today spends 18 hours

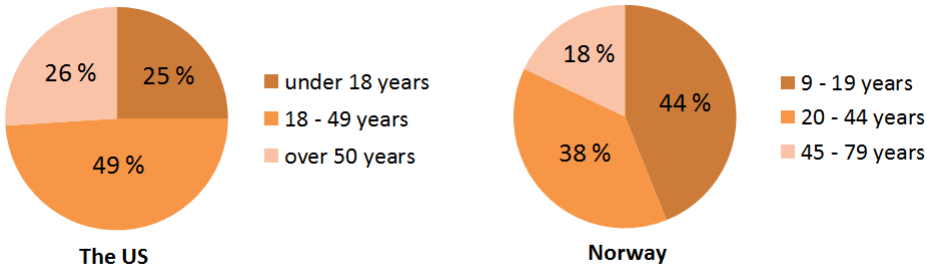

Figure 4.2: Gamer age distribution in the US in 2012 [modified from [18]] and in Norway [calculated from [23] [24]]

a week playing video games. [21] [18]

A surprising fact about the gaming statistics in the US is that as much as 2 out of 5 gamers are women, and that there are more gamers over 50 than there are gamers under 18, se figure 4.1 [18]. "Norsk mediebarometer", a report containing statistics around the topic of media use in Norway, show that 17 percent of the Norwegian population plays computer or video games on an average day in 2011. This includes not only children and teenagers; also a great part of elderly has started to use computer or video games. 8 percent of the population in the age 45 - 79 years use this kind of technologies on an average day, see Figure 4.1, where females are the most active gamers. The US has a higher number of gamers over 50, but the statistics shows that use of computer and video game in Norway has increased from 5 percent in 2010 and this measurement are the highest share ever recorded. [22] [23] One thing worth mentioning about the report of media use in Norway, is that when it came to looking at video games alone, 0 percent of the population in the age 45 - 79 said that they played video games on an average day in 2011! [23]

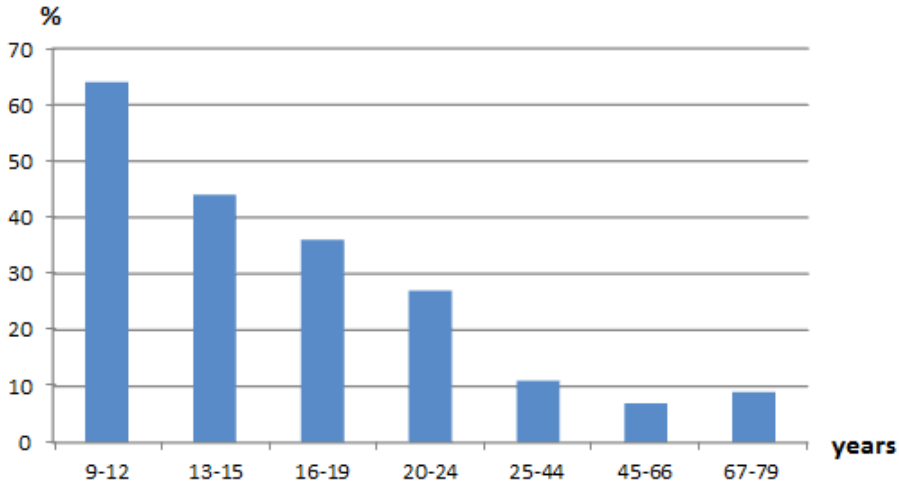

Figure 4.3: Percentage of the Norwegian population that use computer or video games on an average day in 2011, sorted by age" [23]

4.2 Exercise Games

The new generation of video games combining game play and physical activity is called exercise games, or "exergames". Exergames use technology like motion sensors and remote control to track body movement. This requires the player to get up from the coach and physically move their body to be able to play the game, which stimulates exercise. Exergames is proved to be motivating because it is fun, accessible and easy to understand, and it has shown promise in effecting users health in a positive direction [25]. The combination of movement, amusement and social interaction provides exergaming great potential for new business opportunities for the entertainment, recreation and healthcare sectors [26]. Today there exist numerous types of games and technologies related to exergames, where Nintendo Wii, Dance Dance Revolution, PlayStation Eye Toy and Xbox Kinect are some of the more familiar technologies.

Due to the growing interests one has seen it as relevant to study the use of exergames in regard of health and education. The technology these games provide can help improving peoples health in a new and interesting way [26]. In the past years exergames research has increased dramatically, which indicates that it will continue to do so [27]. Research shows tremendous promise in academic and physical progress of youth using exergames. Exergames has also shown an important social aspect, because of the possibility to play with others. This may especially be entertaining for elderly who are often alone and experience loneliness as a part of the everyday life [28].

The health sector is now more focused on prevention of illness instead of treatment, where this type of research can contribute to use of exergames in health care [26]. Exergames has shown promise for use in rehabilitation, e.g. after stroke or damage to the spine [29]. Exergames provides users with a feeling of accomplishment by reaching goals, completing exercises and being physically active, which again increases the users mood [30]. The fun and challenges the game provides could take focus away from boredom and

physical pain which makes it appropriate as an exercise or rehabilitation tool [28]. Games like Wii Sports and Dance Dance Revolution were designed to encourage physical activity, but many other currently available exergames were not designed for this purpose. Few commercial games are suitable for the focused, controlled exercise required for therapy [29]. Games today are too complicated, go too fast and are too difficult to handle for the elderly, in addition they have too complex and cumbersome consoles [28]. However, the popularity of exergames and the increasing customer appeal will improve design principles and physical requirements in the future [27].

We will now describe some of the different video game consoles that can be used for exergaming.

4.2.1 Dance Dance Revolution

Dance Dance Revolution (DDR) is a series of video games created by Konami Corporation's Bemani music games division. DDR is a rhythmic dance simulation game and was first released as an arcade game in 1998. In few years it became very popular, and the game has had its appearance on several game console systems like Sony PlayStation, Nintendo 64, Microsoft Xbox and Nintendo GameCube [31]. DDR uses a touch-sensitive dance pad with sensors to register movements, where one shall press the right sensors in proper time with electronic dance music. Arrows on-screen gives direction on how and when to move around. The DDR games have varying difficulty, requiring different levels of physical activity. GetUpMove.com is an information website about the use of PlayStation Dance Dance Revolution as a weight loss tool. This site was launched in 2004, and one of the highlighted stories was about a young woman who lost about 95 pounds by using DDR as an exercise tool. This and similar stories got widespread exposure, and consumers started to buy DDR solely for the purpose of exercise [31]. In 2003, 5 years after the first release, Konami announce that DDR has reached a total sale of 6,5 million units worldwide [32]. 8 years later, in 2011, the number of sold units had reached over 13 million, which is about 1 million units sold every year since the first release in 1998 [33].

4.2.2 PlayStation EyeToy

In the early 2000s the PlayStation 2 EyeToy was released by Sony Inc. It was the first in this category of games to introduce a device that could translate human motions into a controller input and allow players to physically interact with virtual objects using their own body and without being connected to wires. Human body movements are translated real-time into the controller input by a USB camera and can also map the player's face onto in-game characters. Eye Toy is easy to set up and its applications offer a lot of different environment and can be played by one or more players. [34]

4.2.3 PlayStation Move

PlayStation Move was released in September 2010. The PlayStation Move's interface consists of the Move Eye, a RGB camera with directive microphones, and the Motion Controller, a wand with an illuminating sphere attached to it. The camera can detect the sphere and determine where the wand is, which allows the players to interact with the game through motion and position. The sphere attached to the wand helps the camera to determine the distance from the wand to the camera and to track the controllers position in three dimensions. The wand is equipped with a three-axis accelerometer and a three-axis gyro sensor which are used to track rotation in overall motion and can also be used to detect if the wand is out of range (i.e. hidden behind the player back). [35] Up to four wands are supported at one time, which makes it possible for four players to play together. The color of the sphere can be changed to any color and is usually used to show which player is active and to give visual feedback [36]. The SDK is not made public, so its difficult for a third party to make original applications [35].

4.2.4 Nintendo Wii

Nintendo Wii was released in 2006 as the first motion sensor game. Only one year and 20 million units sold later, it became the market leader of that times generation of consoles. It consists of a Wii remote, which is

the primary controller and a secondary controller called Nunchuk. The Nunchuk is connected at the bottom of the Wii remote control [37]. The Wii remote contains 12 buttons, a 3-axis accelerometer, a high-resolution highspeed IR camera, a speaker, a vibration motor, and wireless Bluetooth connectivity. The IR camera is placed on the remote's tip and can track up to four simultaneous IR light with high resolution and high speed. The accelerometer within the remote control provides the Wi remote's motion-sensing capability. The 12 buttons on the remote are arranged symmetric so that both hands can be utilized. A vibrator motor, LED lights and a small speaker are used for different kinds of user feedback, like varying light strength and sound-effects. The four LED lights are also used to indicate the different players' ID. Communication is sent over the wireless Bluetooth connections, which enables up to four controllers to be connected at the same time. The users of Nintendo Wii can make their own personal profile, called Mii, where the data of the player will be directly connected up on the remote used [37] [38]. By December 2010 over 75 million Wii consoles were sold. To complete the original system with improved accuracy and response time, Nintendo made an enhanced version, Wii Motion Plus, which was released in November 2009 [39]. There are several SDKs for Nintendo Wii open, which makes it possible for a third party to develop applications which utilize the controller [35].

4.2.5 Wii Fit Plus

Wii Fit Plus is a video game created for the Wii console. One of its main add-on accessories is the Wii Balance Board. The board can read your body movements and give them back on the screen as you are playing, by the use of multiple pressure sensors contained in the board [40]. The board has a area of 55,1 cm * 31,6 cm. A third party can also build applications for the balance board using the SDK WiimoteLib [35]. It has been shown that game-based balance programs like Wii Balance Board compared to traditional training is easier, more motivating and more enjoyable [41].

4.2.6 Microsoft Kinect for Xbox 360 and Windows

Microsoft Kinect was released in 2010 and became quickly extremely popular. Only 25 days after its release it had sold 2.5 million units and by January 2012 Xbox 360 had sold over 66 million consoles and more than 18 million Kinect motion sensors [39] [42]. Kinect is a flexible low-cost motion sensor that can track human motions and it can be used with the Xbox 360 game console or with a Windows machine. The sensor is webcam-based, which enables the user to play and interact with the game without physically holding a sensor device. Instead the player can interact with the game console through a natural user interface by moving their body and by using voice commands. The device have the ability to give full-body 3D motion capture capabilities and gesture recognition by help of its RGB camera and depth sensor [43]. One advantage with Kinect is that it has an interface that senses players various motions and it also senses other objects in the field, which makes a natural environment where the players can interact with virtual objects in the real world. [35]. The Kinect sensor for Windows is designed to operate on computer running Windows 7, Windows 8, Windows Embedded Standard 7, and Windows Embedded POSReady 7. All the users need is the Kinect sensor, a computer and a Kinect for Windows application. Kinect for Windows SDK was released in June 2011 and enables developers to build Kinect applications with C++, C# or Visual Basic using Microsoft Visual Studio 2010. This enables any third party to develop Kinect for Windows applications. [44].

In the next section, we will look at some research done with the use of the different technologies just describe for exercise. resultsrelated....

4.3 Using Exergames for Fall Prevention and Rehabilitation: A background Study

There has been done numerous of research on the use of video games for exercise and rehabilitation. The focus are mainly on the physical, social

and cognitive benefits. In this section we will review some of the interesting findings we did with emphasis on the physical and psychological benefits. The physical part includes both "normal" exercise and rehabilitation. The social benefits are important aspects for the target group of Cyberlab's exergame, because they are people that may not have that much social interactions, often because they are afraid of leaving own house. The research review provided here, will also relate to the previous described different technologies.

Primack et al did a broad study of video games in the context of improving health, where they analyzed 1452 articles with the topic of video games. 38 articles met the criterias for inclusion, like , and was therefore included in the study. For articles to be included in the study, they had to meet criterias for inclusion, like involving use of video games, showing health-promoting, clinically relevant outcomes, and being a RCT (randomized controlled trial). Studies was also considered a "health-promoting, clinically relevant health consequence" if they showed effect on health care providers to improve their patients health. Based on the purpose of the video game, each of the 38 articles was assigned to one of six categories of improvement; physical therapy, psychological therapy, health education, disease self-management, distract from discomfort, and increase of physical activity. In all of the categories, beside the category of self-management, 67 - 100 percent of the studies showed positive outcomes with the use of video games. The study with the best outcome was distraction from discomfort, where all of the outcomes showed positive effect. However, the result of these studies showed that the most common positive outcome was related to physical therapy, in e.g. rehabilitation after a stroke, and physiological therapy, in e.g. reducing post-trauma. The purpose of this study was to look into the ability of video games to address a variety of health conditions, and results showed that video games can have a positive effect in a variety of categories in all age groups. Video games has also showed positive outcomes when it comes to health-care personnel using this type of technology to train patients. Video games for elderly, individuals in the age group 50 - 80, often focus in age-related changes like increase of balance

and cognitive decline. However, the study showed that the age group with the best opportunity to improve health is in the age group of 30 - 50. The fact that video games shows potential health-related benefits is an important finding, as it represents a huge industry for the entertainment sector and as the use of video games has become very popular among people of all ages. [45]

Taylor et al. [41] did a review on different studies related to gaming systems in exercise and rehabilitation. We will summarize some of their interesting findings here. From the studies they reviewed they found a trend; the Energy Expenditure (EE) while playing Wii was greater than when doing sedentary activities, but not greater than brisk walking. This suggests that playing Wii sports could not replace real sports activities. Playing DDR on the other hand, maximum heart rate and oxygen consumption were greater compared with Wii sports, suggesting that DDR can substitute physical activity, based on American College of Sports Medicine (ASCM) guidelines for physical activity. In their research they also found a study on what attitudes people have against DDR to encourage exercise. 40 postmenstrual women, aged 45-75 years old were asked. The overall attitude was positive; The game was fun and it gave potential to improve coordination. However, they also expressed a concern about a long learning process. It was also found that playing against a human gave greater arousal ratings and physiological responses to gaming than when playing against a computer, which benefit the enjoyment. This aspect is important to take into consideration when setting up a gaming environment for the older population, because they may benefit from the social interaction. Some games have already shown the potential for rehabilitation , like the EyeToy and the Wii. The main resons why these type of games a suitable are that the have the ability to increase motivation and produce distraction from daily, boring and painful treatments. Wii is seen as an attractive game for rehabilitation, both at home or in institutions. Wii is actually already in use within the National Health Service in UK and is commonly used for the elderly and patients with pathologies. [41]

Another study they found was that non-disabled elderly (70 +/- 5,7 years) was positive to the EyeToy. They enjoyed it and found it easy to use. For patients with stroke it appeared to be less suitable, which could be even worse if they had to hold on to a controller, for example with Wii. This suggests that EyeToy is more suitable for patients with stroke than games with remote controllers. Even though these type of games are initially meant as entertainment systems, there are a number of studies that have used the hardware and developed software to turn for example the Wii into a useful rehabilitation tool. The importance of these games are entertainment that motivates for actual sports. This is very important in for example rehabilitation. [41]

Staiano and Calvert write about how exergames are more and more used in the health sector. Gaming consoles are already integrated into equipments at gyms and health clubs. An example is Concept 2's rowing machine. Here the people exercising are motivated through competition and through virtual trainers who monitor their progress and encouraging them to proceed to the next level. Feedback from a virtual trainer is also offered in Wii Fit. Also some schools are starting to integrate games into their curriculum. In all of West Virginia's 765 public schools they have integrated DDR in their physical education. This has proven to be very effective and popular and some students lost 5-10 pounds after playing DDR daily. [30].

Williams et al. did a study to see if exergames, more specifically Nintendo Wii Fit, was an applicable type of exercise to reduce the falling statistics of community-dwelling people over 70 years. A group who attended Wii Fit exercise sessions was compared with a group who went to a local falls group. 77 percent of the participants said that if the exercise programme was more available, people like themself would use it. 92 percent of the participants expressed that they wanted to exercise with the Wii Fit in the future, while 61 percent would choose to exercise with the Wii Fit rather than attend a

falls group. An improvement in Berg Balance Scale (BBS)[1] after 4 weeks was seen in the group that played Wii Fit, meaning that there is a potential to improve balance in this population. Despite this, there was no change in The Falls Efficacy Scale - International (FES-I))[2] after 4 weeks. The qualitative data for the group that played Wii Fit showed improved confidence for the participants. The conclusion of the study was that Wii Fit is acceptable in older people with a history of falls and that it has the potential to improve balance and confidence. Further work has to be done to find and develop an acceptable exercise programme with the potential to improve balance in older individuals. [46]

Chang et al. did a study where they prototyped a Kinect game that was designed to help motivate people with motor disabilities to do their exercise more frequently and to improve the motor proficiency and quality of life. Because of the inconvenience of having to wear sensors in some of the other relevant technologies, Chang et al. chose to use Kinect. They developed a game, called "Kinerehab", that was meant to assist therapists in rehabilitating students in public school settings. To detect the students' movements Kinerehab uses image processing technology of Kinect. To engage and motivate the student for physical rehabilitation, the system is made with an interactive interface that has both audio and video feedback. For making it easy for therapists to review the progress of each students quickly, the system also includes details of students rehabilitation conditions which is automatically recorded in the system. Two students, a 16 year old girl diagnosed with muscle atrophy and insufficient muscle endurance, and a 17 year old boy diagnosed with cerebral palsy, were chosen to participate in the study. The girl used a wheelchair and could only stand with assistance. The study included two phases: a baseline phase where no assistive technology was applied, and the intervention phase where the Kinerehab was used. Both phases were done twice, beginning with the baseline phase,

[1]Berg Balance Scale (BBS), a performance based measure using 14 activities of daily living (range 0-56) [46]

[2]The Falls Efficacy Scale - International (FES-I). This scale measures confidence in performing a range of activities of daily living without falling [47]

continuing with the intervention phase and so on. In both phases the same exercises were done. The result showed that both participants increased the number of correct movements significantly in the intervention phase. On average the number of correct movements was 49 in the first baseline phase (5 sessions), while 170 in the first intervention phase (11 sessions). Both students indicated that the game motivated them to do the exercises and that they wanted to continue using it. The therapists said it would reduce their workload a lot. This suggests that Kinect can be a viable rehabilitation tool, but further work, where more people with disabilities participate, should be done. [43]

Garcia et al has developed a game-based exercise on a Microsoft Kinect platform, where the game has stepping exercises specially designed for elderly. Microsoft Kinect was chosen as platform because of the possibility to capture movement without the use om gaming consoles or wearable sensors. By freeing their hands elderly can lowers the impact of damage if they were to fall during the exercise. Kinect also makes is possible to give full focus to the exercise, and not thinking about handling different consoles.The purpose of this Kinect-based exercise game is increasing physical strength and improving balance. In the context of developing this game Garcia et al did a review of existing performance-based tests for prevention of fall in older people. They decided to use a CSRT task (Choice Stepping Reaction Time task). The CSRT task has the ability to measure functions as balance and strength, but also cognitive functions as attention and reaction speed. The CSRT had been tested and validated by a group of elderly. The CSRT task involves people standing on the floor surrounded by four panels. The panels will light up randomly, where the participants shall move their feet in accordance to the color of the light. A green light signal that one step onto the green light, where the participant shall stand still on red light signal. The exercise was repeated 20 times, and reaction time was measured. The importance of the task is to identify the participant's step length and fall risk. Garcia et al's game-based system is based upon Kinects advanced technologies, which makes it possible to continuously track body movement and give feedback. Parameters retrieved from the Kinect can be used for

measurement of clinical data, which makes it appropriate to use in clinical practice. The first draft of the game is meant to be controlled in a clinical setting with physiotherapists or other medical personnel. [**?**]

From the different research we can conclude that there is a lot of attention on the use of video games as an exercise and rehabilitation tool, both for the young, and older population. The games are primarily been made for fun and entertainment and are not designed specifically for rehabilitation. There is therefore a need for customized games for this purpose. Based on the study we did on the different technologies available and the research done by others, we conclude that the Kinect sensor is a viable choice of technology for the development of an exergame for elderly. The main reason is the convenience of not having to hold on to a device. In addition it is easy to develop a game for this platform, enabled be the free SDK offered.

Chapter 5

Osterwalder's Business Model Ontology

The goal of this project is to analyse the business potential of the exergame Cyberlab is going to develop. To do this, we have decided to use Osterwalder's Business Model Ontology. We analysed both Alexander Osterwalder's phd thesis [48] and his textbook "Business Model Generation" [49] and made our own synthesis of them. The thesis is a thoroughly description, while the book is easy to understand and on a more user friendly level. The foundation of our description lies in the textbook, with some details that we found important from the thesis. In this way the description is well suited for our analysis.

Osterwalder defines a business model like this: "A business model describes the rationale of how an organization creates, delivers, and capture values" [49]. Osterwalder came up with a way to describe business models through nine building blocks. Going through these building blocks allows us to describe and think through the business model of any enterprise by covering four main areas of a business: Product, Customer Interface, Infrastructure Management and Financial Aspects. The nine different building blocks are: Customer Segments, Value Propositions, Channels, Customer

Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships and Cost Structure. The nine business model elements are the core of the model, see Figure 5. In this chapter we will go through every of the nine building blocks in more detail. [49]

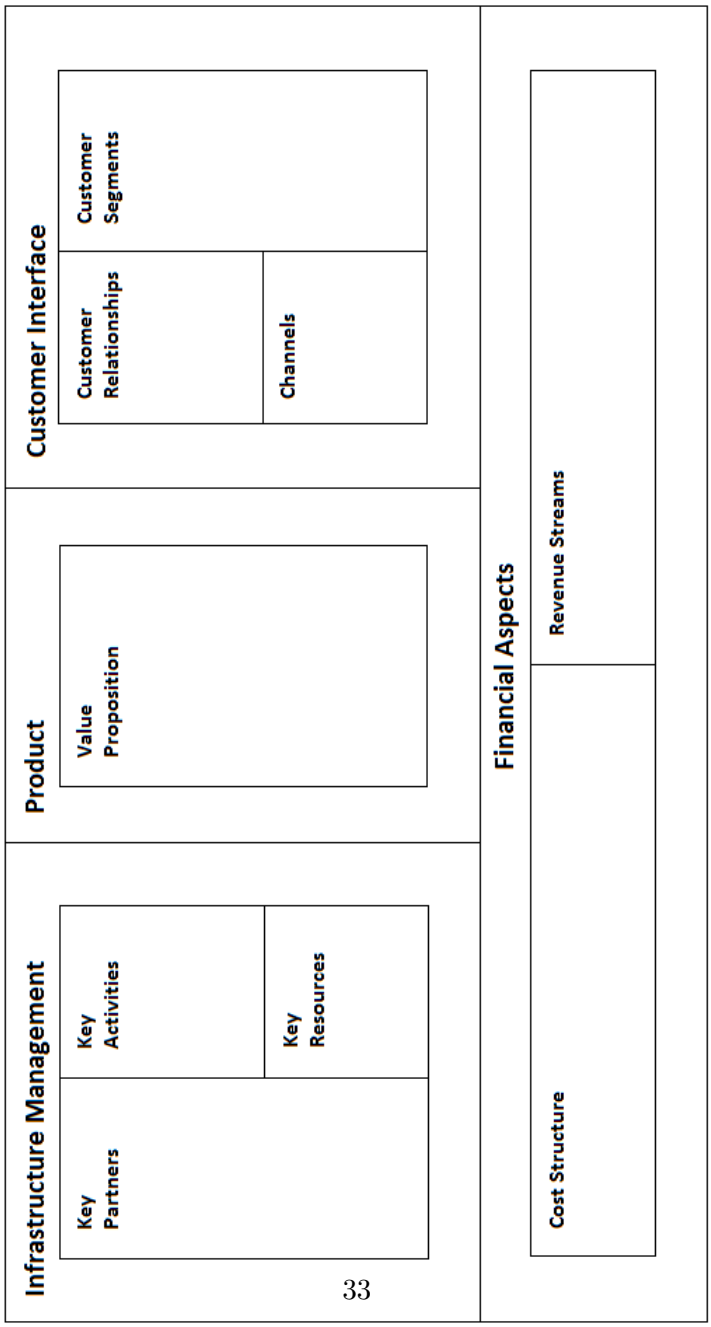

Figure 5.1: The Business Model Canvas [modified from [49]]

5.1 Product

Product is what the company offers to its customer and how it differentiates itself from its competitors. This area covers the building block Value Proposition [48].

5.1.1 Value Proposition

Osterwalder's definition is: "The Value Propositions Building Block describes the bundle of products and services that create value for a specific Customer Segment" [49]. This is what the organization actually offers to their customer or customer segments and are suppose to satisfy the customers needs. It might be different value propositions for the different Customer Segments. The values can be both quantitative and qualitative, meaning that the value can rely on for example price or on design. The value propositions have to be so good that the organization's defined customer segments turn to them over another company. It can be either something new, an improvement of already existing products or services, customized products and services or simply just helping a customer to get a certain job done. Something to also consider is design and brand. These two aspects are more important in some type of products than other. It is also important to compare price levels with their competitors. A common way to satisfy the needs of the customer is to offer them the same value to a lower price. The firm can also keep-up with the market price, offer luxury goods to a higher price or simply offer a value proposition for free. For the latter, the model is based on an other source of income, for example advertising.

There are different ways of creating value for the customer. Reducing the costs will for most customer be experienced as valuable. Also reducing the risk when buying something, by for example offering them one-year guarantee is very satisfactory for customers. Other ways of creating value are to make products and services available for customers that did not have access to them before and to make products and services easier and more

convenient to use. [49]

5.2 Customer Interface

Customer Interface covers everything that have to to with customers: who they are, what kind of relationship the firm has with them and how the firm reach out to them. The three building block covered by this area are thus: Customer, Channel and Customer Relationships. [48]

5.2.1 Customer Segments

Osterwalder's definition is: "The Customer Segments Building Block defines the different groups of people or organizations an enterprise aims to reach and serve" [49]. To make a good business, you have to understand who the business are meant to create value for, which is all about segmentation. It is important to carefully choose the most important customers and to focus on them and their needs. A business can have more than one customer segment, but they can not always serve all segments. Therefore a careful valuation has to be done to choose the organizations most important segment(s). [49] [48]

A firm can deliver a value proposition to different types of customer segments. They can choose to not distinguish between customer segments and rather focus on the mass market, they can distinguish their customers into segments with slightly different needs or problems, or sharpen it even more by targeting a niche market with specialized customers. The firm can also serve unrelated customer segments or even independent customer segments. [49]

5.2.2 Channels

Osterwalder's definition is: "The Channel Building Block describes how a company communicates with and reaches its Customer Segments to deliver

a Value Proposition" [49]. This is about finding the best and most cost-efficient way of reaching the right customers, at the right place and right time [48]. We distinguish between five channel phases, shown in figure 5.2. A channel should be studied over all these phases. It is important for an organization to think about how the customers want to be reached in all of these phases and how the channels can be integrated with the customers routines. The way the organization communicates with the customers is an important role in the customer experience. The value proposition can be delivered either directly, through for example sales force, or indirectly through intermediaries. They can also be delivered through owned channels, partner channels or a mix of both, see figure 5.3. [48].

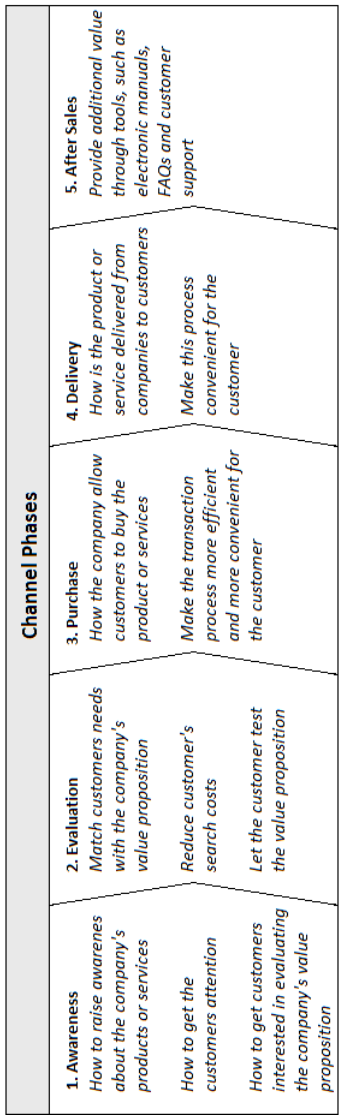

Figure 5.2: The 5 Channel Phases [modified from [49] [48]]

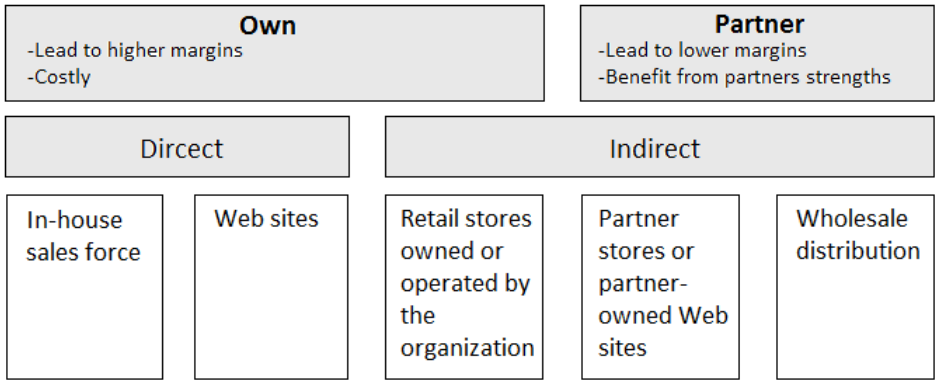

Figure 5.3: Channel Types [modified from [49]]

5.2.3 Customer Relationships

Osterwalder's definition is: "The Customer Relationships Building Block describes the types of relationships a company establishes with specific Customer Segments" [49]. The customer relationship is very important for the customers overall experience. This can range from personal assistance, where a real customer representative communicates with the customer, to a more automated service, where typically the customer helps himself, to a more community based service that allows customer to exchange experiences with each other. For every type of Customer Segments defined, the organization has to keep in mind what kind of relationship the Customer wishes to have. At the same time, the organization has to keep in mind how this relationship is integrated with the rest of their business model and how costly they are. The Customer Relationship is based on customer equity. There are three different customer equity goals: customer acquisition, customer retention and boosting sales (upselling) [48].

- *Acquisition:* A company needs customers to do business. The customer acquisition is a very expensive affair and must be carefully managed and evaluated because the relationship developed with its

customers will strongly influence the two next equity goals.

- *Retention:* After acquired customers, a goal should be to retain them. The customer acquisition is usually more expensive than customer retention. Because of this, ways to extend the duration of the relationships between the company and its (profitable) customer should be found. High switching costs is an element that can help retention. This means that the cost of ending the relationship and building a new one is so high that the customer does not want to switch.

- *Boosting sales (upselling):* This means adding on to the initial sale with additional products and services.

5.3 Infrastructure Management

Infrastructure management describes the companies capabilities and resources that are necessary to deliver the value proposition and maintain customer interface. This block also describes who provides and own the capabilities and resources, as well as who executes the activities and the relationship between them [48].

5.3.1 Key Resources

Osterwalder's definition is: "The Key Resources Building Block describes the most important assets required to make a business model work" [49]. This means all the resources you need to make all the 4 described building blocks work. The resources can be physical (e.g. buildings and machines), intellectual (e.g. brands, patents and copyrights), human (e.g. in an industry where knowledge is in particular important) and financial (e.g. cash). The company does not need to have all the resources within their organization, they can also be acquired from outside the company. A Resource can be linked to one or more Activities, described next.

5.3.2 Key Activities

Osterwalder's definition is: "The Key Activities Building Block describes the most important things a company must do to make its business model work" [49]. This means all the actions that have to be done to make all the 4 first building blocks described work and to generate profit. The main purpose of a company is the creation of value that customers are willing to pay for. This value is the outcome of a configuration of inside and outside activities and processes. Depending on what kind of company it is the configurations can by categorized as a *Value Chain*, a *Value Shop* or a *Value Netork*. Osterwalder distinguish between primary and support activities. Primary activities are involved in the creation of the value proposition and its marketing and delivery. Support activities are the underlying activities that have to be in-place for the primary activities to take place (e.g. firm infrastructure, technology). All the three different types of configurations have different primary activities, as described in figures 5.4, 5.5 and 5.6 [48]:

Value Chain:

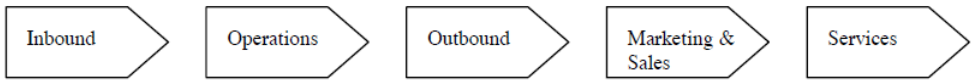

Figure 5.4: Value Chain (5 primary activities) [48]

A value chain describes how a firm creates value from taking an input, transforming it to the final product (refined output), distribute the product to the customers and maintain the product. At each step there are added value (e.g. production and manufacturing). The main property for a value chain is being cost-efficient.

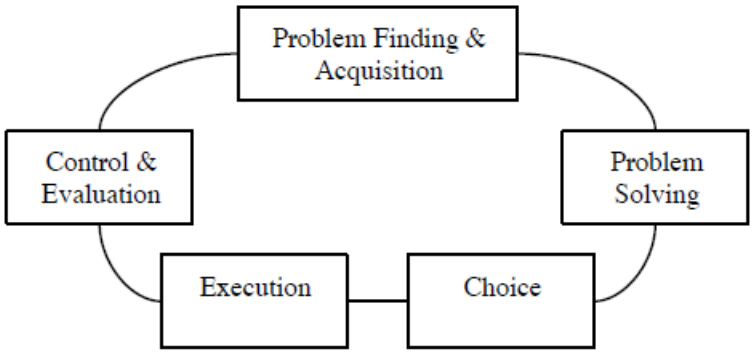

Figure 5.5: Value Shop (5 primary activities) [48]

Value Shop: Value Shop describes how a firm can create value for its customers by understanding their problem and finding a solution for it (e.g. consultancies and doctors). The main property of a value shop is rumour.

Value Network: This is about network effects, which means that the more people a network has the more value it gets. (e.g. banks and telecom operators). It consists of getting potential customers to the network, establishing links between customers and billing for value received, and maintaining and running a physical and information infrastructure so it is ready to serve customers requests.

5.3.3 Key Partnerships

Osterwalder's definition is: "The Key Partnerships Building Block describes the network of suppliers and partners that make the business model work" [49]. Not always can a company do everything on their own. The motivation for creating partnerships can be divided in three:
1. *Optimizing their business model:* Sometimes it is not profitable for a company to own all resources and do everything in-house. Cooperating

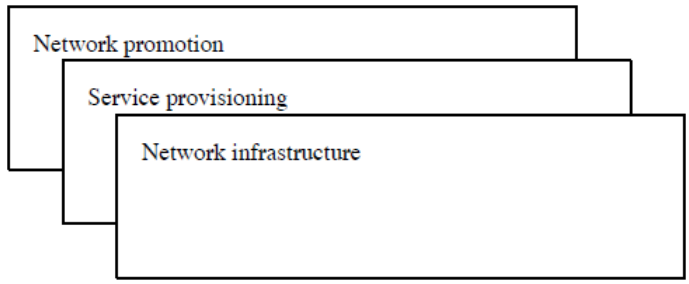

Figure 5.6: Value Network (3 primary activities) [48]

with other firms can reduce costs and optimize the allocation of resources and activities.
2. *Reduce risk:* In a very competitive market it can be safer to cooperate with the competitors in one area, even though they are competing in another.
3. *Acquire resources:* Usually it is not very profitable for a company to have all resources and to have the knowledge to do all the activities. Cooperating with other firms by buying/lending resources is often more profitable than having everything in-house. [49]

5.4 Financial Aspects

All of the other blocks already described influence this last block in the framework, thus this block is an outcome of the rest of the business model configuration. This area covers the Revenue Streams and Cost Structure elements. [48]

5.4.1 Revenue Streams

Osterwalder's definition is: "The Revenue Streams Building Block represents the cash a company generates from each Customer Segment" [49].

Ways to generate revenue	Example
Asset sale	Selling a car
Usage fee	Customer pays telecom operator for minutes spend on the phone
Subscription fee	Users of Spotify pay a monthly fee to access Spotify Premium
Renting	Renting a car for the weekend
Licensing	Companies have to pay a license fee to get access to patented technology
Brokerage fee	A seller that earns a commission each time he sells a product
Advertising	A newspaper takes a fee from companies who wants to promote their product in the newspaper

Table 5.1: Different ways to generate revenue streams

This is where the company earns its money. It is important to keep in mind what the customers are willing to pay, as well as what they are currently paying. A firm can have one or more revenue streams where each revenue stream can have different pricing mechanisms, shown in table blabla. There are several ways of generating revenue streams, listed in table 5.1

The pricing mechanism chosen is very important and can make a huge difference on how much revenue that is generated. Osterwalder distinguish between two types of pricing mechanisms: fixed and dynamic pricing, where fixed pricing means that the prices are based on static variables, while dynamic means that prices changes with market conditions. [49]

5.4.2 Cost Structure

Osterwalder's definition is: "The Cost Structure describes all costs incurred to operate a business model" [49]. The costs in the business model come from Key Resources, Key Activities and Key Partnerships. The book [49]

Type	**Description**
Fixed costs	Costs stay the same regardless of the volume
Variable costs	Costs depend on volume
Economies of scale	Less cost as output increases
Economies of scope	Less cost due to larger scope of operations

Table 5.2: Characteristics of cost structures

defines two cost structures: cost-driven business model, which focus on minimizing costs, and value-driven business model, which are focussing on value creation by for example making personalized services. Both cost structures can have different characteristics, shown in table 5.2 [49].

Chapter 6

Information Gathering

Research and previous work have been well examined, to find out what has already been done within this field. Based on our foundational knowledge we developed different business models where we looked at four different customer segments, namely *the end user (elderly*, *training groups*, *community centres* and *physiotherapists (and the health sector in general)*. During our work on the business model we discovered many loose ends, and at one point we could discard some of our theories. We ended up with physiotherapists as our main customer segment.

In this section we will describe the methods we have used to gather information. We will then provide a discussion of the information relevant for the analysis of the business model for this product.

6.1 Qualitative Research

Qualitative research means to get an in-depth understanding of a phenomenon [50]. We have performed this type of research with regard to prevention and rehabilitation of elderly and of the possible use of an exercise game. After choosing a customer segment, we used interviews as a method for information gathering.

We interviewed three physiotherapists, working with the older patient group. In addition we had a conversation by email with one physiotherapist. Our supervisor helped us get in contact with one physiotherapist, who again put us in contact with more. In addition to that, we contacted some physiotherapists ourselves. We choose to look at both clinics controlled by the government and also one private clinic. The reason why we did this, is because the two entities have two quite different economic models. In the private clinic, the owners are the payers, while in the public clinics, the government is the payer.

6.1.1 Interview Methods

There are different types of qualitative interview methods:
1. *Structured Interview:* The main topic for the interview is decided and a complete interview guide is prepared beforehand.
2. *Unstructured Interview:* This is a very flexible method where the topic is decided, but there is usually no interview guide. This allows the interviewer to improvise suitable questions during the interview.
3. *Semi-structured Interview:* This is a mix between method 1 and 2. The interviewer has an interview guide with some prepared questions, but these questions serve more as guidelines, and allows the interviewer to improvise suitable questions during the interview. This is the most commonly used interview method, and is often called "qualitative interview". [51] [50]

We used semi-structured interview (because) of several reasons. First, all of our interviewees where physiotherapists and we had some specific questions about their routines directed towards the business model we were developing. However, since they were all working in different clinics the questions had to be adapted towards their field of expertise, and it was therefore room for improvisation. Second, since neither of us are professionals in this field, it would be impossible for us to foresee everything that should be asked about. Last, we wanted to make the interview as a natural conversation, without locking ourselves to specific questions. This allowed the

conversation to flow more naturally, providing us with some unexpected information, that we did not think of beforehand.

In accordance to the normal structure of an interview [50], we started with an introduction, telling about who we are, about our project, and the goal for the interview. Then we followed up with some basic questions about the interviewee, like name, age, work and education. In this way, we got to know each other better before the questioning started. We had two different main topics we wanted to discuss. First, we wanted to learn about how they work and what kind of relationship they have with their patients. This was to identify if there was a need and also how the product could fit into their working situation. Second, we had some questions more directed towards the business model, like how they got to know about products and how they acquired them. In each topic, we had some defined questions to guide us, but not to limit us. There was room for improvisation at all times. We also modified the interview guide between the interviews based on the experiences we gained.

6.1.2 Possible Pitfalls

When doing a qualitative interview there can always occur some unexpected problems or difficulties. We will go through some of the limitations that may have affected our interviews, based on a list of possible pitfalls we found in [51]:
Artificiality of the interview: All our interviewees were strangers to us. The interviewee was asked to answer questions and give opinions under time pressure. This might have made the interview artificial.
Lack of trust: Because we did not know the interviewees, them not trusting us could have been an issue. This means that the interviewees may have held back what they think of as sensitive information. This information may have been important information for us, and a possible holdback of this information would make the gathering incomplete.
Lack of time: In one of our interviews, we had a time-limit. Whether this had a positive or negative effect is hard to say. Time limit can result in

an incomplete data gathering, but also lead to the opposite where the interviewee creates opinions under time pressure which can result in more data, but possibly less reliable data. In our case, we do not feel that time constraints resulted in any unreliable data.
Constructing Knowledge: Interviewees may not have reflected over the questions asked during the interview before. Maybe they do not know that much about the topic, and therefore construct a story that is consistent to appear knowledgeable. This is hard to say if have been a problem in our case, but we believe that all of our interviewees had sufficient knowledge on all of the topics. In addition the answers from the different interviewees where consistent to each other.
Ambiguity of language: Sometimes a meaning of a word can be ambiguous. Both the interviewer and the interviewee can misunderstand the meaning. Since our knowledge within this field was limited, it appeared some misunderstandings during the interview. The misunderstandings were discovered when the interviewee read through the interview report, and were fixed at the same time. In this way it did not affect our final report.

6.2 Interview Discussion

In this section we will discuss some of the findings we did in our interviews. We will only take into consideration what we find important for our project. Everything is taken from the interviews conducted, in addition to our own opinions and perception of the interviews. For the interested reader, you can find the interview reports in the appendix.

As already mentioned, two of our interviewees were physiotherapists working in government controlled clinics, from now on called public clinics. The third interviewee worked in a private clinic, owned by herself and a partner. All of the interviewees had elderly people as a patient group, but not necessarily their only patient group. The private clinic offers an exercise program where elderly can meet and exercise with other elderly once a week. This is also something that is arranged in the public arena, called

"Seniortrim" [11]. The latter is a training groups specifically for fall prevention. One of our interviewees mentioned that one of the problems of motivating the patients is that they do not identify themselves as persons being afraid of falling, so when working with fall prevention it is important to not mention the word "fall". Therefore, in promoting "Seniortrim", they are focusing more on encouraging them to improve their physical health. The typical feedback from these training groups is that the participants think it is nice to get some physical movement and that the social aspects is important. The training group in the private clinic costs 60 NOK per session and the one in the public costs 30 NOK per session, allowing most people to afford it. This is an arena where people can play together, as well as getting assistance from a professional. We see this as two interesting offerings, where there is a potential for the exercise game to be implemented.

Two of our interviewees mentioned that they wish to get the patients in for an examination earlier. Most of the patients go to the physiotherapist first when their problem gets serious. Getting them in earlier means a chance for prevention instead of rehabilitation. Everything really depends of the patients background; whether or not it is important for the patients to be able to continue working out everyday activities, or if they just accept the fact that they are getting older and are not able to do everything they did before. Typically, people that are used to be very active in the sense of often taking a walk, go skiing during the winter etc., will be more eager to keep a good physical health. For those that are used to get physical activity from for example gardening, the relation to other type of physical activity may not be present. Thus, it is very important to not look at elderly as one common patient group. They are also different people with different interests.

A normal problem is that elderly are afraid of walking outside their house, making it hard for them to attend their appointments and also other type of activities. Some people are very motivated to improve themselves while others are satisfied with how things are. Usually, one hour at the physiotherapist is not enough and it is hard to get the patients to exercise at

home, often because of the lack of motivation. It is common to provide the patients with an exercise program that can be performed at home, but there are some problems related to this. First, the patient may not be motivated enough to actually perform the program. Second, it is hard for the physiotherapist to give feedback to make sure that the exercises are done right. And third, there are no one there to make sure that they do not fall and hurt themselves. These problems can also be related to the Kinect based exercise game.

With regard to our business model we asked all our interviewees where they typically hear about new products, treatment methods and tools. Different channels were mentioned, like "Fysioterapeuten", an academic magazine for physiotherapists, conferences and from suppliers they already had an established relationship with. Every one of them pointed out how important it is that the product we are trying to sell is proved to work. It is not enough to have an ad in a magazine or newspaper, or show up demonstrating on a conference, if there is no well documented effect. If the product has a proved good effect, the staff meeting of the physiotherapists could be an effective arena for promoting the product. Again, she emphasized the importance of the well documented good effect. The threshold for the use of a product should be very low. It must be easy to use and must also ease the workload for the physiotherapist. If it is not better than what the physiotherapists can offer themselves, they would not use it. In the public clinics the government pays for everything. Every year, a certain amount of money is given to each clinic. The clinic is then responsible for how they want to spend the money. If a physiotherapist believes in - and wishes to get a new product, the leader will be responsible to consider it and decide if they should buy it. This is different in the private clinics. Here every decisions are made by the owner(s).

The most common way to acquire a product is to buy and own it. Leasing is not that common, but not irrelevant. The private clinic was only one year old, so their economy had not had time to get very stable yet. Because of this vulnerability they were careful about buying expensive new

products and they were also sceptic to subscribe on a rental agreement. We represented a fictive scenario where they could get an opportunity of paying only for the use of the game. She was very positive to this possibility. All of the interviewees mentioned that it might be interesting to rent, or even try for free, a product for a certain period of time to check out if it was interesting to buy. One of our interviewees mentioned that for this specific game, it would be necessary to run a pilot project, where some clinics tried the game out for a couple of months. In this way they could test the game and document the effect. It is not enough for the potential buyer to know that this is an EU-funded project and that it seems like a nice product. The product must be well proved over a longer period of time.

The main goal for the exercise game is to prevent elderly from gradually loosing their physical abilities. It is shown that exercise only ones a week is not enough [4], this could also one of our interviewees confirm. At the same time, some exercise is better than none, and the physiotherapist who had the group training once a week told that you could actually see improvements after six to seven sessions. For the elderly to be able to improve themselves even more, they will have to exercise more. A plan for the future should therefore be to provide the game for the elderly to use in their own home. It is not natural for us to believe that an older person would go in the store and buy this game themselves. Therefore, it was interesting for us to see if physiotherapist could work as a possible channel where the patient could get this game. In the public clinics it is normal to let patients borrow products, but the number are limited. If the government believed in a product, they could buy some copies that the patients could borrow. In the private clinic it is normal to sell products, like for example special shoe soles, but they do not typically let patients barrow products.

It is not common for physiotherapists to physically go to the store and buy a product. An already established relationship with a supplier is the most common channel where new products are bought. Often after buying a product, the supplier will contact the clinic later with improved or new products. It is quite normal to maintain a relationship with the supplier

after a product is bought. This is usually done by the supplier providing the clinic with brochures with news and by offering support if something goes wrong with the product. When the product is bought, it usually gets delivered at the clinic. Physiotherapists have already enough to do as it is, and have not always time to set up and learn a new product. It depends on the product whether they get an introduction or not. It would for instance often be necessary to get an introduction to technical products. When it comes to relationship with the supplier, all the physiotherapists we interviewed stated that the opportunity to come with feedback on the product was important. The reason for this was that they wanted the product to be customized for their and their patients need.

One of our interviewees talked about how this game could fit into the Norwegian government's new reform "Samhandlingsreformen" discussed in chapter 3. Of course this depends on whether the game is proved to be effective in health improving purposes and in cost.

All of the interviewed physiotherapists were positive to Cyberlab's exercise game. At the same time, neither of them could say anything about whether they would use it or not, nor if they thought it is a suitable tool for elderly to use. The reasons for this were that the game had not been developed yet, and they would have to see it and try it before they could make an opinion about it. The game has to ease the workload of the physiotherapist and also offer something better than what they can offer themselves. The ability to customize the program was an aspect that was very important for all of the interviewees. The game should provide the possibility to put together different type of exercises and change the degree of difficulty. To make it possible for elderly to use this kind of game it has to be easy to use and self-explanatory. In addition, the game should give some kind of feedback to the user with instructions on whether they are doing the exercise right or wrong. This can work both as a motivation factor for the user and as a tool for the physiotherapist to keep track on how the patient is doing. The opportunity to not only customize in the sense of the right exercises, but also different themes, should make the game more fun and motivating.

It is important to remember that elderly today are not familiar with technology. This game will probably be more relevant when the next generation gets older, especially with regard to the use in private homes. Today, we can assume that the older patient would not go out and buy this game themselves, but rather use it after a recommendation from their physiotherapist.

Another issue pointed out was where the game could be used. The different clinics may not have space to have for instance four people playing a video game in one room. Most likely, to be able to take the game seriously, as well as not disturb other patients in the clinic, the game has to be played in an own room. This must be up to each clinic to find a way to work around. An issue implementing this game in a private clinic, might be that they do not have that big customer base. The reason for this is that the patient has to pay for the treatment. At the same time, it could be an interesting tool for them to use to tempt customer to choose them as a clinic. Of course, this might not work, if "all other" clinics offered this game as well.

From the interviews conducted, we can conclude that physiotherapists are the right customer segment for Cyberlab. Today, it would not be relevant to go straight to the end user, because they are not familiar with this kind of technology. A physiotherapist is a professional who the patient can trust. If a professional say something, we are likely to believe in it. It is important that the game can be customized both in the favour of the physiotherapist providing it and the patient using it. The game has to be shown to improve patients physical health as well as their mental health. And at last, it should be fun, motivating and easy to use.

Chapter 7

Business Model for the Microsoft Kinect Based Exercise Game

From the information gathered and from the knowledge we have acquired from the research done through this project, we will now structure our work to make an analysis of the business opportunities of the exergame. We will provide a detailed description of a business model that describes how the game should be created and delivered, and how it can create value. As a framework for this description, we will use Osterwalder's Business Model Ontology, as described in chapter 5.

In this chapter we will describe the potential of Cyberlab's exercise game through all of the nine building blocks.

7.1 Product

A product covers all aspects of what a company offers to its customers. The product is composed of value propositions, which are services and values offered to the customer. Cyberlab will develop an exercise game

used by physiotherapists in prevention and rehabilitation for elderly. The focus of the exercise game is to improve strength and balance in elderly to prevent fall and injuries. The game should have one general workout version directed towards prevention and one customized version used in rehabilitation.

7.1.1 Value Proposition

A tool with the ability to customize an exercise program and to offer an alternative, fun and motivating training method and at the same time ease the workload of the physiotherapist

Value propositions refer to the value a company offers to a specific customer segment. One value this product provides to the customer is the possibility to offer an alternative, fun and motivating training method. The exercise game is meant to be used as a supplement in training programs or as an exercise motivator. A good motivator is a social aspect, which is highly important for elderly, and that there exist games for different interests. The game can also be used as a tool for physiotherapists to make it easier to customize training programs for their patients. Every patient is different, with individual problems and needs, and it is therefore necessary to provide personalized exercise program for each patient. An important value the product has to serve is that the exercise game can set up training programs and be more motivating than a physiotherapist can. To get a consultation hour at a physiotherapist there is often long waiting lists, so an important aspect for physiotherapists is to be efficient to serve as many patients as possible, without losing quality in the work done. The exercise game can be used to ease the physiotherapists workload. This game has the ability to be a multiplayer game, which makes it possible for physiotherapists to serve more than one player at the same time. A physiotherapist can then consult and exercise with more patients in one hour than a physiotherapist can manage without the exercise game. This will be valuable in the work of shortening the long waiting lists.

7.2 Customer Interface

In this section we will describe how Cyberlab can create value to the customers. Who are the customers, how will they establish contact with them and how will they maintain customer relationship after sales.

7.2.1 Customer Segments

In general, a company generates value for a specific customer segment. To define the right segment for Cyberlab we studied different groups of people; elderly who are them using the exercise game, and several entities related to elderly like training groups, community centres, and physiotherapists.

Elderly:
The end user of the exercise game are the elderly and they are therefore considered as a possible customer segment. The idea is to sell the game directly to elderly so they can use this exercise game at home. It will be appealing for this customer segment to have the possibility to exercise at home. The fair of falling makes many elderly afraid of walking outside their own house, and in order to become physically stronger physiotherapy sessions or other appointments once a week is not sufficient. Regular workout at home will contribute to become stronger and increase balance, which prevents falling and increase self confidence. The connection this game has to fun and entertainment in stead of "workout" is a motivating factor to exercise more. A social factor is also included, which is important for elderly who spends much time alone.

Training groups:
There exist several training groups focusing on elderly who can be a possible customer segment for Cyberlab. Here, elderly pay a small fee to join a training group, which is fun, social and more motivating than exercising alone. These training groups are engaged by the government, physiotherapy clinics, organizations and individuals. During these workouts this exercise game can be used as a supplement or a different alternative to exercise.

Playing the exercise together with other elderly makes the game social and entertaining.

Community centres:
We evaluated community centres for elderly as a possible customer segment. This centres will buy the product and all the equipment needed from Cyberlab and install it in their own environment. With this game they can provide their patients (riktig ord i forhold til eldresenter?) with an alternative activity compared to chess, card play or taking a walk. One possibility for the community centres is to rent out the game to their patients, so the patients can use the equipment for a certain amount of time, alone or in a group.

Physiotherapists:
Physiotherapists is an entity with very close relationship to elderly, and the goal for a physiotherapist is to help elderly decrease the risk of falling by using mobility techniques to improve balance and physical strength. Physiotherapists are also a group of people with a certain authority appearance, which makes them trustworthy. Physiotherapists can buy this product, install it in their environment and use it as a tool for training and in therapy sessions.

After composing, studying and discussing business models for each possible customer segment, we recommend Cyberlab to focus on physiotherapy clinics as customers, more precisely, public clinics and private clinics with contribution from the government. The goal of work for a physiotherapist connects well to the purpose of Cyberlab's exercise game, and the authority they have is very valuable when trying to get elderly to adapt the new technology this game provides. The physiotherapy clinics we recommend for Cyberlab has access to a wide customer base consisting of elderly, and they have a stable economy which makes it affordable to buy new products.

7.2.2 Channels

This subsection about distribution channels describes how Cyberlab should deliver and market their value propositions to the customers. We will describe this by going through the five channel phases.

Awareness:
We will look into some activities Cyberlab should perform to raise awareness about their product and how they can get their customers attention. "Fysioterapeuten" is a magazine targeting physiotherapists in Norway. This magazine is published by Norsk Fysioterapeutforbund (NFF) and distributed out to the whole country. "Fysioterapeuten" contains mostly scientific papers, and the idea is that this magazine shall contribute to evolvement of the physiotherapy profession according to the society and populations need. This magazine is read by 9 000 physiotherapists around the country, and articles printed here are seen as scientific and are therefore taken seriously. Cyberlab should use "Fysioterapeuten" as a medium to promote their exercise game by printing an article or an ad. Printing research papers and articles about the exercise game in other credible magazines or newspapers is also a way to get physiotherapists attention.

Another solution for Cyberlab is to promote their product by taking direct contact with target customers. This could be done by joining conferences related to subjects like e.g. welfare technology or by visiting physiotherapy clinics. Cyberlab will then get the opportunity to present the product and show direct interest in establishing a customer relationship. Physiotherapists see it as very relevant to try a product for an amount of time before they decide to buy. When taking direct contact Cyberlab should introduce a suggestion for physiotherapists to run a pilot project, which imply testing the product for free in e.g. 6 months.

Evaluation:
Physiotherapists points out two very important aspects in evaluating a product. These two are; documented effect of the product and own experi-

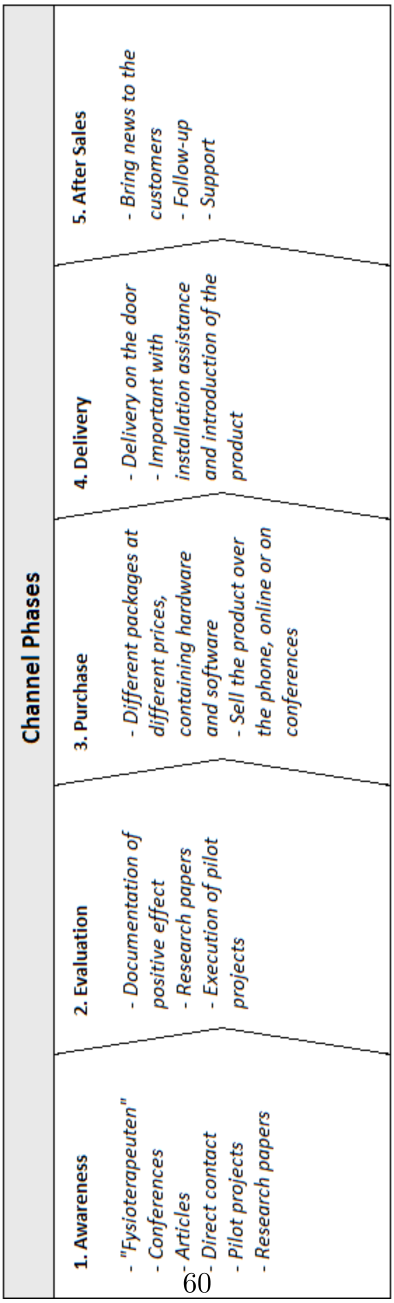

Figure 7.1: The 5 Channel Phases [modified from [49] [48]]

ence by testing the product. If a physiotherapist should even think about trying the product, it is necessary to provide research papers or statistics that shows positive effect in this kind of games. Documentation will give them a security in the choice of buying the product. Other physiotherapists providing positive feedback after trying the game also contributes to this security. Cyberlab should start pilot projects at physiotherapy clinics where physiotherapists will have the possibility to test, experience and evaluate the product themselves for a period of time. The evaluation received from physiotherapists should be used as documentation for the product.

Purchase:
Most physiotherapists have already established connections with suppliers. Ordering and buying products are usually done online, but it can also be by phone or when interesting products are discovered on conferences. Going to the store to buy products is very unusual. To play this game there are software and hardware needed, like Microsoft Kinect sensor and the exercise game. It is unreasonable to think that a physiotherapist already owns a Kinect sensor, so the best strategy for Cyberlab is to sell packages containing both hardware and software. Packages should include various agreements with appropriate pricing.

Delivery:
When buying a new product, especially technical products, there is a need for introduction to the product and maybe also installation assistance. Feedback from interviews with physiotherapists shows the huge importance of start-up help. With much to do at work already, physiotherapists do not have time to pick up deliveries at the postal office, or to setup and learn a new product all by themselves. Buying, receiving, installing and learning should not be difficult or time consuming.

From the interviews conducted we found that it was desirable with installation and introduction help when buying technical equipment, so the product should be delivered at the door, by someone who can install the product and teach the physiotherapists how to use it. However, this is a

complicated task for Cyberlab if we look at every physiotherapy clinic as their customer segment. It is not realistic that one representative from Cyberlab will travel to the other side of the country as soon as a clinic order the game. Therefore, we will not take this into consideration in this assignment, but there is still an issue to take into account.

After sales:
When taking a new product in to use, it is important for physiotherapist to have the possibility to come with feedback. Therefore, Cyberlab should have some kind of support that can take these feedbacks into consideration. Feedbacks can be comments on direct errors or directions on how to make the exercise game more suitable for its use. Cyberlab should follow their customer in the process of learning, and they should inform them of new features and improvements.

7.2.3 Customer Relationships

Customer relationship is an important part of the customer experience, and it describes what kind of relationship the company establishes with the customers. Support, follow-up and feedback handling are some aspects in establishing customer relationship. Cyberlab has to be available when the customers have problems and need help. When using a new product one may discover errors or find the product not suitable for its use, so many physiotherapists have an eager to provide feedback on this. Cyberlab should handle these feedbacks, fix errors as soon as possible and take comments on improvements into consideration. Using feedback to make a better product shows customers that Cyberlab takes their comments seriously. In addition, the customers will hopefully get a more suitable product. The maintenance of a direct and personal contact with the customer shows interest in the use and the experience of the product. All this can contribute to a good customer relationship. Cyberlab should also give their customers a heads ups on updates, new features or products.

7.3 Infrastructure Management

This section is about how Cyberlab creates value. What resources needed and what activities that have to be preformed are described here, as well as if they will get them in-house or from a partner.

7.3.1 Key Resources

In this section we will describe all the resources needed to make the business model work. The resources are divided into 4 different types, described in table 7.1.

Type of Resource	**Resource**
Intellectual	Insight and experience with fall problematic in elderly
	Programming skills
	Creativity
Physical	Premises
	Equipments, i.e. desks and computers
	Microsoft Kinect Sensor
	Windows machines
	Projector and screen
	Working Environment, Kinect for Windows SDK
	Internet Connections
Human	System Developers, i.e. programmers and interaction designers
	Administration, i.e. marketers, customer related tasks
	Support Person(s)
Financial	The European Union

Table 7.1: Different types of resources

Intellectual

The developer team needs insight and knowledge about different exercises that will strengthen muscles and improve balance in elderly. Cyberlab is provided with research information from other entities in this project, so their job will be to process this information. When they have enough knowledge to form the foundation of an exercise program, they can start to get creative. Creativity is needed to make the game entertaining and easy to understand and conduct. In addition, good programming competencies are needed to develop the game. To make it as cost-efficient as possible, an experienced team should be put together.

Physical

To be able to conduct this project, the team need premises with everything that comes with it, like desks, chairs, computer, internet connection, lights etc. Cyberlab is an already established business, so we can assume they already have these premises and equipment established, and that this will not provide any additional costs. For this project, they will need specific hardware. The hardware consists of the Kinect sensor, a Windows machine, a server for storing and running the game and a projector and screen for testing purposes. In addition they will need the Kinect for Windows SDK to be able to develop a game for this platform.

Human
Programming skills and creativity are already described above as intellectual resources. So they will need system developers and interaction designers. An administration is needed for marketing, customer related tasks and resource management. When the game is finished it needs to be operated and maintained. These tasks can be done by one or more of the system developers.

Finance
This project is financed by the European Union. However, we will not take this into account when looking at the financial aspects of this game.

7.3.2 Key Activities

The game can be described as a Value Chain, which means transforming inputs into a final product. From the knowledge and experience they have acquired the company wants to make a product as good, cost efficient, and price-competitive so that their customers would choose their product instead of a product with similar value. A description of the different stages in the value chain is depicted in figure 7.2. The development of the game should be test-driven, meaning that they will test the product both on the end-users and the customer segment during the development, and adapt the game based on the experiences acquired during the testing. Activities that need to be done include research processing, development, testing,

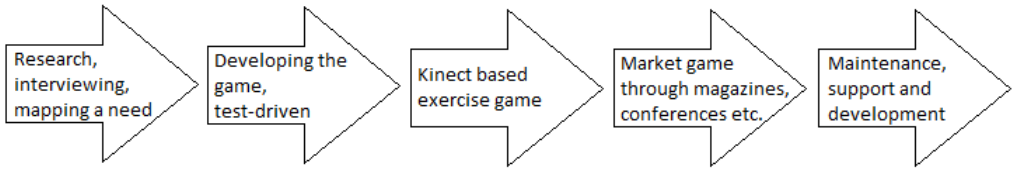

Figure 7.2: Value chain for the Kinect based exercise game [modified from [48]]

Type of Activity	**Activity**
Primary	Research
	Development
	Testing
	Marketing
	Support
Support	Maintenance
	Administrative tasks

Table 7.2: Different types of activities

maintenance and updates, support, marketing and administrative tasks, shown in table 7.2.

7.3.3 Key Partnerships

Microsoft
The main partner in this project is Microsoft. They are the owners of the Kinect sensor for Windows and the SDK. So they have to form some kind of agreement with Microsoft, both on how they can use their hardware and how they can sell it to a third part.

Norut
Norut is a national research group located in Tromsø. Cyberlab depends on them because they provide them with research information.

Physiotherapists and the government
Physiotherapists are Cyberlab's customer segment, but they can also serve as a partner. This game fits very well into where the Norwegian health system is going towards (see "Samhandlingsreformen" chapter 3). We mean that this game has a potential to work as a tool for "everyday rehabilitation". A goal for Cyberlab should be to get this game in as a "regular" tool for prevention and rehabilitation. The government is responsible for the health sector, so they could be a natural partner for the future. Having the government as a partner will solve most of the financial issues. Getting this game into a medical program financed by the government will make this game very credible for the end user. The government could then provide the game to hospitals, care centers, physiotherapy clinics, training groups, and for special cases, when the elderly for example need the game in their own house.

7.4 Financial Aspects

In this section all the outgoing and incoming money will be described. All the previous blocks described are contributing to a cost or an income. We will try to provide an as realistic and detailed estimate of both costs and

income. For convenience we will only consider the Norwegian marked. (Si noe om våre forutsetninger for å kunne beskrive kostnader og inntekter og om forenklingene gjort.)

7.4.1 Cost Structure

Cost structure takes into account all elements that generates costs specific to this game. Cyberlab is an already established business and we can therefore assume that there are not any additional costs associated with premises and some of the "regular" equipment (e.g. desks, chairs, computers etc.). We will not distinguish between fixed and variable costs, but rather look at every costs as fixed annual costs. Variable costs in this case, include installation help, and hardware in stock, because these depend on the demand. For simplification, we will not include these costs here. Other variable costs are salaries associated with support and administrative tasks. Here we will assume that these tasks have assigned a fixed amount of workload for each year. Further, we will distinguish between investment costs and ongoing costs.

Investment Costs
Investment costs are all the costs associated with the development of the game. This includes salaries for the development team, the hardware and software needed to develop the game and the cost of the pilot project. Spending six months on the initial developing and six months on the pilot project, will mean that Cyberlab is looking at a whole year without revenue.

Hardware and Software:
The commercial price for the Kinect sensor is 1790 NOK [52], and the Software Development Kit (SDK) for the sensor is free. In addition they should have a screen for testing purposes. The screen should be of significant size, so we suggest they invest in a projector and 90" projector screen, which should be sufficient for its purpose. We found that the cost of an average screen lies around 895 NOK and 2449 NOK for a projector [53] [54].

1	Gross Salary		730 000 NOK
2	Holiday Pay	12.1% of 1	88 330 NOK
3	Employee Fee	14.1% of 1+2	115 385 NOK
4	Pension Costs	8.0 % of 1	58 400 NOK
5	Employee Fee of Pension Costs	14.1% of 4	8 234 NOK
6	Insurance		2 000 NOK
7	Mobile and Internet		1 000 NOK
	SUM		**1 003 349 NOK**

Table 7.3: The cost of FTE = 1 in the private sector (for Cyberlab

Development:
Cyberlab has estimated that for the developing of this game they need a Full Time Equivalent (FTE) = 1.0, meaning that the workload is equivalent to one person working full time for a year. We assume that this will cover development, testing and administrative tasks during the development. In addition, Norut who provides research has also assigned a FTE = 1.0. How many people assigned to the project is unknown and also irrelevant for the cost prediction, (assuming each employee has the same salary). We have done an estimate on how much the cost of having a engineer with a FTE = 1 in the private sector is. From [55] we found statistics of salary in the private sector in Norway. Assuming that the "average" employer on this project graduated in the end of the 90's, we look at an average gross salary of approximately 730 000 NOK a year. From this we can calculate the average cost of a FTE = 1.0, based on [56], see Table 7.3, which will be 1 003 349 NOK. We did the same calculations for researchers in the government controlled sector and for marketers in the private sector. They both ended up on a cost of 715 577. See appendix for calculations.

Pilot Project:
As mentioned we suggest that Cyberlab should run pilot projects to document the effect of the game. This will also serve as a very effective way of marketing the game. We suggest that the pilot project should be carried

out in one or more clinics in Trondheim for convenience, and that it should run for six months. The effect have to be documented during the project and after. This documentation should be published in scientific articles and distributed to physiotherapists. We assume that the development of the game will take about six months, so the first year will contain the development phase and the pilot project. The pilot project will most likely provide Cyberlab with valuable feedback on the game, where they can both test the usability in a real environment as well as discover bugs and errors. This will require close monitoring from Cyberlab, so we suggest that this will require a FTE = 1/5 for this six months (This equals FTE = 1/10 seen in a whole year). In addition they will have to pay the physiotherapists working with the pilot project. We assume this will be the same amount as their hourly salary. For these six months we will recommend the amount physiotherapists are working with this equal to a FTE=2/5 (or FTE=1/5 seen in a whole year).

The investment costs are summarized in table 7.4. For calculations, see appendix.

Investment costs		
Hardware:		
	Kinect sensor	1 790
	Projector	2 449
	Screen	895
Storage		1 087
Development team FTE=1		1 003 349
Research from Norut FTE=1		715 577
Pilot Project:		
	Representative(s) from Cyberlab FTE =1/10	100 335
	Representative(s) from the physiotherapy clinic FTE = 1/5	70 000
SUM		1 895 482

Table 7.4: Investment costs (in NOK) associated to the development of the game. For calculations on FTE, see appendix

Ongoing Costs

We will now look as some ongoing costs on a per year basis. With the rapid evolution of technology, we believe that Cyberlab can offer this game for five years after its release. After, or even during, these years, they will probably have to start making new versions, even for new types of technology. (FINN KILDE PÅ DETTE) We do not take the development of new versions into account in our calculation, and we will set the lifetime of this game to be 5 years.

Storage:

The game has to be operated on a server. This can be on a local server located in Cyberlab's office, a server located at one of the physiotherapy clinics or on a cloud hosted server. The size of a Kinect game varies a lot, depending on quality, colors, how many levels etc. What we do know is that the game itself will be of fixed size. The dynamic part of the space needed on the server is associated with how many customer profiles it needs to store. This is a hard task to answer, but we assume that the user profiles do not take up that much space, and that Cyberlab can make it with a small server with fixed space. At this stage it is also hard to make an exact assumption on how big the game will become, but from already existing Kinect games, we can assume that the size will not be bigger that 10 GB. From Gogrid Servers [57] we found a small server with storage space of 25 GB. We believe this will be sufficient for Cyberspace's purpose. There is also reasonable to believe that Cyberlab has some space available on their servers. However, if they would have to rent this kind of server space, we are looking at an annual price of \$181.25 which is is roughly 1 087 NOK (with a currency of \$1 = 6 NOK).

Support and Maintenance:

With new software and technology there will always be some errors and bugs after the product or service is delivered. We can assume that the first six months are the most critical months, and will require a FTE = 1/5. The remaining life time will only need support for some minor problems that might appear (e.g. customer service, operating the server). We assume this

period will require a FTE = 1/10. This is very hard predictable numbers, because this may vary over time. However, our predicted numbers are reasonable as "average" numbers, taking unexpected events into account.

Marketing:
Marketing is one of the most important part of selling a product or service. This is especially important in the first year of the games life time. The cost of marketing is difficult to analyse because it depends on how long it will take to acquire customers. A new product or services need to acquire customers quickly, and therefore more resources need to be put into the marketing tasks. We can look at the exercise game as a niche product that is targeting a specific customer segment. Thus, the marketing task needs to be customized for this specific customer segment. When a critical mass (the number of customers needed to survive economically in the market) is reached the market will somehow be self-supported [58]. We believe that after this critical phase, the marketing costs will be rather low and close to constant. We assume that the first year right before, during and after the release, the marketing task will contribute to a FTE = 1/2. After being on the market for one year, the customer base should have reached critical mass. We believe that in this type of community (the physiotherapist community), words spread fast. If someone starts using a product that is proven good, it will soon appear in magazines and by word of mouth, resulting in the interest from others. Even after critical mass is reached, there will still be some marketing related tasks (e.g. keep up with the market, look for new customer segments), so we suggest that the marketing tasks should contribute to a FTE = 1/5 after the first year. With this low workload, Cyberlab should consider to hire a marketing consultant instead of having a permanent employee. But in this analysis, we assume they have hired a marketing person for this task.

Costs associated to sales:
The exergame will be sold to the customer as a package with the Kinect sensor and the game included. For convenience, a more comprehensive package with everything else needed to play the game (e.g. screen and a

Ongoing costs						
Year	**1**	**2**	**3**	**4**	**5**	**Total**
Storage	1 087	1 087	1 087	1 087	1 087	
Support	150 502	100 335	100 335	100 335	100 335	
Marketing	357 789	143 115	143 115	143 115	143 115	
SUM	509 378	244 537	244 537	244 537	244 537	**935 686**
PV	489 787	226 089	217 393	209 032	200 992	**848 380**

Table 7.5: Ongoing costs (in NOK) on a per year basis. For calculations on FTE, see appendix

windows machine), should be offered for the interested buyer. here Cyberlab could gain some profit. However, to simplify our calculations we will assume that the package includes the Kinect sensor and the game only and that Cyberlab will not gain any profit on the hardware sold. We will also assume that Cyberlab buy the sensors from Microsoft on demand, meaning they do not have the sensors in stock. This is because of the risk of having a stock. We will discuss this later. Therefore, there are no costs associated to the specific sales.

Total Cost:
Taking all the described costs into account, the project with six years of lifetime (including development and the pilot project) will have a total cost of 2 743 862 NOK.

Total Costs	
Investment Costs	1 895 482
Sum Ongoing Costs PV	848 380
SUM	2 743 862

Table 7.6: Total Costs in NOK

7.4.2 Revenue Streams

The revenue stream describes how the company can earn money, and for Cyberlab this involves selling a product package consisting of the Microsoft Kinect sensor and the exercise game. There are various ways to sell this product, and we will present two revenue stream solutions.

Before pricing the product it is necessary to observe today's market with possible target customers, prices on existing games and physiotherapy tools, and the potential demand for this product. Demand will depend on the documentation of the product and popularity within the physiotherapy community, as well as the product price. Calculating an exact demand for this product is almost impossible due to the lack of existing games in the same genre for this purpose, and also since the game Cyberlab is going to sell does not exist yet. In this section we will assume that the exercise game has been developed, tested and that it has received a great amount of positive feedback. Physiotherapists in Trondheim has started to use the exercise game, and it is being appreciated at the same level as other equipment used at physiotherapy clinics.

Pricing the product depends on existing games and tools, and Cyberlabs development costs in hope of achieving a non-negative profit. We start by looking at existing products. Cyberlab's exercise game falls under two definitions, a video game and a tool used in physiotherapy for training and rehabilitation. The video game market today exist of a huge amount of various games. They are mostly in an affordable price range, where e.g. Nintendo Wii games are priced between 99 - 499 NOK [59] and Xbox Kinect games are priced between 199 - 399 NOK [60]. Physiotherapy tools has more variation in price range as the definition of this tools are quite wide. Prices can vary from a fixed price of 120 NOK for a stretch pulley [61], 11 000 NOK per month for shockwave therapy leasing (see appendix "Intervju med Nina"), up to 75 000 NOK for a treadmill [62]. As we will present later, a package consisting of hardware and Cyberlab's exercise game will have a much higher price than other video games on the market. Trying

to sell the exercise game for more than the already existing ones will be difficult, so it is therefore highly important for Cyberlab to promote their product as more than just a regular game to justify the price difference. This should be done by emphasizing the products value propositions, which relates the product more to physiotherapy equipment than "just" a video game.

Cyberlab's market potential, which is important to estimate for setting a suitable price, can be roughly calculated by looking at the number of public and private physiotherapy clinics with support from the government, from now on referred to as physiotherapy clinics or just clinics. We looked at four municipalities in Norway; Oslo, Trondheim, Fredrikstad and Tønsberg, where we for each found the number of clinics and compared that number to the population in each municipality. The average ratio we got describe inhabitants per clinic in Norway. Multiplying this with the total population in Norway gave us an approximation of physiotherapy clinics suitable for Cyberlab's customer segment. Our calculation (see Appendix blabla for details) shows that Cyberlab has a possible market in approximately 1 200 physiotherapy clinics in Norway. It should be mentioned that the market potential can become bigger if Cyberlab takes private physiotherapy clinics without any economic support from the government into consideration. These clinics has shown interest in this product, which makes them potential target customers. Also, after some time, when the product has been on the market for a while, physiotherapists has got the time to work with the product and elderly has used the exercise game with assistance in a safe environment, it might be time for Cyberlab to think about expanding their market and start selling the product to end users, the elderly. This will increase the market potential significantly. The package price for the end user has to become drastically lower, and with a greater market potential Cyberlab will have the opportunity to sell their products to a lower and more affordable price for an elderly. Private clinics and elderly will not be taken into consideration when discussing Cyberlab's revenue stream.

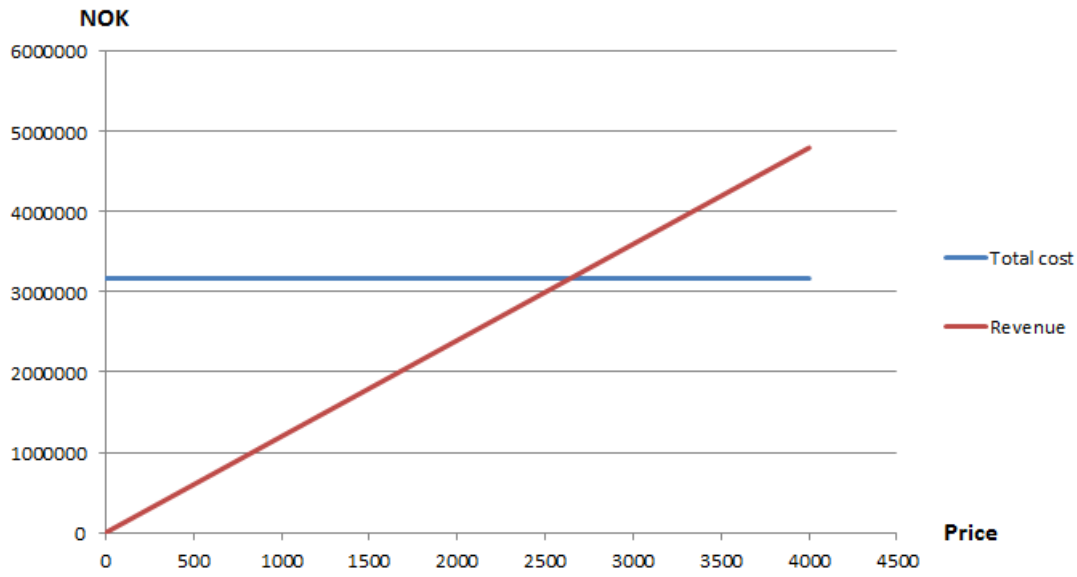

Figure 7.3: The lowest possible package price Cyberlab can have, provided that they sell the max amount of copies - 1 200 units, is 2650 NOK

We will now present two different solution for selling the product, each with proper pricing.

Solution 1 - Fixed price
The first solution is to sell the product as a package consisting of both software and hardware to a fixed price. Included in this package is delivery, installation assistance, and introduction to the product. We believe it is necessary to sell the product included in a total package for several reasons. Assuming that physiotherapy clinics already possesses needed equipment as a Kinect sensor, projector or screens big enough is unreasonable. Neither is

it reasonable to believe that physiotherapists will buy software from Cyberlab and then walk to the store to buy rest of the equipment. In the package we have also included installation help and introduction, which we have experienced as important for physiotherapists. For this type of technology equipment it is useful to give an introduction to the product. We can not expect that physiotherapists have the time to teach themselves how the products work. This could result in physiotherapists buying the product and ending up never using it because of the lack of information.

The package price will cover hardware needed, and cost connected to development, investment and marketing of the product. The calculated total cost for Cyberlab is approximately 3 170 000 NOK (see Appendix Kines-Regneark). This number is only costs related to developing the game, and does therefore not include purchase of hardware for the packages. We will now look at different price proposals for the software, which should cover all costs related to developing the game. A reasonable price for the exercise game, as it can be described as a video game, is a price similar to other video games on the market. The price range of existing Xbox Kinect games are 199 – 399, so we choose to price the game at 300 NOK. How Cyberlab's revenue will develop with this price is shown in figure (blabla). We observe that Cyberlab has to sell about 10 570 units to cover their total cost, which is an amount almost ten times higher than the estimated market potential. We can therefore conclude that it will be impossible for Cyberlab to sell their game for a price as low as 300 NOK.

If we assume that Cyberlab has the possibility to sell their product to all of the 1 200 physiotherapy clinics in Norway, they could have a price as low as 2 650 NOK, see Figure 7.4.2, without gaining negative profit. However, it is very risky, almost unreasonable, to assume that Cyberlab could reach out to all target customers. How many units Cyberlab has potential to sell and what price customers are willing to pay depends on demand, which we have mentioned is difficult to measure. A maybe more reasonable sales number would be to cover a third of the possible market share, which is about 400 units. (Si noe om: dette pga av usikkerhet rundt spillet, det

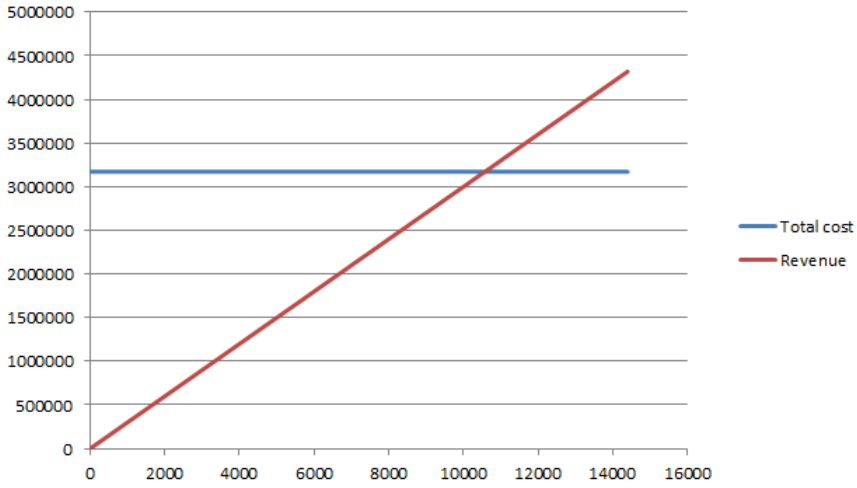

Figure 7.4: Total cost and revenue with price at 300 NOK. We observe that Cyberlab has to sell about 10 570 units to gain some profit

er nytt. Ikke alle klinikker har behov. Konservativ gjeng. Ingen lignende teknologi. Ikke så kjent med teknologi).

Figure 7.4.2 shows three income lines related to three different prices. With a price of 6 000 NOK Cyberlab needs to sell at least 529 units to achieve non-negative profit, but with a price of 10 000 NOK they only has to sell 317 units. Selling to the expected market share, Cyberlab can price these 400 units at 8 000 NOK, which will give Cyberlab a minor profit. However, to also include hardware price in the final package price, the customer will have to pay significantly more for the product. The Kinect sensor, projector and screen costs approximately 5 140 NOK, which means that the final package price will end up at 13 140 NOK if Cyberlab choose to price their exercise game at 8 000 NOK.

Figure 7.4.2 shows every combination of price per unit and number of units sold that will cover all of Cyberlab's costs related to developing this exergame, namely 3 170 000 NOK.

Solution 2 - License agreement

The second solution is to sell the same package as in the first solution, where the package here is implemented in a license agreement. Customers will pay a low start price for the package, and a certain amount of money for each time they use the product. This low start price will not alone cover all of Cyberlab's total costs, even if they sell to all their potential customers, so it depends on customers using the product. As in the first solution, Installation and introduction is also here included in the package, but it will not be taken into consideration when we describe package price proposals.

We will start by making an estimation of how much this exercise game potentially will be used. Usually, a physiotherapist works approximately 8 hours a day, which includes 30 minutes lunch. Not every patient visiting the physiotherapy clinic during a regular day falls under the category "el-

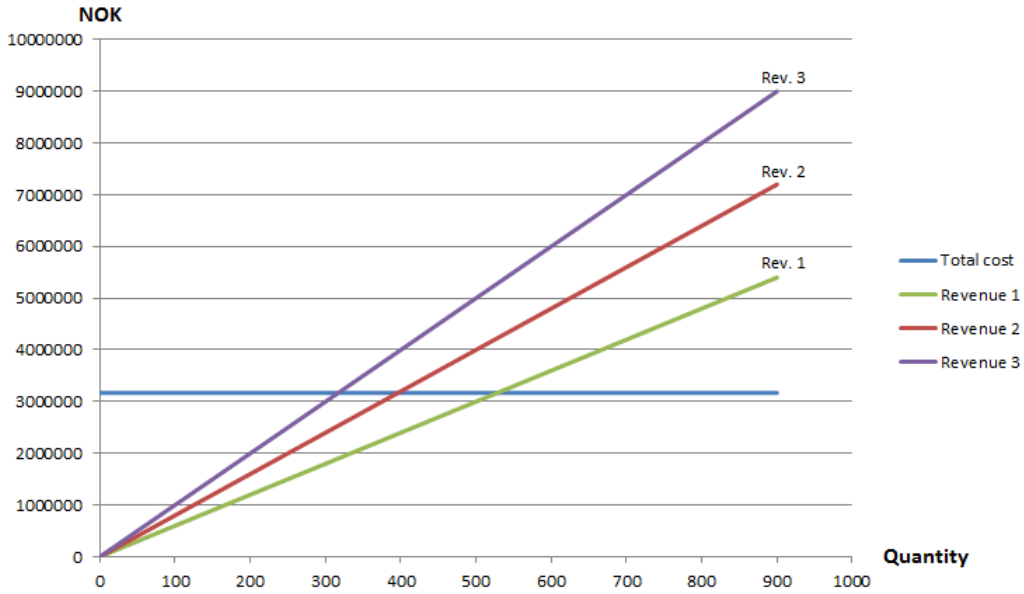

Figure 7.5: Total cost and three revenue lines related to three price examples; 6 000 NOK per unit, 8 000 NOK per unit and 10 000 NOK per unit, shows minimum number of units Cyberlab has to sell to achieve a non-negative profit

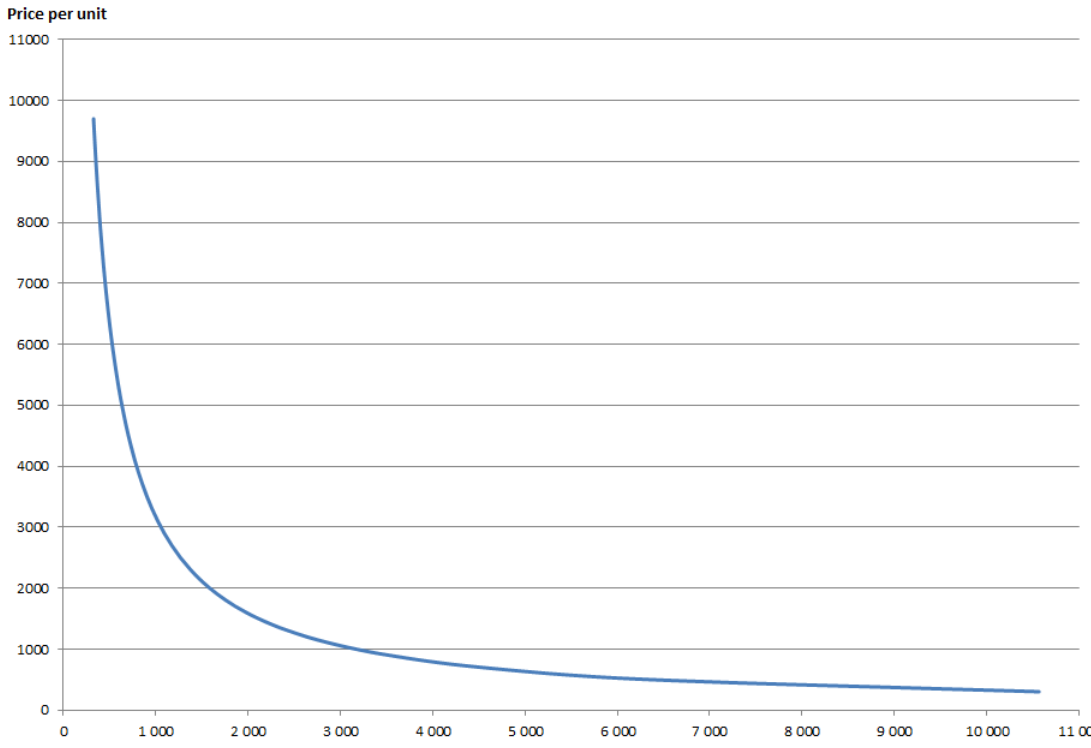

Figure 7.6: This figure shows every combination of unit price and number of sold units which will cover Cyberlab's total costs

derly", and not every elderly visiting the clinic has the need or wants to use this exercise game. We roughly estimate that the exercise game will be used approximately 2 hours a day. A physiotherapist works 47 weeks a year, assuming they have 5 weeks of vacation, and this adds up to 470 hours a year where the exercise game will be used.

A proposal for a suitable price for this license agreement is a startup price of 2 000 NOK for the package and a price of 50 NOK (Begrunne denne prisen med total pris for en time, hvor mye de sparer på effektivitet/ha flere i samme time) for each hour physiotherapists use the exercise game. During a year this will add up to 25 500 NOK. In the first solution, the price for hardware was added on top of this total price, but here this is included in the license agreement. Therefore, since Cyberlab's total costs is measured without consideration of the hardware price we subtract this price from the estimated revenue. So, for each customer purchasing this license agreement, Cyberlab will have an estimated revenue stream of approximately 20 000 NOK. We observe that Cyberlab in this case only need to sell approximately 160 units to make a profit. The income increases much more in this license agreement example than in the fixed price example. Where we in the first example showed that Cyberlab barely achieved profit by selling 400 units, they can with this license agreement sell the same amount of units to a profit of 4 830 000 NOK (See Appendix blabla).

We can conclude that selling a license agreement is the best solution for Cyberlab. The possibility of gaining a non-negative profit is higher, and the profit has the potential of becoming much higher than with a fixed price solution. We can conclude that selling a license agreement is the best solution for Cyberlab. The possibility of gaining a non-negative profit is higher, and the profit has the potential of becoming much higher than with a fixed price solution. There will be some risk related to this license agreement. As mentioned, the low startup price for the license agreement is not alone enough to cover all of Cyberlabs costs, so even if Cyberlab manage to cover the whole market they will experience a huge economic loss if no one use the product. Since the idea is that the startup price of 2 000 NOK

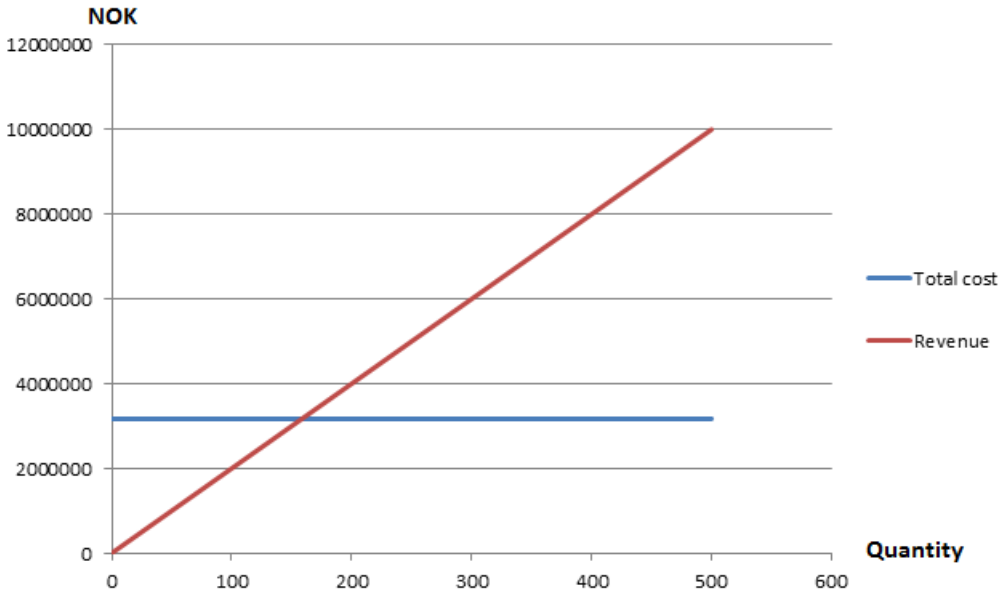

Figure 7.7: Profit when using license agreement(blabla

should cover Cyberlabs costs and the hardware price, we can easily understand that this will lead to a major loss. If we predict that Cyberlab sell the likely amount of 400 units, and no of the customers use the product, they will have a negative profit of - 4 570 000 NOK. However, if all of the 400 customers use the exercise game, only one hour a day for a year will be enough for Cyberlab to gain non-negative profit. Expected life time for a game like this is approximately 5 years, so Cyberlab is actually only dependent on customers using the game one hour a week to gain non-negative profit, which is very likely! (see Appendix blabla2)

For the customers point of view a license agreement will appear more appealing than a fixed package price because of the low startup price (trekke inn noe psykologisk rundt kjøpsprosesser). Customers observe that the product price is higher than other existing video games on the market, but they also know what value propositions this exercise game holds, which justify the price difference. They also have information about prices on equipment used at physiotherapy clinics, which makes Cyberlab's license agreement affordable. Customers also have other reasons for why they prefer this solution. One example is "Ilen Fysioterapi og Idrett", a private physiotherapy clinic with no economic support from the government, which sees a security in the possibility of buying the product with a license agreement (Se Appendix "intervju med Nina"). The startup price is manageable, and they can control additional costs themselves after how much they want to use the equipment. Private physiotherapists might not have the same financial resources as local institutes, so the idea of paying according to how much they use the product is appealing.

7.4.3 Financial Analysis

In this section we will make a financial analysis based on the costs and the different revenue streams just described. To be able to see how much revenue we can except each year, we have to make an prediction on how many products can be sold. We suggest that Cyberlab should start with Trondheim as their main focus. The reason for this is that the product has

been developed in Trondheim with (close collaboration with the hospital, scientists and physiotherapists?), so the marketing task should be easier. This will make it convenient for Cyberlab to follow up and to respond quickly to requested changes or possible errors. If Cyberlab can establish a customer base in Trondheim consisting of e.g. 10 physiotherapy clinics and the feedback from these clinics are positive, the game's reputation will most likely spread to the physiotherapy community in the rest of the country. As we will soon demonstrate, selling the product to 10 physiotherapy clinics to a suitable price will not provide Cyberlab any profit. We believe that as soon as the game gets attention from the rest of the market, it will spin of pretty fast, selling many games, before it will slow down again when the potential market gets saturated. We can describe this with the help of a s-curve, depicted in figure 7.8. The s-curve describes the diffusion of a product [63]. It says something of how an innovation will adopt customers over time. In the introduction of a product or service it will take som time to adopt a critical mass. It is describes as that there are different type of people adopting to the technology described as innovators, early adopters, early majority, late majority, and laggards. As the actors are adopting to the technology, its marked share will eventually have reached all it can takes, meaning it is saturated. Most innovations can be described with a s-curve, but the curve will look different for different innovations.

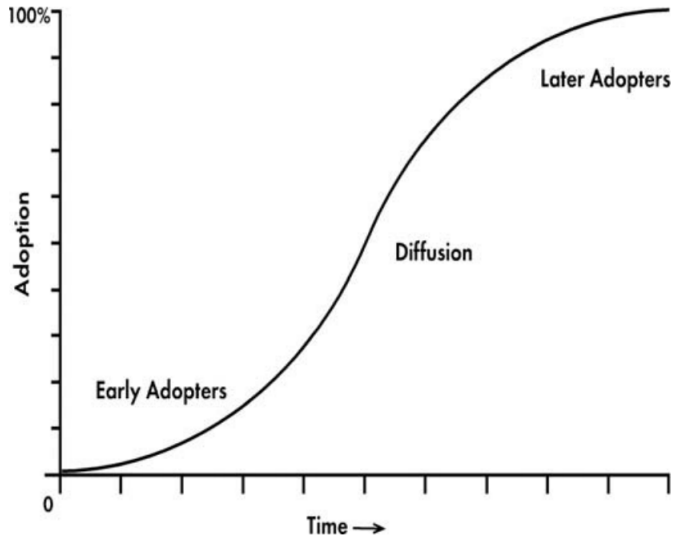

Figure 7.8: The S-curve [63]

Chapter 8

Discussion

IKKE VITS Å LESE. HER SKAL DET KOMME DISKUSJON. SIKKERHET INNE I DISKUSJON.

8.1 Security aspects

There are some issues regarding the security of personal information associated to this game. When a clinic starts using this game, they will make a user profile for each patient. This profile will presumably contain name, age, physical and mental conditions, diagnosis, the patients exercise program and the history of games played. It might also contain other type of information, like home address, phone number, relatives etc. The purpose of this record is for the physiotherapist to easily keep track of the patients improvement and to be able to adjust a program in an efficient way.

The goal in the long run for this game is that patients eventually can start using this game at home as a supplement to their regular treatment. It will then be possible for the physiotherapist treating these patient, to log on to and look at the patient's profile at any time. This profile will probably be a webpage where the patient (or user) and the physiotherapist treating this patient can log in. This webpage will be retrieved from a remote server

hosted by either Cyberlab or in the cloud.

Anything on the web always face some security issues, and we could spend a lot of time discussing all the different treats and vulnerabilities. However, this is out of scope of this project, so we will only discuss some aspects to keep in mind for these user profiles.

SSL should be used for secure communication between the server and the client. This prevents eavesdropping, tampering and message forgery. (siter securityboka).It is important to know that the right person with permission is getting access to the information. This require proper login and authentication. However, something that we can ask ourselves is how sensitive the information contained on the web page really is? Of course, no one would like anyone to read their health history. Except from that you can really get the other information anywhere else on the web. If an intruder steels someone's login information, they will get full access to the profile and can read and alter all the information.

One way of not linking the actual patient to the information, is to use patient numbers. This requires the physiotherapists to have their own database with patient names linked to patient numbers. We assume they already have this. However, this will make it more inconvenient for the physiotherapists to use, because they will have to look up every patient number and link it to the name themselves. It is very important for the physiotherapists that the information will be given to them in an easy and efficient way, so this solution will not hold.

What harm will a possible information leakage do? First, if an attacker get access to the data and reads it, they can get some interesting information. For example they can read a medical description that says that the patient is in a wheelchair. If in addition they can get the address from the patients profile, this house can be a target for a robbery. ...Ikke ferdig.. (Første utkast)

8.2 NAV Hjelpemiddelsentralen

Hei

8.3 Discussion

Fra customer segment: In the starting phase we will recommend Cyberlab to focus on public clinics and private clinics with economic support from the government ("driftstilskudd"). Remaining private clinics will at the moment not be considered as a target customer in this business model. These clinics have other decision making processes, different economy aspects and often a more limited customer base compared to public physiotherapy clinics. With no support from the government these clinics might have a more restricted economy, which complicates purchase of new products. As mentioned, private clinics do not have the same access to customers as public clinics. One reason for this is that customers who consult private clinic have to pay for the therapy session themselves. Elderly may not have that kind of money or willingness to pay for a therapy session at a private physiotherapy clinic (see Appendix, mail fra Nina). Since elderly are the end user of this product, and this group will be challenging to reach through private institutes, we will recommend Cyberlab to not focus on this entity. Some reasons are worth mentioning. Elderly today usually do not have any connection to video games or technology at all. So a developer trying to sell this exercise game by presenting this products value proposition to a person who do not have any knowledge about this area, will be meaningless. The number of technological devices existing today are endless. It will be very difficult for Cyberlab to reach directly out to this customer segment. A solution for Cyberlab to reach their end users is to use someone elderly trusts and rely on. As many others, elderly relies on authorities. Physiotherapists are an example of that kind of authority, so if a physiotherapist tells an elderly that "this product will be good for you", they will most likely believe them. (Legge til eldrehjem, at eldre kan bli brukergruppe senere?). The customer will not always be the end user, and it is important to recognize

and pay attention to this difference. For this business model physiotherapy clinics will be Cyberlab's customers, while elderly are the end users. For a physiotherapy clinic, elderly will be both the customer and the end user. (Komme med et eksempel?). A satisfied end user is important for the customer, although they are not the same person. In the beginning we were thinking about elderly as a target customer segment for Cyberlab as they are the end users of the product, but after working with and studied this business model we experienced that elderly is not the proper target for Cyberlab right now.

Fra channels - awareness: Through conferences, magazines or just word of mouth one can also get an impression of which products that are popular right now. The popularity mark might attract some customers. Physiotherapists working at private clinics do not have the same access to customers as public clinics have, so they might chose to buy a popular product to attract new and more customers.

(Say something about other possible revenue models we have decided not to focus on, like a license agreement revenue model or a advertisement revenue model.)

Fra cost: In the first year, we suggest that Cyberlab focus on delivering the game to clinics in Trondheim. Selling the game in only Trondheim to an acceptable price, will not make profit. We believe that Cyberlab is looking at some years before they will make profit. The physiotherapy community is small and they have a lot of similarities. By the time this game has become well-known in Trondheim, the game should have gotten attention from clinics in other cities as well. We suggest that Cyberlab hire some of the physiotherapists that are already using the game to present it on conferences and teach other physiotherapist how to use it. In this way, the game will be both more believable to other physiotherapists, as well as Cyberlab do not need to do the hazel with travel around promoting their game. There is still some costs associated to this.

Fra revenue - about not including installation prices in our revenue discussion: or wages for installation and introduction. In this section we will not take wages for installation and introduction into account, as it is very difficult for us to calculate all costs connected to this.

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Appendix

Apendix A - Intervju 22/10/12 kl. 1300

-Intervjuobjekt:
Jorunn Helbostad, utdannet ved Universitetet Bergen, hovedfag og doktorgrad i fysioterapi. Jobber som forsker.

-Av deres pasienter fra 65 år og oppover, hva er problemet? Har dere pasienter som er hos dere for opptrening etter for eksempel en skade (rehabilitering)? Har dere pasienter som er hos dere for generell trening fordi de ønsker å styrke kroppen?
Det finnes private og kommunale fysikalske klinikker. Disse har avtale med trygdesystemet. For å få time hos fysioterapeut må man ha rekvisisjon. Pasienten kommer i kontakt med fysioterapeuter gjerne fordi de har et definert problem. Det hender for eksempel hjemmesykepleiere tar kontakt på vegne av en pasient de pleier. Det er sjeldent den eldre tar kontakt selv.

-Hvordan er oppfølgingen under behandlingen? Hvordan er oppfølgingen etter behandlingen? Pleier dere å gi pasienten program som de må trene på hjemme mellom hver time?
Ofte er det ikke nok å være hos fysioterapeuten 1-2 ganger i uka. Det er en utfordring å få de til å gjøre noe hjemme. De eldre ønsker gjerne å "bli friske", de er ikke veldig motiverte til å trene hjemme på egenhånd. Vanlig å oppfordre til å bevege seg mer hjemme, enten ved å gi en form for treningsprogram eller si noe som "husk å være fysisk aktiv". Dette kan

være at fysioterapeuten skriver en lapp med strekmennesker som forklarer øvelser, eller et dataprogram hvor man kan sette sammen et program med øvelser og printe ut til pasienten, eller noen sier bare noe så generelt som at de må ut å bevege seg.

-Opplever dere at det er pasienter som har problemer med å komme seg til behandling? Hender det dere må dra på hjemmebesøk?
Nei, de som er dårlige til beins, får dekket drosjetransport til behandlingen. Men det er klart at mange vegrer seg for å gå ut. Det er også mange som vegrer seg for å bevege seg innendørs.

-Er det noen som uttrykker at de ønsker hyppigere trening?
Sjedent. De vil vel gjerne få en slags "pille/medisin" og bare bli frisk og rask.

-Er det mange som uttrykker ensomhet/ulykkelighet?
Det er veldig få som identifiserer seg selv som en person som er redd for å falle. I prosjekter hvor det har blitt foreslått forskjellige tiltak blir man ofte møtt med svar som "Det høres ut som en fin ting. Gi det til noen som trenger det". Det er mange som ikke sier ifra at de har falt. Å forebygge noe som "ikke har skjedd" er vanskelig. Dersom man jobber med fallforebygging, bør man ikke nevne ordet "fall". Det bør fokuseres mer på positive ting, som å styrke kropp for å kunne leke med barnebarna, gå på kafe osv.

Det er opprettet noen treningsgrupper i Trondheim som er ment å forebygge fall. Men de reklamerer ikke med dette. I stedet reklamerer de med feks: "Vil du greie mer enn før...?".

-Hvordan får dere høre om nye behandlingsmetoder, hjelpemidler, vektøy osv?
Vi har "Fysioterapauten" som er et tidsskrift for fysioterapauter. Her blir stilen holdt ganske ren. Ellers er det jo også artikler i blant annet aviser og magasiner. Man drar på kurs og konferanser, men da gjerne innenfor

et bestemt fagområde. Et bra sted å lansere nye produkter er kanskje på konferansene eller i "Fysioterapauten". Det er ofte snakk om etterutdanningskurs, ikke så mye om nye produkter.

-Hva er interessen for nye ting?
Her er det snakk om en ganske konservativ gruppe. Man vil veldig gjerne ha en dokumentasjon på at det fungerer. Produktet bør ha en lav brukerterskel. Hvor lett er det å bruke? Det må lette arbeidsmengden eller forbedre arbeidet for at det skal være interessant å ta i bruk. Man må også finne ut hvem som skal betale dette. Helsesektoren? Kommunen? Man må gjerne "stå for produktet" og klare å få fram at det er verdt å betale for. Pris på produktet har nok mye å si!

-Må nye produkter være godkjent for medisinsk bruk?
Et spill som dette havner litt i en gråsone. Det finnes lover og regler, men jeg tror ikke man trenger medisinsk godkjenning for å ta i bruk dette spillet.

-Hvordan foregår en kjøpsprosess hos dere?
Det vanligste er nok at man kjøper for å eie selv. Det er interessant å leie eller prøve produktet en viss tid for å være sikker på at det er et godt kjøp. Ofte skjer det at man kjøper inn et produkt, men så blir det gjerne liggende fordi man ikke tar seg tid til å lære det. Her kreves det opplæring! Det som også gjerne skjer er at en ivrig person tar initiativ til å kjøpe et nytt produkt og lærer seg hvordan det skal brukes, for så å kanskje slutte. De gjenværende har ikke lært seg å bruke produktet, og så blir det liggende.

-Hender det at dere kjøper inn produkter for så å selge dem videre til kundene deres?
Fysioterapautene kunne jo kjøpt spillet og eventuelt en lisens med på kjøpet, men jeg tror kanskje at eldre vil vegre seg for å kjøpe. Hvis kommunen så på det her som noe bra, så kunne kommunen ha kjøpt inn og lånt ut til eldre.

Det er alltid en utfordringen med ny teknologi - hvem skal betale? Prosjekter har strandet fordi man ikke blir enige om hvem som skal betale.

På fylkeskommunalt nivå har man hjelpemiddelsentralen. Hjelpemidler som kan lette hverdagen til folk kan bli kjøpt inn av hjelpemiddelsentralen og leid ut videre. Jeg er ikke helt sikker på hva som er grensen mellom trening og "fungere bedre i hverdagen"

-Hva slags forhold har dere til leverandørene deres?
På avansert utstyr kan man kjøpe serviceavtale. Men det er gjerne ingen som kjøper fordi det er for dyrt. Det er behov for oppgraderinger og oppfølging. Man ønsker gjerne tilpassede programmer, det vil gi større lyst til å prøve/bruke produktet. Sånn sett foretrekker jeg å samarbeide med små bedrifter, for da kan det være lettere.

-Hva tenker dere om å bruke det videospillet som vi har beskrevet som en alternativ og annerledes behandlingsmetode
-for generell trening?
-tilpasset rehabilitering?
For å kunne si noe om dette, ville jeg sett og prøvd spillet. For at det skulle vært interessant måtte det kunne lette arbeidsdagen min som fysioterapeut og gi meg muligheten til å tilby bedre hjelp til pasientene. Dersom jeg ikke syns øvelsene er relevante, ville jeg ikke brukt spillet. Spillet må være bedre enn det jeg kan tilby selv og øvelsene må kunne tilpasses. Når jeg har en pasient vil jeg finne ut hva som er pasientens problem ved å undersøke pasienten. Ut i fra problemet jeg finner, vil jeg legge opp et program ut ifra hver enkelt pasient. Innhold og vanskelighetsgrad må være tilpasset behovet.

-Hva slags verdi tror du er bevegelsesstyrkende videospill kunne gitt til en bruker?
Det kan oppleves både som spennende og som en barriere for pasienten. Mange eldre opplever teknologi som en barriere. Spillet må fenge pasienten. Spillet bør ha mulighet for individuell tilpasning. For å redusere fall bør øvelsen inneholde balanse og styrke og det må være mulig å tilpasse vanskelighetsgrad slik at det kan bli vanskeligere. Med øvelser med fokus på

styrke og balanse er det bevist at man kan redusere fall med 20-60 prosent. Det teknologi kan bidra til er å gjøre det mer underholdende og motiverende. Tilbakemelding er en viktig motivasjonsfaktor. Dersom man for eksempel får tilbakemelding på at øvelsen du gjorde tilsvarte at du var 10 år yngre, ville du sannsynligvis trene en ekstra gang dagen etter. De fleste pasienter ville ikke tatt i bruk et slikt produkt på egenhånd. Måtte fått det anbefalt av for eksempel fysioterapeut. For at fysioterapeuten skal kunne følge med på pasientens progresjon, må det være lett tilgjengelig for dem.

-Generelt
Dere bør sjekke ut hjelpemiddelsentralen på www.nav.no. Her kan dere lese litt om regelverk. Folketrygden dekker ikke sport- og fritidsutstyr. Dere må tenke på: hvis spillet skal brukes, hvordan får dere fysioterapautene til å si ja? Hvordan får dere fysioterapautene med på laget? Det kan sikker være en lur idé å snakke med både fysioterapauter og ledelse.

Sånn til slutt så vil jeg si at jeg har tro på dette prosjektet!

-Nye kontakter
-Fysikalsk institusjon - fastlønnet stilling
-Høre med Sylvi Sand (72549553, sylvi.sand@trondheim.kommune.no), hun vet hvem av de private klinikkene som driver med eldre. Har ansvar for fagutvikling
-Pensjonistenes fellesorganisasjon - Hornemannsgården. Spørre spørsmål angående forebygging. Høre med ledelsen at det er ok, når det passer. Inger Olsen (73841703) - daglig leder