Acronyms

VM Virtual Machine

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heiheihei

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hallo

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hvordan går det

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Digital games where exercise and game play are brought together are called exergames. Technology for tracking body movement, like motion sensors and remote controls, require the players to move which stimulates exercise. The combination of movement, fun and social interaction provides exergaming great potential for new business opportunities for the entertainment, recreation and healthcare sectors [1].

Today there exist numerous types of games and technologies, where Nintendo Wii, Dance Dance Revolution, Playstation Eye Toy and Xbox Kinect are some of the more familiar technologies. This genres of games has become very popular, and due to the growing interests one has seen it as relevant to study the use in regard of health and education. The technology these games provide can in an interesting way help provide health-related information to specified target groups [1]. In the past years exergames research has increased dramatically, and indications show that it will continue to do so [2]. Some research done on exergaming shows tremendous promise in academic, social and physical progress of youth using exergames. The health sector is now more focused on prevention of illness in stead of treatment, where this type of research can contribute to use of exergames in health care [1]. Games like Wii Sports and Dance, Dance Revolution were designed to encourage physical activity, but many currently available exergames were not designed

for this purpose. The popularity of exergames and the increasing customer appeal will improve design principles and physical requirements [2].

2.2.1 Dance Dance Revolution

2.2.2 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 you to physically interact with virtual objects using your own body and without being connected with wires. The EyeToy is a USB camera that can track body movements and translate them into a video game [3]. Human body movements are translated real-time into the controler input by a USB camera and can 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 [4].

2.2.3 PlayStation Move

PlayStation 3 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 PlayStation 3 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). It also consists of a geomagnetic sensor used to calibrate the wand's orientation against the Earth's magnetic field, which makes it possible to recognize the wand's position accurately. (hmmm... hvordan kan denne setningen skrives på en annen måte?) [5]. Up to four wands are supported at one time, meaning that four players can play together. The color of the sphere can be changed to any color and is usually used to show what player is active and to give visual feedback [6]. The SDK is not made public, so its not difficult for a third-party to make original applications [5].

2.2.4   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 [7] [8]. 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. Each Wii remote has a IR camera sensor on its tip. The camera ship 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 Wii remote has a total of 12 buttons and the buttons 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 lightstrength 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. To operate ,the remote needs two AA batteries [8] [9]. 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 [10].There are several SDKs for Nintendo Wii open, which makes it possible for a third party to develop applications which utilize the controller [5].

2.2.5   Wii Balance Board

The Wii Balance board is an add-on accessory for the Wii Fit, which is a video game created by Nintendo to work with the Wii platform. Just like the Wii Remote controller, the balance board can read your body movements and give them back on the screen as you are playing [11]. This measurement it gets from the multiple pressure sensors that the board contains. The board has a area of 551 mm * 316 mm. A third party can also build applications for the balance board usin the SDK WiimoteLib [5].

2.2.6   Kinect

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 [10], [12]. (With this it became the fastest selling electronic
device of all times. ¡-huskerikke hvor jeg har funnet denne). Microsoft Kinect
is a flexible low-cost motion sensor device for the Xbox 360 game console and
for Windows PCs that can track human motion. It is a webcam-based add-
on peripheral for the console, 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 using
gestures and voice commands ([13], siste setning kanskje litt avskrift.. se
på senere). The device gives full-body 3D motion capture capabilities and
gesture recognition by help of a RGB camera and a depth sensor [13]. The
advantages of Kinect are 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. Kinect also have some limitations. Compared to Nintendo Wii and
PlayStation Move Kinect's camera has a relatively low resolution of 30 Hz [5].
Another advantage is that its possible for a third party to write application
for Kinect. 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 [14].

Chapter 3

Case 1: Prevention for Elderly Afraid of Falling

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 there has been little contact with friends and acquaintances lately because of the fear of going out. Olga has no close family nearby. Beside the unsteadiness, Olga is very ambulatory 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.

Many elderly are afraid of falling, so Olga is not alone with this problem. Fall is actually considered as a public health problem [15]. 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. The worse outcome of a fall is death. 25 percent of elderly getting hip fracture after a fall, dies within a year [16] [17].It is shown that after a fall one-third will be afraid of falling again. Being afraid of falling make them insecure which can result in a even bigger risk of falling. For many elderly, the fair of falling can result in them being less active and a loss of confidence in carrying out everyday activities. This can result in fair 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 [16]. Another issue is that missing the ability to carry out everyday activity can result in loneliness and even depression (site dette?).

To prevent developing disabilities elderly should regularly perform a training program that strengthen their muscles, improve balance and coordination, endurance and mobility [16]. 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 exists senior dance, walking groups and water gymnastics [18]. These activities are good initiatives, but when Olga's main problem is that she is afraid to go outside, how will she 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 Olga's physical strength [16]. 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 [16].

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 falls 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. [15] [16]

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 per week. 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 of the study 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, as well as the balance gets challange. [19]

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 put together 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 you can add to your exercise program. When all exercises are chosen you can print out pdf-files with pictures and descriptions or you can read 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. [20]

The new generation of video games that combine game play and physical activity is called exergames, and it has shown promise in effecting users health [21]. Exergames has proved to be motivating because of its easy understanding, accessibility and fun. This type of games are suitable for people in various age groups because most of the games does not require any prior knowledge of either computers or video games [22]. Use of exergames is

also an important factor to the social aspect, because of the possibility of playing with others, something that will be entertaining for elderly who are often alone and experience loneliness as a part of the everyday life [23]. It has also been shown that this type of exercise improves moods [24]. The feeling of accomplishment users get from reaching goals, completing exercises and being in physical activity increases the users mood. This combined with the social interaction you get from playing provides a desire to play again [23] [24]. Exergames has shown promise in rehabilitation of balance after stroke and damage to the spine. The use of exergame also has an appropriate use in exercise and rehabilitation, because the fun and challenges you get through the game could take the focus away from boredom and any physical pain [23] [25]. Today there exist numerous games of this type, but very few commercial games are suitable for the focused, controlled exercise required for therapy [25]. The existing games are unfortunately too complicated, too rapidly and too difficult to handle for the elderly, and they have too complex and cumbersome consoles [23].

Chapter 4

Osterwalder Business Model Ontology

We have decided to use Osterwalder Business Model Ontology for the analysis of the case. Osterwalder defines a business model like this "A business model describes the rationale of how an organization creates, delivers, and capture values" [26]. 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 4.1. In this chapter we will go through every of the nine building blocks in more detail.

Figure 4.1: The Business Model Canvas [modified from [26]]
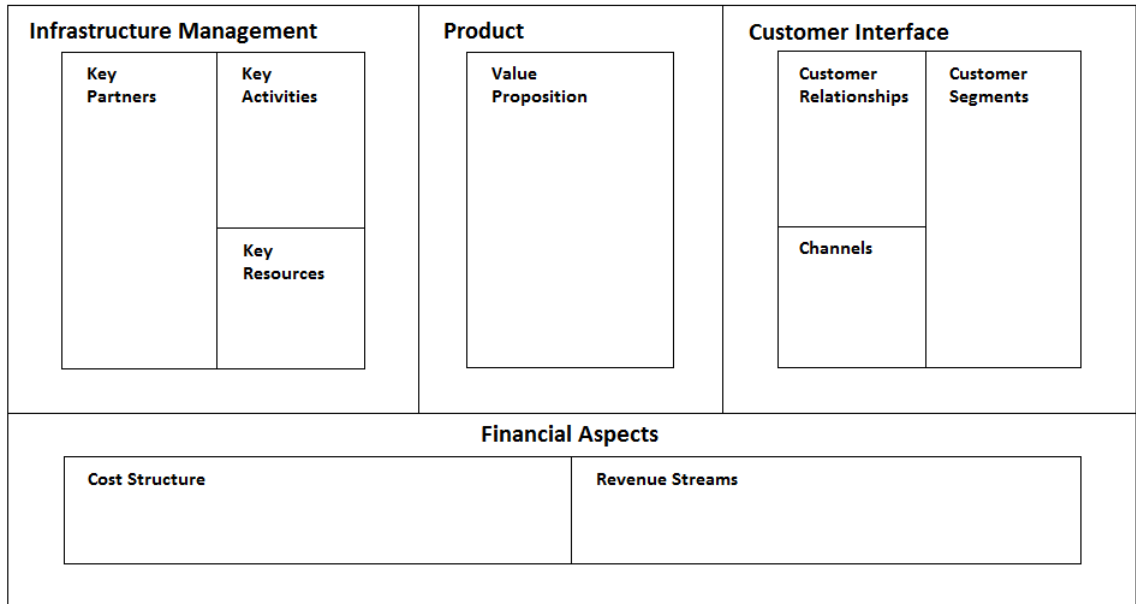
4.1 Product

Product is what the company offers to its customer and how it differentiates itself from its customers. This area covers the building block Value Proposition [27].

4.1.1 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" [26]. 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, customizing products and services or simply just helping a customer to get a certain job done. Something to also

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consider is design and brand. These two aspects are more important in some type of products than other. With the Value Propositions 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 from advertising.

There are different ways of creating value for the Customer. By reducing the cost, this 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.

4.2   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, described below [27].

4.2.1   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" [26]. 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 this organizations most important segment(s).

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.

4.2.2 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" [26]. This is about finding the best and most cost-efficient way of reaching the right customer, at the right place and right time. We distinguish between five channel phases: Awareness —¿ Evaluation —¿ Purchase —¿ Delivery —¿ After Sales 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. The direct and/or indirect channels are decomposed into Link(s).

Link(s) describes each of the different ways the firm reach out to its customer, either direct or indirect. The set of Links together describes a Channel. Channel links have the potential for value creation and therefore it contributes to a company's Value Proposition [27].

As mention, we can distinguish between five channel phases of a customer's buying cycle, see Figure 4.2. A channel should be studied over all these phases.

Figure 4.2: Buying Cycle

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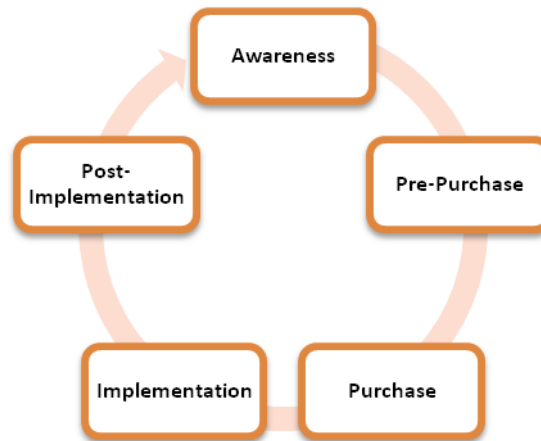
4.2.3 Customer Relationships

Osterwalder's definition is: "The Customer Relationships Building Block describes the types of relationships a company establishes with specific Customer Segments" [26]. The Customer Relationship is based on customer equity and can be decomposed into several Relationships Mechanisms. 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. There are three different customer equity goals: customer acquisition, customer retention and boosting sales (upselling).

- *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 [27].

- *Retention:* "The goal of customer retention is to leverage customer acquisition investments. "¡-skrive om.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 [27].

- *Boosting sales (upselling):* This means adding on to your initial sale with additional products and services [27].

4.3 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 [27].

4.3.1 Key Resources

Osterwalder's definition is: "The Key Resources Building Block describes the most important assets required to make a business model work" [26]. 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 (for example 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 (bedre ord for "de"?) can also be acquired from outside the company. Usually you can link a Resource to one or more Activities (described below).

4.3.2 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" [26]. This means all the actions that have to be done to make all the 4 first building blocks described work and to create and market value and generate profit. The key Activities will depend on what kind of company it is and can be divided into production (e.g. designing, making, and delivering a product), problem solving (e.g. coming up with a solution to a problem), and platform/network (e.g. platform management, service provisioning, and platform promotion). 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) [27].

As outlined above, 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.

The value that the company creates is an outcome of a configuration of inside and outside activities and processes. There are three different different types of configurations, value chain, value shop and value network, that all have different primary activities [27]:

Value Chain:

Figure 4.3: Value Chain [modified from [27]]
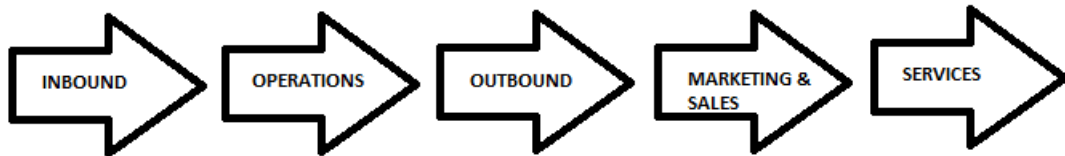
This is all about how a firm creates value from taking an input, transforming it to the final product (refined output), distribute the product to the customers and maintain the product. At each step there are added value (e.g. production and manufacturing)

Value Shop:
Problem Finding and Acquisition–Problem Solving–Choice–Execution – Control and Evaluation ——— (sirkel) (få tak i figur)
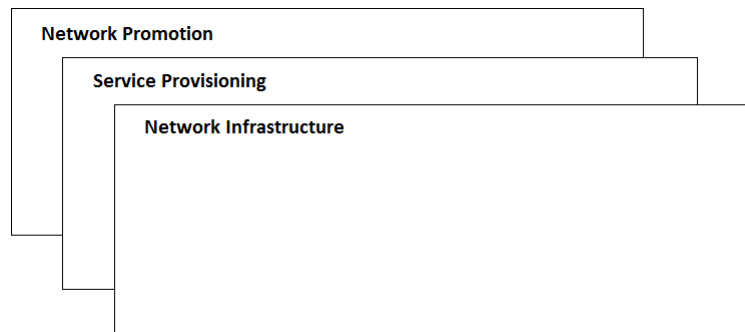This figure describes how a firm can create value for its customers by understanding their problem and finding a solution for it (e.g. consultancies and doctors).

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

Figure 4.4: Value Network [27]

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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.

4.3.3 Key Partnerships

Osterwalder's definition is: "The Key Partnerships Building Block describes the network of suppliers and partners that make the business model work" [26]. 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 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.

4.4   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 [27]

4.4.1   Revenue Streams

Osterwalder's definition is: "The Revenue Streams Building Block represents the cash a company generates from each Customer Segment" [26]. 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, including asset sale (e.g. selling a car), usage fee (e.g. customer pays his telecom operator for the minutes he has spend on the phone), subscription fee (e.g. users of Spotify pay a monthly fee to access Spotify Premium), renting (e.g. renting a car for the weekend), licensing (e.g. companies have to pay a license fee to get access to a patented technology), brokerage fee (e.g. a seller earn a commision each time they sell something.. sjekk denne), and advertising (e.g. newspapers take a fee for companies who wants to promote a specific product or service in their newspaper).

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. TABELL: PRICING MECHANISMS s 33 i boka

4.4.2 Cost Structure

Osterwalder's definition is: "The Cost Structure describes all costs incurred to operate a business model" [26]. The costs in the business model come from Key Resources, Key Activities and Key Partnerships. The book [26] 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. Despite of if the model is cost-driven or value-driven the costs can have the following structure: fixed costs (e.g. costs stay the same regardless of the volume), variable costs (e.g. costs depends on volume), economies of scale (e.g. less cost as output increases), economies of scope (e.g. less cost due to a larger scope of operations).

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