Aalborg University
Entrepreneurial Engineering
Master's Thesis

# The usability potential of a digital assistant in health care

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**Synopsis:**

This thesis aims to examine how voice recognition technology can serve the various needs of the health care sector. The collaborating company called Entranet, wants to launch the "digital nurse", which is a digital assistant for health care facilities. How can this product help the end users in hospitals, rehabilitation centers and assisted living facilities?

The results give an answer to this question and suggest how Entranet can proceed with its new product and also what it should be aware of.

Bill Aulet's "Disciplined Entrepreneurship" framework is used in order to structure the business part of the thesis. Eric Ries' "The Lean Startup" theory is used for the essential validation/empirical part of it.

Vasileios Moschovitis

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# Preface

This document constitutes a long Master's Thesis and part of the second year (3rd and 4th semester) of the Entrepreneurial Engineering program at Aalborg University. The theme of the third semester is "Entrepreneurial Strategy" and the fourth semester includes the Master's Thesis. During the second year, students implement the knowledge gained in the first year regarding entrepreneurship and business innovation. The goal of this project is to design a business strategy and validate a new product idea.

This thesis started in September 2018 and was completed in May 2019. A collaboration with a technology startup called Entranet provided the subject that allowed experimentation with innovation processes for a real business idea. During the academic year, two Super Wise Networks took place and the supervisors who attended them offered valuable feedback. Some other people helped, as well.

Frank Gertsen is my supervisor. He offered me guidance throughout the whole year. His suggestions and feedback helped me improve my work and see it from different perspectives. He shared his enthusiasm about the project theme, convincing me that it is a good fit for an Entrepreneurial Engineering Thesis. He had the patience to hear what I wanted to say. Thank you Frank.

Lefteris Papageorgiou is the CEO of Entranet. When I was looking for a project theme, I contacted some startup companies. Some of them were not open for a collaboration. Some of them didn't even reply. When I first contacted Lefteris and asked for a collaboration his answer was "Sure. We will definitely find something to work on". Despite his busy schedule, he devoted time to give me all the information and contacts I needed. He invited me to his book presentation. He shared with me some of his experience as an entrepreneur. Thank you Lefteris.

During this project I met a lot of people. They let me interview them, they opened their office's door, their home's door or even their heart to me. Each story was unique. The invaluable information they shared with me, also made this work possible. Thank you for your time. It was a pleasure to meet you all.

I also have to thank my fellow students. During the first year I learned a lot from each and every one of them, that helped me improve my practices and evolve. Listening to their perspectives and ideas, watching their presentations and working together made me better. For this, I feel lucky.

# Executive summary

One of the most promising technologies nowadays is voice recognition, which aims to simplify our everyday life. Products with voice recognition technology are widely used in various sectors, such as automotive or home security and automation, but their full range of applications has not yet been declared.

The health care sector faces great challenges, such as lack of staff or excessive administrative work that act as a hurdle in providing better services to the patients. This thesis explores how voice recognition technology and digital assistants can be beneficial to the various actors in health care.

Entranet is the collaborating startup that has developed its own speech recognition software. Its new product, which is called "digital nurse" is a digital assistant for hospitals, rehabilitation centers and assisted living facilities. The end users are patients, nursing and medical staff. The objective is to find out what can a digital assistant do inside a patient's or elder's room, offering value to the end users.

In order to answer this question, a lengthy validation process based on the lean startup methodology took place, which included interviews with the potential end users. In addition, the methodology presented in Bill Aulet's book "Disciplined Entrepreneurship" is used to structure the business part of Entranet's new venture and reduce uncertainty and action research is used to consider existing knowledge, before adding to it.

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# List of Abbreviations

ALF Assisted Living Facility

B2B Business-to-Business

BMA British Medical Association

CAGR Compound Annual Growth Rate

COCA Cost of Customer Acquisition

CT scan Computed Tomography scan

DKK Danish Krone

DMU Decision Making Unit

EE Entrepreneurial Engineering

etc et cetera

FIM Functional Independence Measure

GDPR General Data Protection Regulation

IBSE Install Base Support Expense

IoT Internet of Things

LTV Lifetime Value

MRI Magnetic Resonance Imaging

NC New Customers

R&D Research & Development

RCN Royal College of Nursing

SWN Super Wise Network

TMSE Total Marketing and Sales Expenses

UK United Kingdom

US United States (of America)

# 1 Introduction

This chapter aims to provide the reader with the project theme, present the problem area that is explored and suggest how certain problems in this area can be approached and solved. Specifically, the problem area of the project is the health care sector and the approach to cover the existing needs is the emerging voice recognition technology.

## 1.1 Needs in health care sector

Health care sector incorporates various actors, including patients, nurses and physicians. All of them face different situations during working hours and have needs, waiting to be satisfied.

A huge issue that health care facilities face nowadays, is the shortage of nursing staff ([AMN Healthcare, 2017]). According to a 2017 survey conducted in the USA, there is a growing belief that nursing staff shortages are getting worse. The number of the registered nurses participated in the survey was 3.347 and almost half of them (48%) stated that the shortage was worse than in the previous years (Figure 1.1).

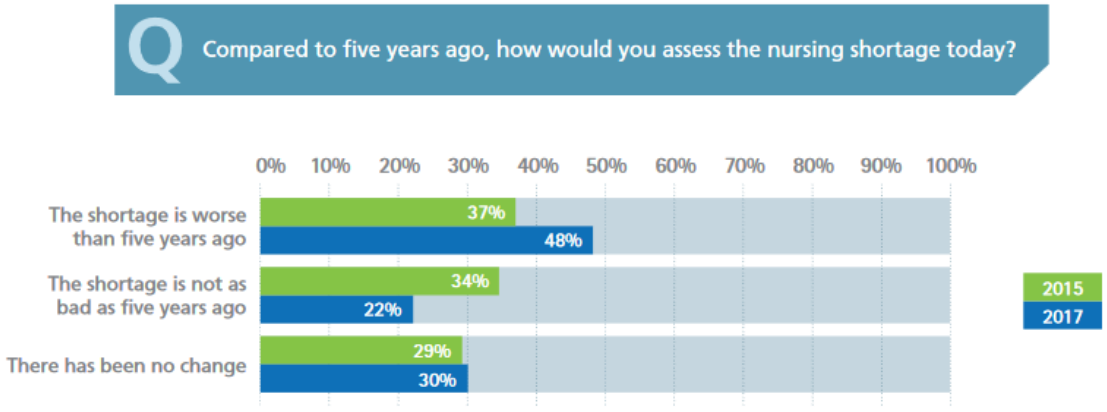



**Figure 1.1:** AMN survey: Question about nursing shortage

([AMN Healthcare, 2017])

Less nursing staff for the same number of patients (or even more), results in an increased workload and an unbalanced nurse-to-patient ratio. This means that the existing nurses don't have enough time to provide the necessary care to the patients. According to the

same survey (Figure 1.2), 44% of the respondents supported that they usually don't have the time they need to spend with patients and another 20% were ambivalent.

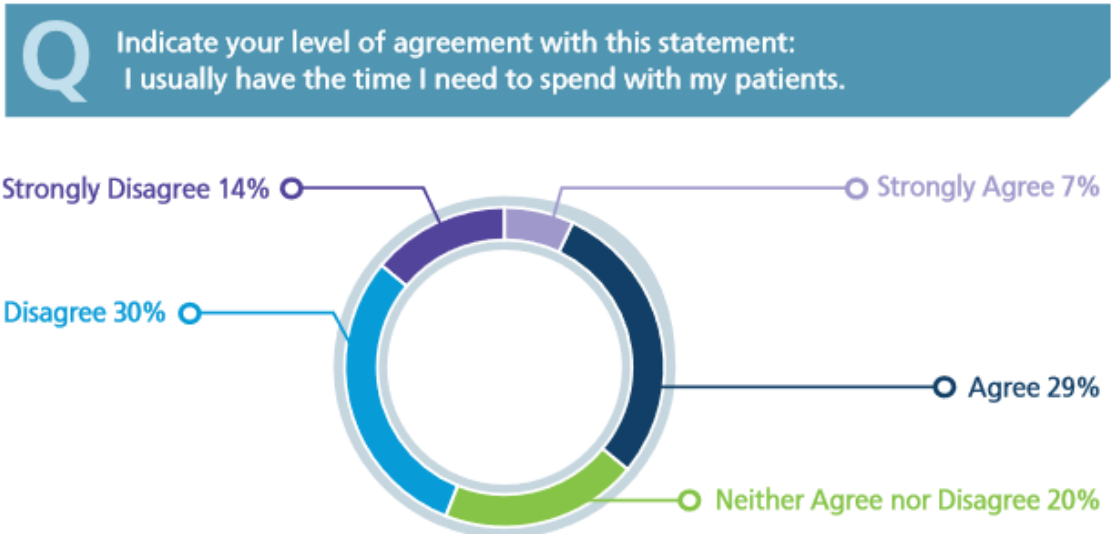



**Figure 1.2:** AMN survey: Question about time with patients

([AMN Healthcare, 2017])

Registered nurses also expressed their concern about the impact of this issue on their health, as it can lead to reduced engagement and low morale. This emotional burden is reflected on their answer when asked whether they often feel like resigning from their job and more than one third of them gave a positive answer.

Keeping the right nurse-to-patient ratio is important for various reasons ([Medical staffing solutions, 2018]). Each patient receives more individual attention, which equals better patient care. Nurses can also take care of themselves, since the number of patients is manageable. In case of an emergency, nurses become more available, which equals lower response time and saving lives. Nurses are happy and most importantly patients/customers are also happy.

Regarding doctors working in health care facilities, an important issue they are facing is the mountains of paperwork they need to cope with. The average doctor in the US spends 16,6% of his weekly duties (8,7 hours per week) on administrative work, which is not related to the patient ([EurekAlert, 2014]). Just like in any other profession, the more time they spend on bureaucratic tasks and the less time caring for patients, the more dissatisfied and unhappier they are about their job.

Another challenge for doctors that prevents them from delivering quality care is that the access of patient information is time-consuming ([Brian Geary, 2016]). Doctors spend a great amount of time looking up for patients' history or treatment in multiple systems, losing time that could be spent for patient care. It's obvious that this wasted time needs to be minimized.

When it comes to patients, apart from their need for medical care, they also have emotional needs that need to be covered. According to the British Medical Association (BMA), hospitals should offer patients some entertaining activities like listening to music or playing games, helping in beating boredom and keeping them occupied and happy ([BBC, 2011]). The BMA's head of science and ethics, Dr Vivienne Nathanson, said: "What people sometimes forget is that while helping people to feel better during their hospital stay we can reduce their need for painkillers, their likelihood of getting some depression and perhaps not eating enough". She added: "All of these things will limit their recovery and if we can speed people's recovery, they have shorter time in hospital, shorter time for the problems of being in hospital and of course save money."

The Royal College of Nursing (RCN) is the world's largest union and professional body for nursing staff. An extensive UK-wide research on the digital future in nursing care showed that a digitally enabled health service would free nurses to devote more time to the patients. Technology can improve services for people receiving care and the working lives of nurses ([Royal College of Nursing, 2018]).

Another research from the Queen's Nursing Institute shows that there is an overwhelming desire to embrace IT systems and tools that would benefit both staff and patients. Significant barriers though, are the financial cost of implementing such systems, the reluctance of health care staff to embrace change and poor connectivity, which leads to system crash and failure in loading information ([The Queen's Nursing Institute, 2018]).

Heart & Vascular Hospital and Neuromedicine Hospital in Florida, already provides bedside tablets for patient education, communication, hospital information and entertainment ([https://ufhealth.org/uf-health-heart-vascular-hospital, 2018]). The hospitals of the future will concentrate on value-based health care, which means that health care centers will be paid based on the patient health outcomes and not on how many services they provide. Hospitals' main focus will be on reducing their costs, improving the quality of care and boosting consumer experience ([Shawn Radcliffe, 2018]).

## 1.2 The emerging voice recognition technology

Drones, 3D printing, robots, blockchain and artificial intelligence are only some of the most promising technologies that humankind has only discovered a small part of their potential to help in everyday life. The technology that this project focuses on, is mainly voice recognition technology, where digital assistants promise easier task-handling processes.

Regarding the voice recognition market, its global size was valued at USD 55.17 billion in 2016 and is expected to grow at a CAGR (Compound Annual Growth Rate) of 11.0% during the years 2016 to 2024 (Figure 1.3).

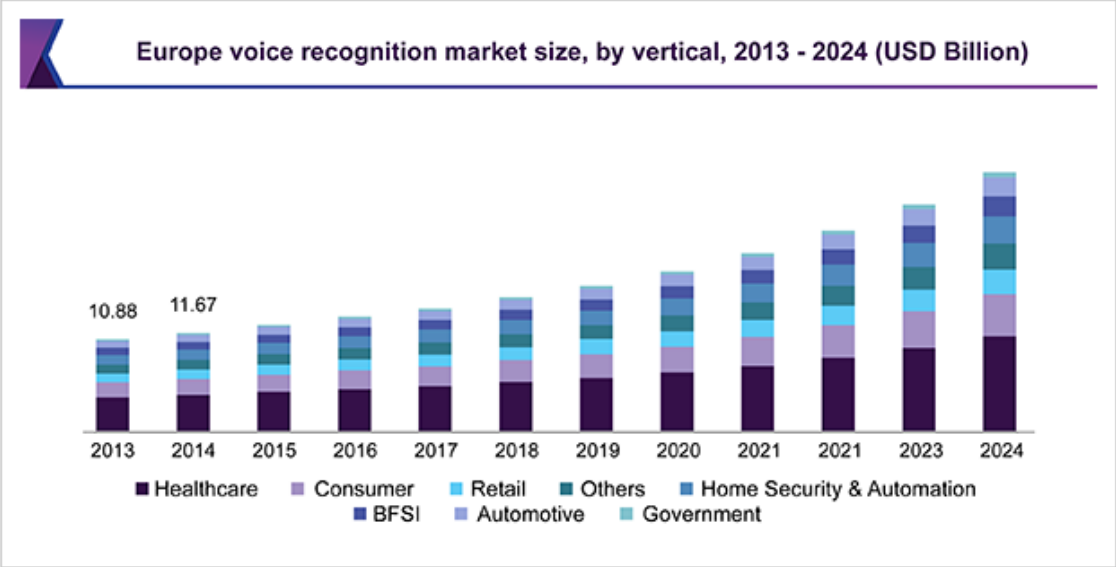



**Figure 1.3:** Europe voice recognition market size forecast ([https://www.grandviewresearch.com/industry-analysis/voice-recognition-market, 2018])

Among the various sectors that benefit from the voice recognition application, health care was by far the one that got the most out of this technology back in 2016 (Figure 1.4).

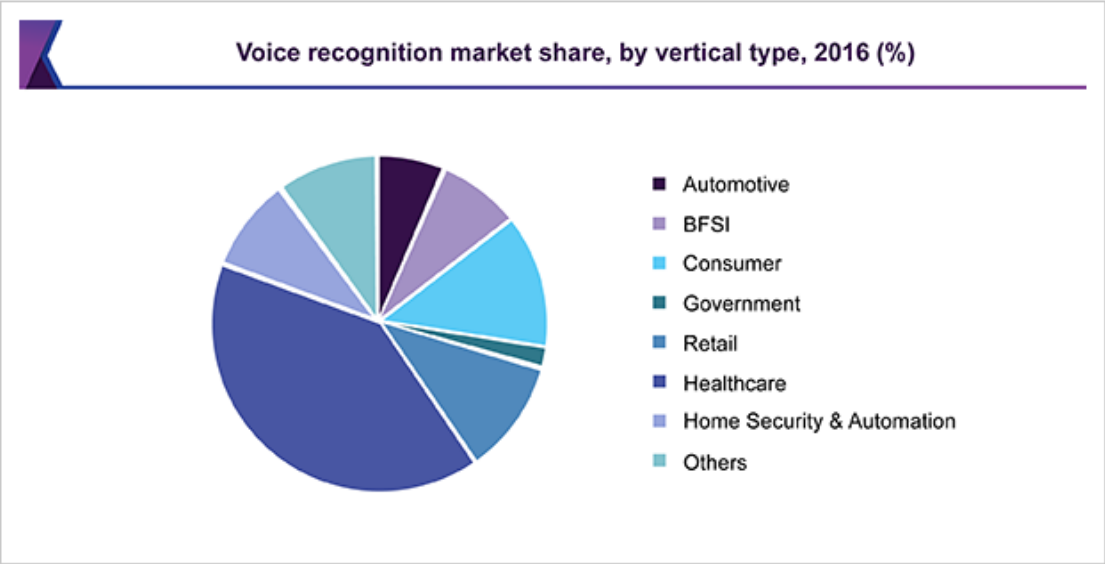



**Figure 1.4:** Voice recognition market share ([https://www.grandviewresearch.com/industry-analysis/voice-recognition-market, 2018])

The digital assistant market grew significantly from 2015 to 2016 and is expected to grow exponentially until 2020 (Figure 1.5). Everything shows that digital assistants are here to stay.

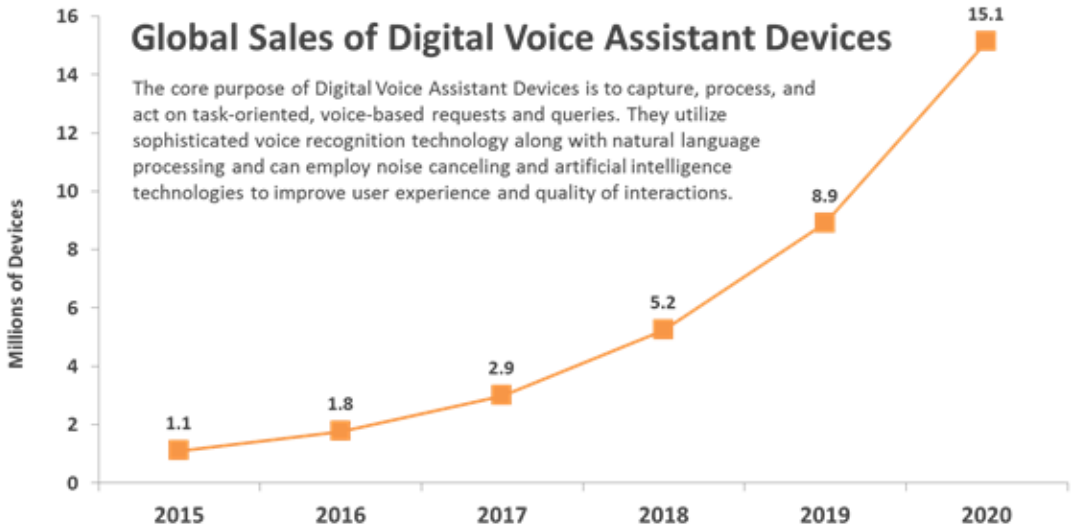



**Figure 1.5:** Global sales of digital voice assistant devices ([Watkins and Branca, 2016])

Clinicians have been using voice recognition technology for documentation ([Baker, R Hat, May 2010]). Clinical notes in patient electronic health record are usually of poor quality and even poorer than when paper was used for documentation. The ease of using "copy & paste" has helped in this situation, which also results in poor communication among clinicians. Voice recognition technology enables them to dictate and electronically store their assessments, notes and concerns into the documentation, helping subsequent caregivers deliver care more effectively.

Of course, when it comes to health, there is a moral dimension of the clinician-to-computer communication since documentation is a responsible and critical process ([Cheshire, William P, 2013]). Sometimes, ineffective voice recognition can magnify medical error if the meaning of the dictated phrases is altered.

It is obvious that voice recognition technology and its applications are of growing interest. It is also obvious that health care professionals face important problems in their jobs. Technologies are made in order to serve people and make life easier. Taking these points into consideration, the attempt of this project is to discover if and how this particular promising technology can serve this particular sector.

# Entranet and project objective 2

The aim of Entrepreneurial Engineering's Long Master Thesis is to document the knowledge, skills and competences, acquired throughout the study program. Both the third and fourth semesters are part of a one-year Master Thesis allowing more time to cope with innovation processes, which are often lengthy of nature.

The opportunity is given to work more closely with different external partners, for instance, to collaborate with an existing business and any partner who is willing to let you become part of the learning processes concerning innovation and entrepreneurship.

This chapter follows the journey to find a subject for the project, introduces the collaborating startup, explains its new product idea and declares the agreement and project objective.

## 2.1 Discovery

The term "Discovery" is referred to the first phase of the D-I-A (Discovery-Incubation-Acceleration) approach ([Arteaga and Hyland, 2014]), which is an innovative framework to bring business and new product ideas to life. The Discovery phase aims to identify opportunities, generate ideas and come up with new concepts.

The primary goal of the idea generation process for this project was to include a physical product, meaning something tangible. The reason for that was the desire to experiment with physical prototypes, since the first two semester projects included a smartphone application and a product, which was not ready as a prototype from the collaborating company.

Three ideas were generated (Appendix A).The first idea included the use of sea weed for creating thermal insulation surfaces for buildings. This idea was abandoned because it seemed too demanding for a semester project, which led to another two ideas. The second idea was using reed to build sustainable products like furniture and the third one was offering Airbnb host services for those who rent their apartments through the Airbnb platform.

Owing to significant obstacles like the ease to copy and the difficulty to scale up, pivot was necessary. Right before pivot, a visit to the annual international business fair in Thessaloniki brought a potential collaboration with an existing business to the surface. A few startups were contacted and only one replied. It's name, Entranet!

## 2.2 Introducing Entranet

Entranet is an award-winning (Figure 2.1) innovation leader that operates in the IoT (Internet of Things) industry with expertise in developing speech recognition consumer applications for the interaction between people and smart devices.


**Figure 2.1:** Awards won by Entranet

It's mission is to make every house in the world, smart! This is why it creates and promotes innovative technological solutions that make life more simple and easier for everyone. Entranet has designed the easiest smart home system ever. The easiest to install, use, expand, configure and update.

The "Smart home of the future" design is based on the V.A.S.I. concept. "Vasi" is the Greek word for "Foundation" and the foundation of the future smart technologies should be based on four main principles that technologies should follow in order to be easily and widely used by everyone: Visuality, Accessibility, Simplicity, Interactivity.

Smart elevators, smart homes and assisted living technologies are among the driving forces of the future global economy, as they address simultaneously an expanding emerging market (elders) and a niche market (people with disabilities).

Entranet is a US based company, with it's headquarters in Florida, U.S., sales and marketing department in London, UK and R&D department in Thessaloniki (Greece).

The company designs and develops both competitive hardware and software solutions that can be easily customized to fit any needs by continually investing in research. Its team conducts research to improve and utilize a wide range of technologies, so as to offer integrated solutions for various uses. The three basic principles under which the team works and operates are team spirit, having a joint goal and showing respect to different backgrounds and experiences.

## 2.3 New product description

Entranet seemed positive for a collaboration even from the first contact. During the first meeting, a detailed discussion about the business took place, as well as the objectives of the Thesis, trying to find a fit between them.

The company's current priority is to start producing "Housemate", which is the easiest, almost plug&play smart home system. Apart from that, the company has already thought about the next product. It's going to be a digital assistant or digital nurse for health care facilities, which promises to upgrade their services. It's been accepted by a European program and Entranet, among with its partners, have been given three years to build it.

The new product aims to provide some pleasantly occupying activities for the patients, help nurses to focus on their job and make doctors' work easier. The product should be something easy-to-use, so that it can be easily adopted by those involved.

The initial concept of the digital nurse includes a digital avatar on a screen, sensors and smart devices for a patient's room. The screen could be a tablet or a TV screen. Sensors and smart devices could be the same as those used in a smart home, for example, smart sockets, thermostats, switches etc. Smart devices will be able to communicate with the tablet and the tablet will receive voice commands through the avatar.

The following include examples that describe what the product could do and how it could be used:

- The patient will be on his bed and he will have the tablet in front of him. He will be able to watch movies, listen to music, surf the internet or communicate with his loved ones via video calls. Patients will wear earphones in order not to disturb the other patients in the room.
- In case the patient needs something, he's going to say "Eliza" and the avatar is going to appear on the screen. Then he will tell her what he wants her to do. For instance, "Eliza, turn the lights off" or "Eliza, call me the nurse".
- When the patient asks Eliza for the nurse, the nurse will first talk to him through a video call on the tablet screen to see what the patient wants and filter if it's something important or not, or if it's something that lies in her or someone else's responsibility. For example, "Nurse, I want to go to the bathroom" and the nurse responds live "I will send someone to help you". In this way, the pertinent staff will take care of it.
- When the patient says "Eliza, help", it's an alert and staff gets there immediately to check what happened.
- Notifications will remind the patient for sleeping hours or other aspects of the care plan.
- Games specialized in specific diseases like the Alzheimer's disease that can help the patient, will be available.
- Nurses will be able to turn the tablet cameras on and talk to the patients individually, ask them if they are feeling well, check if they are sleeping etc.
- The doctor will be able to visit the patients' room and ask Eliza to show him the patient's health card, which includes all his temperature or blood pressure

measurements at once. For example, the command "Eliza, show me the patient's blood pressure" will show the relevant chart on the screen.

The digital nurse is going to be multilingual, including a variety of languages for use in different countries. What is more, it will be user independent, meaning that the voice recognition system will be able to understand everyone, no matter who talks. The same product will serve the patient's/elder's, doctor's and nurse's/carer's needs.

## 2.4 Project objective

The proposed project goal was to take constructive feedback from health care centers staff such as nurses and doctors, in order to define what a digital assistant can do inside a patient's room. The subject was a match, as it includes business development processes, an important validation part and it also constitutes a technology-based and knowledge-based concept.

After an initial research on the market and the voice recognition technology, a more detailed discussion took place. Entranet wants to introduce a new product on the market and normally when a company has a new market suggestion, it starts small. This means that Entranet should start for example, with hospitals and consider as end users only doctors or only nurses working there. On the contrary, what Entranet wants to do is to explore a wider range of the health care facilities and end users. Considering a broader market, health care facilities include hospitals, Assisted Living Facilities (ALF) and rehabilitation centers. End users could include different actors in this sector such as doctors, nursing staff, carers, physiotherapists, patients and elders.

What would be useful for the company right now is to discover and validate the different real needs of the various end users, confirm the market need for such a product and ultimately find out how the digital assistant/nurse can be tailored to each health care facility in order to better serve the end user needs. Once the user needs are revealed, it becomes clear what features the product should have in each case.

So, the question to answer is:

**"What can a digital assistant do inside a patient's or elder's room?"**

This question can be broken down into three further sub-questions:

- "How can a digital assistant help the end users in hospitals?"
- "How can a digital assistant help the end users in rehabilitation centers?"
- "How can a digital assistant help the end users in Assisted Living Facilities (ALFs)?"

The answers to these questions are the project objective and also the agreement made with Entranet. The results are expected to be very useful for the company, as it will gain the necessary knowledge and insights about the new market it wants to enter.

# Methodology 3

The scope of this chapter is to argue that the theory used is a good choice and well-suited for the the addressing problem. In this thesis, the methodologies that were taken into consideration are action research, the disciplined entrepreneurship framework and the lean startup methodology. This chapter describes these methodologies, makes a comparison among them and explains why they are chosen, how they fit the concept of the project and how they are used.

## 3.1 Disciplined Entrepreneurship

The framework used to structure this project is the one presented in the book "Disciplined Entrepreneurship" ([Aulet, 2013]). Entrepreneurship entails risk, uncertainty and often chaotic processes that need to be tackled. Disciplined Entrepreneurship suggests a very useful framework for any type of business that:

- helps entrepreneurs get from an idea to full realization,
- provides practical guidance on how to approach the launch of a new and world-changing business,
- systematically increases the likelihood of building a sustainable business and making a great product,
- sees the overall process, including important steps that can efficiently bring new products to market,
- brings discipline to chaos,
- offers guidance when entrepreneurs want to innovate and introduce something completely new to the market and
- helps them reduce the risk, at least in factors that can be controlled.

This framework can be compared to a board game (Figure 3.1). It includes 24 steps that act as a roadmap that gets entrepreneurs from an idea to actually building a successful business. At the end of the game, you either win or learn along the way. But even if "failure" is unavoidable, you "fail" fast and cheap.

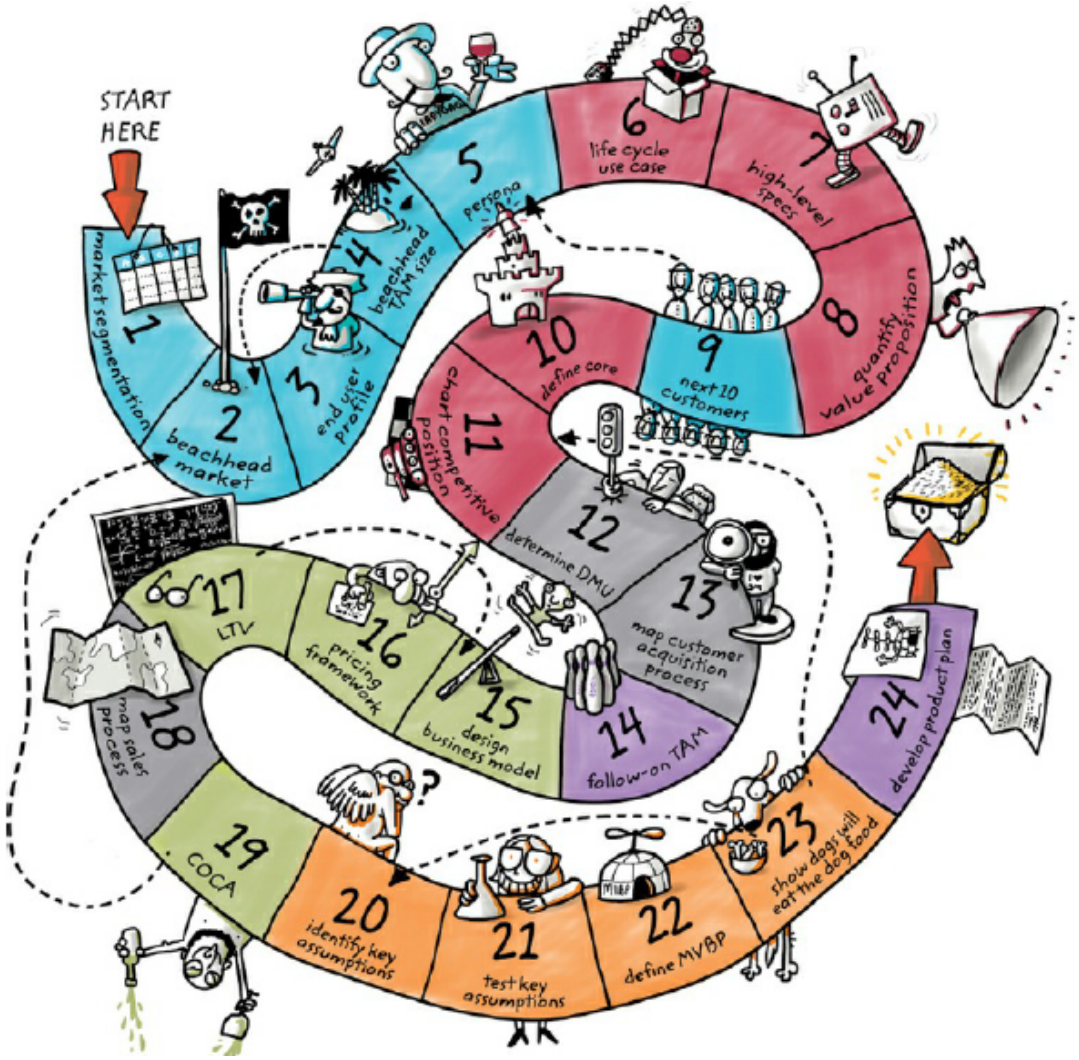



**Figure 3.1:** The 24-step framework
([Aulet, 2013])

The 24 steps are discrete and can be grouped into six fundamental themes (Figure 3.2). Each of those themes constitutes one separate chapter that focuses on the relevant content.


**Figure 3.2:** The six themes
([Aulet, 2013])

These themes constitute a complete framework to launching a new business. The steps included in the themes can be iterated and redefined along the way, while new knowledge is gained in order to make sure that the final offer will be something valuable for the customers.

## 3.2 Action research

Action research is a research methodology initiated to solve an immediate problem. It is undertaken by a group of individuals working together in teams and trying to improve the way they solve problems. The researcher can try out different practices, experiment, make mistakes, learn from them and become better in problem solving by taking action. He actively participates in the problematic situation while also conducting a research and testing his ideas. Some of the definitions of action research are the following:

"Action research aims to contribute both to the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually acceptable ethical framework."([Robert N. Rapoport, 1970])

"A general term to refer to research methodologies and projects where the researcher(s) tries to directly improve the participating organization(s) and, at the same time, to generate scientific knowledge"(|Kock, 1997|).

Action research is an empirical process whose twofold goal is to solve a particular problem and produce guidelines for effective practices. "Knowledge is always gained through action and for action" ([Torbert, 1981]). Traditionally, according to Lewin's model, action research includes seven stages ([Lewin, 1946]):

- Stage 1: The problematic situation that needs to be changed is identified.
- Stage 2: In order to make clear what the nature of the problem is, the researcher looks for facts to have the big picture of the addressing problem.
- Stage 3: This stage includes a literature review so as to find out what has already been done as a research on the chosen problem and what knowledge can be gained from them. In addition, the researcher makes some hypotheses about the problem.
- Stage 4: It is time to gather the necessary data to test the hypotheses made in Stage 3, by taking action to check if the evidence is congruent with the hypotheses.
- Stage 5: The action research team discusses and decides on the procedures they will follow to conduct the research.
- Stage 6: The team determines the data collection and analysis methods and they implement the action plan.
- Stage 7: At this stage, the collected data are evaluated and the team makes reflections on the whole research process. Some suggestions are made and the whole process is repeated. The results become known to the public.

Another approach of action research, includes an iterative process of the five following steps ([Susman, 1983]):

- Diagnosing: identify the problem that needs to be addressed.
- Action planning: after defining what needs to be tested, the researcher designs the whole process and determines the data methods and the deadlines.
- Taking action: the researcher goes from theory to practice, tests out a strategy, experiments and collects the necessary data.
- Evaluating: the collected data are analyzed, organized and transformed into charts or graphs, specific trends are identified and discussed with peers.
- Specifying learning: it is the reflection process, where the results are shared with the world, the researcher reflects on his practice and this leads to newer questions.
- Iteration: this cycle is repeated as the problem is redefined.

Action research should be characterized by the 5 C's ([E.T.Borgia and D.Schuler, 1996]):

- Commitment: action research is a time-demanding process and all participants should be aware of that and be committed throughout the whole research.
- Collaboration: all participants contribute equally in the action research. Sharing ideas, knowledge, experience and suggestions should be carefully listened to, respected and constructively discussed.

- Concern: during the research, participants inevitably develop a support group of "critical friends" who all have trust in each other and the value of the project.
- Consideration: participants look for patterns and relationships that will make sense and be able to generate results. So, concentration, focus and careful consideration are crucial when reflecting on the research process.
- Change: change is an important part of human developmental cycle but at the same time, change is an indispensable element for maintaining one's effectiveness.

## 3.3 The lean startup approach

The Lean theory originates from the car manufacturing industry. Toyota was the first to introduce the lean concept in order to improve and optimize the efficiency and effectiveness of the production processes by minimizing any form of waste. The core 5 principles for implementing Lean theory are the following ([Womack JP, 2003]):

- Identify Value: Companies offer products or services that create value for the customers. Value adding-activities should be identified and be distinguished from wasteful activities that create no real value for the customers.
- Map value stream: After values are identified they should be visualized to illustrate their path to the customers.
- Create flow: Work is undertaken in batches and any kind of waiting between different parts of the process is a waste. Lean seeks to ensure a smooth and continuous flow.
- Establish pull: As James P. Womack put it, "Pull, in simplest terms means that no one upstream should produce a good or service until the customer downstream asks for it". Lean supports the "pull" concept, meaning that's it's better to start creating something when there is adequate demand for it rather than creating something and then try to "push" it in the market.
- Seek constant improvement: The concept of continuous improvement is an important part of the Lean management. The focus should be on ameliorating the most value-generating activities, while removing the wasteful ones.

After the success of Lean theory in manufacturing, it was spread to more fields such as in business.

Why are startups differentiated from other business ventures? How are they different?

Startups are new ventures that are tightly interwoven with two factors: innovative products and conditions of high uncertainty and risk. This means that trying to apply traditional methods to manage a startup, is not something worth-doing and will most probably lead to failure. A new method was introduced in Eric Ries' book "The Lean Startup".

The Lean Startup approach is a management tool for startups, helping them to bring innovative ideas to life and reduce uncertainty ([Ries, 2011]). Major building blocks of this approach are the so-called "validated learning" and the "Build-Measure-Learn feedback loop".

Validated learning is the learning gained in practice, by contacting real users/customers and gathering empirical data from them. The key to a startup progress is learning and

for that, involving potential customers in the development process is necessary. It's the only way to understand their real needs and adapt your product to them. The way to achieve validated learning is by running experiments to test your assumptions and gain the knowledge needed.

The Build-Measure-Learn feedback loop (Figure 3.3) is a model to achieve validated learning by reiterating three stages: "Build", which means turning an idea into a product, "Measure" how customers react to the product and "Learn" how to improve your product, so that it can satisfy the customers' needs.

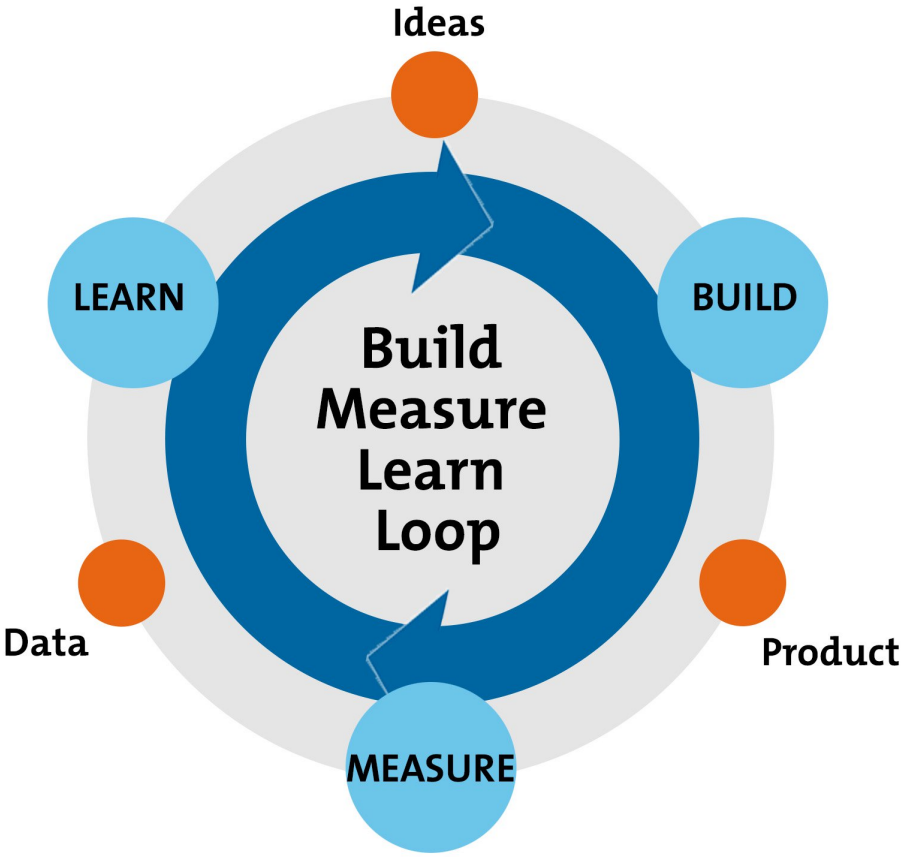



**Figure 3.3:** The Build-Measure-Learn feedback loop ([https://www.mindtools.com/pages/article/build-measure-learn.htm, 2018])

It includes a cycle of identifying and testing assumptions by building the simplest version of the product for potential customers to try, measuring their reactions and receiving constructive feedback. Repeating this cyclic process, a startup can fail fast and cheap, using the minimum amount of resources and effort and most importantly keep improving the product until it can completely fit the user's real needs.

## 3.4 Theories comparison and use

The above-presented theories are the ones taken into consideration for the thesis. There are some similarities and differences among these theories that make them less or more suitable for it. In order to better illustrate each theory's strong points, a comparative table was created (Figure 3.4). The points of comparison are explained below:

- Problem solving: The theory helps in solving an immediate problem in a specific problem area.
- Empirical process: The theory includes an empirical part, where testing out certain points and data collecting are necessary.
- Considering past research: The theory takes into consideration the research that has already been done on the addressing problematic situation and exploits what has been learned from past research.
- Contribution to existing knowledge: The researcher uses the existing knowledge and goes one step further, building on it and generating new knowledge.
- Business development: The theory incorporates a complete process of business development, going from idea to realization.
- Product development: The theory helps in testing out a rough version of the product in order to improve it.
- User-centered: The end users of the product have a saying in the development process and are involved in every step of it.
- Iterative: The models or stages used in the theory are iterative, following a learning loop to gain new knowledge.

| | Disciplined entrepreneurship | Action research | Lean startup |
|---|---|---|---|
| Problem-solving | X | √ | X |
| Empirical process | √ | √ | √ |
| Considering past research | X | √ | X |
| Contribution to existing knowledge | X | √ | X |
| Business development | √ | X | X |
| Product development | √ | X | √ |
| User-centered | √ | √ | √ |
| Iterative | √ | √ | √ |

**Figure 3.4:** Theories comparison

All three of the theories explained before, are utilized in this project, but how exactly are they used?

The steps included in Disciplined Entrepreneurship serve as a complete solution to the initial business development process of the new business that Entranet wants to create. It incorporates the indispensable business part of the project, helping the company decide on important issues regarding the digital nurse such as who is the customer, what is the offering value of the product or which is the right pricing strategy for it.

Apart from that, Disciplined Entrepreneurship serves as a framework to structure the

project. Normally, it is comprised of 24 steps, which are clustered to form 6 different themes. In this project, all the steps that are used, are applied as explained in the theory, adding external theory where necessary. Some of the steps, though, were either not included or merged with one another. The reason that few of them were not included, is explained in each case, in the relevant parts of the project. For example, selecting a beachhead market for the digital nurse, may not make sense, since the final objective of the thesis includes exploring the needs of a broader range of the market and not limiting it to target a specific end user type.

Disciplined entrepreneurship is a good fit for this project, since it is based on a new venture. It may not be a typical example of an entrepreneur who starts a new company from scratch, because the company already exists. It is a new business within an existing business, but still, it is a new business, a new and innovative product with a lot of uncertainty and financial risk that needs to be tested.

An important part of Disciplined Entrepreneurship's framework is the validation part. This is the empirical part, in which the entrepreneur makes some hypotheses and tests them with the end users to get feedback and validate or refute them. For the validation part, the Lean startup theory is a perfect match. So, the theme "How do you design and build your product?" utilizes the Lean startup theory at full extent in order to get the most out the validation process, which is one of the building blocks, if not the core of this project. A complete "Build-Measure-Learn" feedback loop is applied in this part.

So, the business part of the project is covered using the Disciplined Entrepreneurship framework. The empirical part is covered using the Lean startup theory. What about the research part? Action research is used for this. Existing knowledge on similar research is considered and the project builds on the existing knowledge generating new insights on the subject. If Lean startup offers empirical learning, action research offers learning from other researchers, who also worked with the same problem and published their work on that.

The existing knowledge that is utilized in the project includes the articles and past research presented in the project theme regarding health care needs and voice recognition technology. Disciplined entrepreneurship, the lean startup theory and also various sources that are used throughout the whole project to support the chosen theories, constitute existing knowledge and serve as a base to start from. Part of this learning is also reflected in knowledge gained during the first year of the Entrepreneurial Engineering Master's program, as well. For example, knowledge from first year's marketing courses is considered when shaping the pricing strategy of the product.

At this point, it needs to be stated that methodology for more detailed issues such as data collecting methods, are mentioned and explained later in the relevant chapters.

# Who can be the customer? 4

This chapter aims to illustrate the market that Entranet wants to address with its new product and outline the potential end users that could benefit from it.

## 4.1 Market segmentation

Market segmentation starts with a short expression of the initial idea about the product, including what will be achieved by using it and how. The basic idea around the aim of the digital nurse can be described by the following sentence:

"We want to improve health care centers' services with voice recognition technology."

This simple expression helps you understand what Entranet wants to accomplish (improve the services of health care facilities) and how they wish to do it (by utilizing voice recognition technology). It is also clear, where market segmentation should start from. Given that the company aims to a specific industry (health care centers), it is not necessary, at least for now, to look for different industries for the product. So, market segmentation's starting point is not on an industry level but on a customer level. The following chart (Table 4.1) constitutes a short description of the chosen market, including its basic characteristics.

| | |
|---|---|
| **Industry** | Health care centers |
| **End user** | Nurses, carers, doctors, patients |
| **Application** | Communication, health monitoring, room control, internet |
| **Benefits** | Efficiency, time saving, independence, entertainment |
| **Market characteristics** | Fierce competition, resistance to change |
| **Competition** | Amazon Echo, Google home, MLS MAIC |
| **Complementary assets required** | Reliable internet connection |

**Table 4.1:** The Digital Nurse market segmentation chart

At this point it is useful to elaborate on the term "customer". A customer is made up of two parts: the end user and the decision making unit ([Aulet, 2013]). The end user is the person who uses your product. The Decision Making Unit or DMU is the person who decides if the product will be purchased or not. So, the end users are patients/elders, nurses/carers and doctors working in the health care centers and the DMUs are the owners of the private health care centers or the administrators of the public ones.

A breakdown of the health care centers market is presented below (Figure 4.1), aiming to include a wide array of potential customers that are involved in the specific market. The graphic representation was created online with the mind map technique using the website www.mindmup.com.

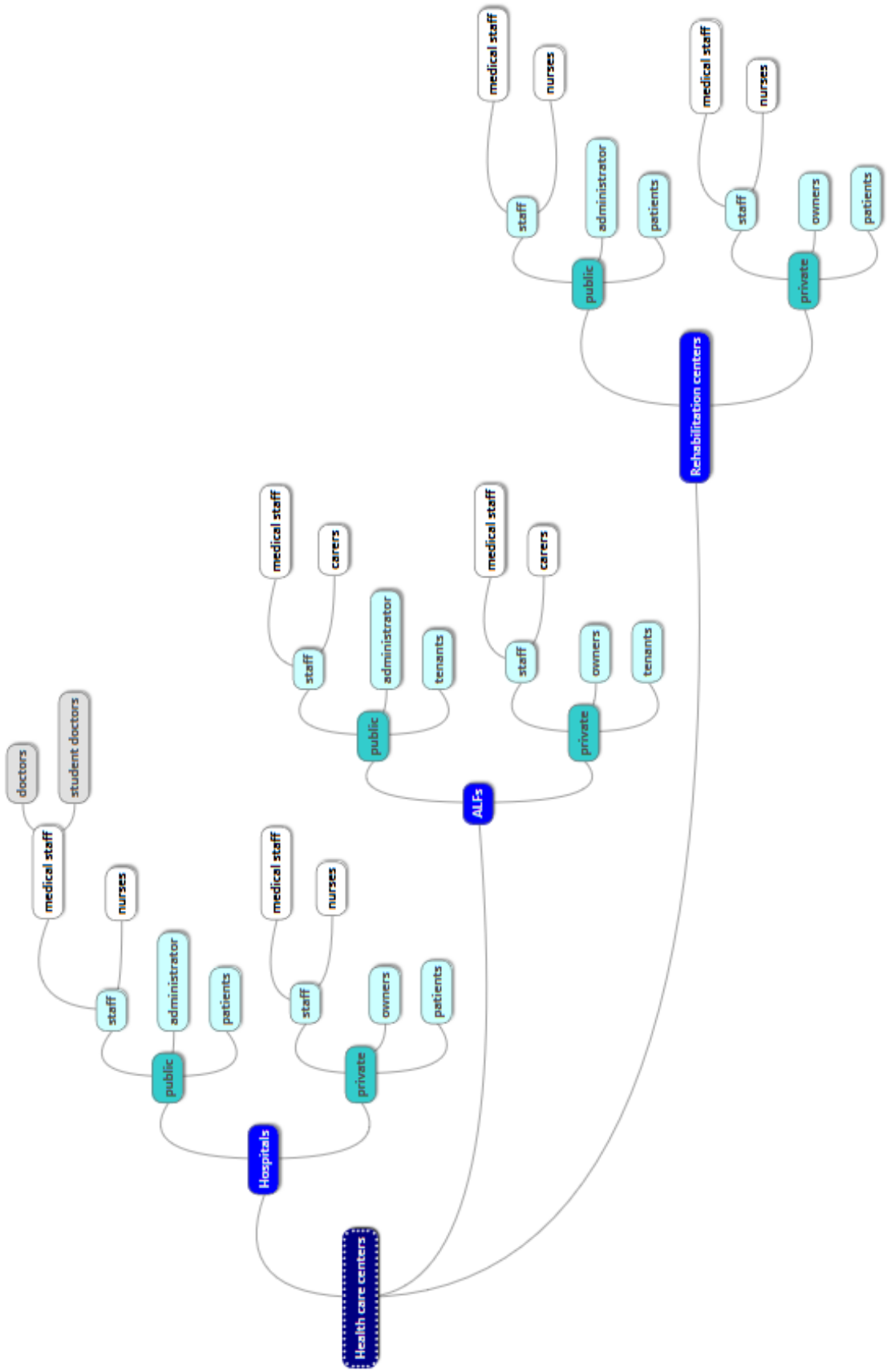



**Figure 4.1:** Health care centers: market segmentation

Based on this diagram, the potential customers for the digital nurse are:

- Nurses working in hospitals
- Nurses working in rehabilitation centers
- Nurses/carers working in ALFs
- Doctors working in hospitals
- Doctors working in rehabilitation centers
- Doctors working in ALFs
- Hospital owners or administrators
- Rehabilitation centers owners or administrators
- ALFs owners or administrators
- People who had been hospitalized
- People who have been hosted in a rehabilitation center
- People who live in ALFs

## 4.2 End user profile

In order for a business to succeed in a specific market, it has to be customer-focused. Businesses should focus their energy on serving the customers, making and keeping them happy. Trying to understand the customers even before start talking to them is extremely important. The end user profile helps in this direction. It's a more detailed description of the potential customers mentioned before, that helps the whole startup team to be in the customers' shoes first.

Some of the potential customers of the digital nurse seem to share similar characteristics or personality traits and they can be grouped into the same categories. Nursing staff or carers working in any of the health care centers make up one category. The same happens for doctors and owners, while hospital patients, rehabilitation center patients and ALFs' tenants are seperate categories themselves. The end user profiles are presented below (Tables 4.2, 4.3, 4.4, 4.5, 4.6, 4.7).

| **Nursing staff working in hospitals, rehabilitation centers and ALFs** | |
|---|---|
| Gender | Female (70%), Male (30%) |
| Age | 25-55 years old |
| Personality | They want to take care of people. They are concerned about the well-being of others and they often don't hesitate to put others' needs above theirs. They are empathetic and compassionate. They have emotional strength that helps them cope with heartbreaking work. They have innate communication skills that help them interact with patients, family members, doctors, nurses, hospital staff and administrators. |
| Context | They chose to work as nurses, not only to make a living but mainly because they love what they do. They are givers and they are always looking for ways to be better in what they do. Most of them are not very familiar with technology, especially the older ones. They are very observant, used to work through mountains of paperwork and also have physical strength that helps them lift patients and be always on their feet. |
| Fear | Their biggest fear is the case that something bad happens to a patient during their shift. For example, if the patient falls down or if they forget to give the patient's medication. These situations all lie in their responsibility and besides feeling guilty, they also risk losing their job. |

**Table 4.2:** End user profile: Nursing staff working in hospitals, rehabilitation centers and ALFs

| **Doctors working in hospitals, rehabilitation centers and ALFs** | |
|---|---|
| Gender | Male (80%), Female (20%) |
| Age | 27-60 years old |
| Personality | They want to cure. They have compassion with the patients and are empathetic to their needs. Responsibility and strong work ethic is what characterizes them. They have a lot of patience, composure and confidence in what they do. |
| Context | They have very good medical knowledge, are able to recall it at any given time and never stop learning new things and keep adapting. They are careful in how they interact with patients, so that they can be trusted. They hear everything the patients have to say before making a diagnosis, especially their medical record. They are passionate about their job and what they mostly see is patients and not customers. They are flexible and able to make fast decisions when needed. |
| Fear | Their nightmare is if the patient's condition deteriorates or worse, if a patient dies, because of their mistake. It's a predicament for them, since they have to account for what happened to the family members. |

**Table 4.3:** End user profile: Doctors working in hospitals, rehabilitation centers and ALFs

| **Owners/operators of hospitals, rehabilitation centers and ALFs** | |
|---|---|
| Education | Medicine, Health care or Business |
| History | They were working for years in the health care sector as nursing staff or doctors and at some point they felt confident to launch their own business. They could be businessmen who decided to go for the health care market or people that just inherited their parents' business. They might also be operators that manage public health care centers. |
| Context | Of course they want to treat patients and help them as much as they can but their primary goal is profit which can be achieved through good patient/customer treatment. They are always trying to find new ways to improve their services, lower their costs, maximize their profits, have a good reputation, keep their rooms full and become more competitive. |
| Fear | What they fear most are potential mistakes from the staff that can damage their reputation and keep their customers away. |

**Table 4.4:** End user profile: Owners/operators of hospitals, rehabilitation centers and ALFs

| **People who had been hospitalized** | |
|---|---|
| History | At least once in their life, they had a health issue that led them to a hospital's patient room. It could be a surgery or just a precautionary stay in a private or public hospital. |
| Context | They made the choice for the particular hospital based on some criteria and during their stay, they gained both positive and negative experiences. |

**Table 4.5:** End user profile: People who had been hospitalized

| **People who have been hosted in a rehabilitation center** | |
|---|---|
| History | At least once in their life, they had a health issue or an accident that led them to a rehabilitation center's room. During their staying the appropriate staff took care of them and helped them with their body movement. |
| Context | They made the choice for the particular rehabilitation center based on some criteria and during their stay, they gained both positive and negative experiences. |

**Table 4.6:** End user profile: People who have been hosted in a rehabilitation center

| **People who live in ALFs** | |
|---|---|
| Context | They are old people that are alone in life and don't have anyone to take care of them, so they decided to live in an ALF room for the rest of their lives. Some of them started having health issues, mainly mental, that don't allow them to take care of themselves, so their families decided to move them to an ALF. |

**Table 4.7:** End user profile: People who live in ALFs

According to the "disciplined entrepreneurship" methodology, market segmentation starts with a brainstorming on different industries, markets and potential customers. It continues with narrowing them down to 6-12 market opportunities, analyze them and choose only one beachhead market to pursue, since a startup's resources are limited at the start and it is extremely difficult to survive in large markets. After the beachhead market is known, it's time to build one end user profile, which is a detailed description of the typical end user of the chosen market segment.

A limitation of this methodological part for the digital nurse is that the market opportunity or the desired market to enter is known and the brainstorming is unnecessary. What is more, the project's focus in not only on one market segment. Maybe it is focused on one market (health care centers), but the actors are multiple including different health care centers and various end users. This limitation makes sense, considering that the purpose of this project is exploratory, aiming to discover the needs of more than one end user. In the future, after the needs are discovered, the company will have to narrow down and

"attack" a specific market segment, but at this early point the goal is different and it is a first and broader contact with the desired market.

# What can be done for the customer? 5

Now that there is a better understanding of the potential end users, it's also necessary to have a better understanding of the product use. This chapter examines a full life cycle use case, presents a visualization of the product in order to make the idea more concrete and defines, or better supposes, the value for each end user type.

## 5.1 Full life cycle use case

The full life cycle use case puts the entrepreneur and the whole team in the customer's shoes. It helps them better understand the interaction between the customer and the product, it makes clear how the customers gain value from the product use and what adoption hurdles may come up. The full life cycle use case does not only include how the customers make use of the product but also other factors regarding the adoption process, beginning from how they find out about the product to how they buy more and also suggest it to others. The following questions shed light on the digital nurse's full life cycle use case.

**How will customers find out about the product?**

Initially Entranet is going to approach the owners or managers of the health care centers to introduce the new product to them. After the product is installed in some health care centers, then the end users will spread the word about it. Of course Entranet will continue approaching new customers.

**How will they analyze the product?**

New potential end users will learn more details about the product by talking with people that have already used it and will share their experience. DMUs will analyze the product by talking directly with Entranet and discuss how it can be customized to their specific needs.

**How will they acquire the product?**

Since the product is customized to each customer, it can't be sold as a package in retailers. After the agreement is made, the company will put all the hardware units in a box, transfer it to the hospital or ALF, install both hardware and software and make sure that the whole system works perfectly. Entranet will also show the staff how to use the product, if asked.

**How will they install the product?**

The screens are going to be attached to each one of the patient's/elder's beds. Smart

devices will be installed inside the rooms. Depending on the agreement, the devices could include smart switches, thermostats and sockets. Entranet's software will be installed in the central computer, which is used by the nurses. The software will be installed and checked if it works properly, if information can be retrieved from the central computer and be displayed on the screens.

**How will they use the product?**

The end users will be able to use the product both by touching the screen and through voice command. Patients will surf the Web, control the room (lights, bed etc.), use the camera system to communicate with their loved ones or call the nurse when needed. The nurses will be in their room accepting the patients' video calls to see what they need. The doctors will ask the digital assistant called "Eliza" to show the patients data on the screen, such as blood test results, temperature charts, blood pressure charts, patient's diet or medication.

**How will they determine the value gained from the product?**

Nurses and doctors will realize that the product will save them time and help them be more productive. DMUs will realize that the quality of the offering services will be ameliorated and thus customers will show preference to their health care center, because of the innovative product, as well.

**How will they pay for the product?**

Customers will pay online through Entranet's website or by transferring money to the company's bank account. The initial payment will include the hardware, software, installation and system check. Then the customer will pay a yearly fee for the server hosting service.

**How will they receive support for the product?**

The after sales services will include teaching the staff how to use the product, fixing any software or hardware problem that may occur and adding more features to the system.

**How will they buy more product and/or spread awareness (hopefully positive) about the product?**

DMUs will only buy more if they add more beds to their facilities or decide to put it in more of the existing beds, if they see that the product covers their needs. DMUs will spread positive awareness about the product, since they are expected to use it as an asset to advertise how innovative they are, attract more customers and be more competitive. End users will also share their experience with the new product with their network.

**What problems may be created by the product?**

- Even if the patients use ear phones when talking to their family through the camera system, it will still be annoying for the other patients inside the room.
- If there are more than one patient in one room, then the room control is going to be a problem, one might want the window or curtain open while the other one not.

- If one patient says "Eliza" and all the screens in the room are activated, it's going to be disturbing for the users.
- The transition phase during which the staff will be adapting to the new situation may temporarily deteriorate the quality of the offering services.
- There might be GDPR issues with the camera system or with the patients data available on the screen.

## 5.2 High-level product specification

It's always easier to conceive the product idea when there is a visual representation of it. It doesn't have to be in great detail. A rough sketch that gives a first approach on how the product will look like is enough. For Entranet's product specification, an attempt was made to visualize its software, meaning what the user will see on the touch screen. These screnshots were created by using Balsamiq, an online mockup tool and they are presented below.

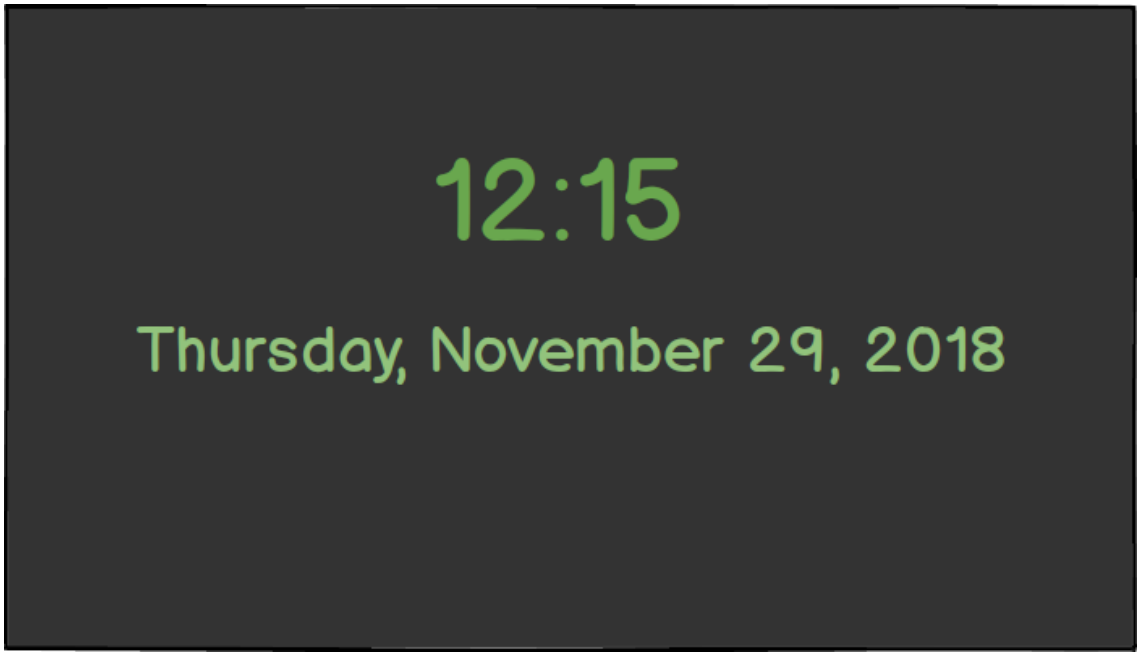



**Figure 5.1:** "Screensaver" screenshot

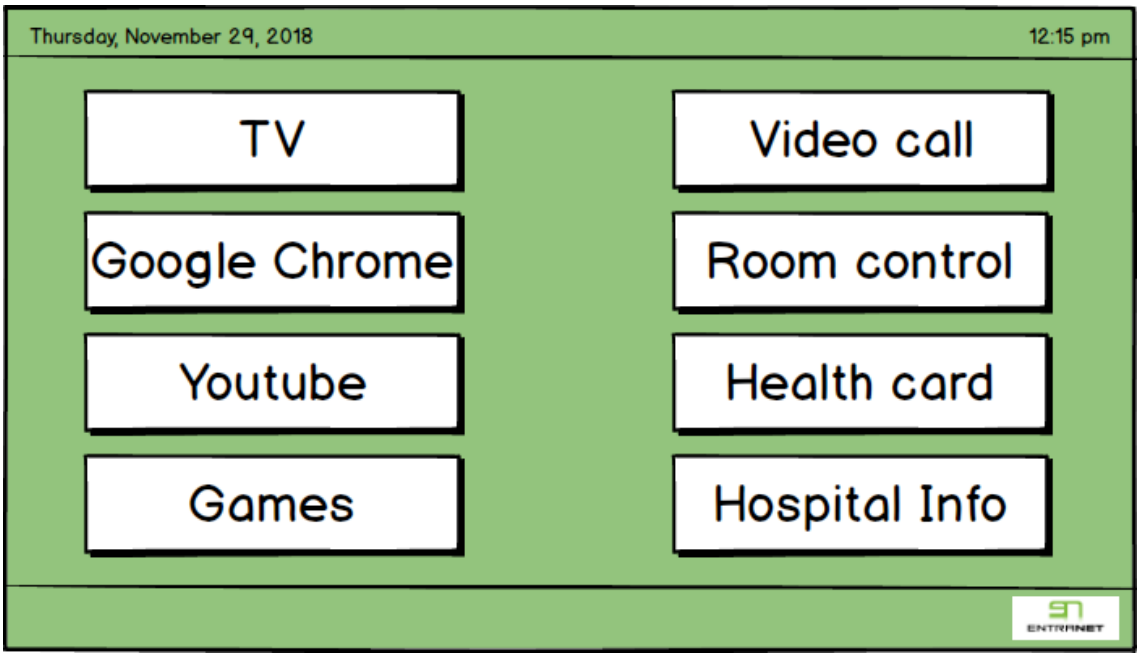



**Figure 5.2:** "Main menu" screenshot


**Figure 5.3:** "Digital assistant" screenshot

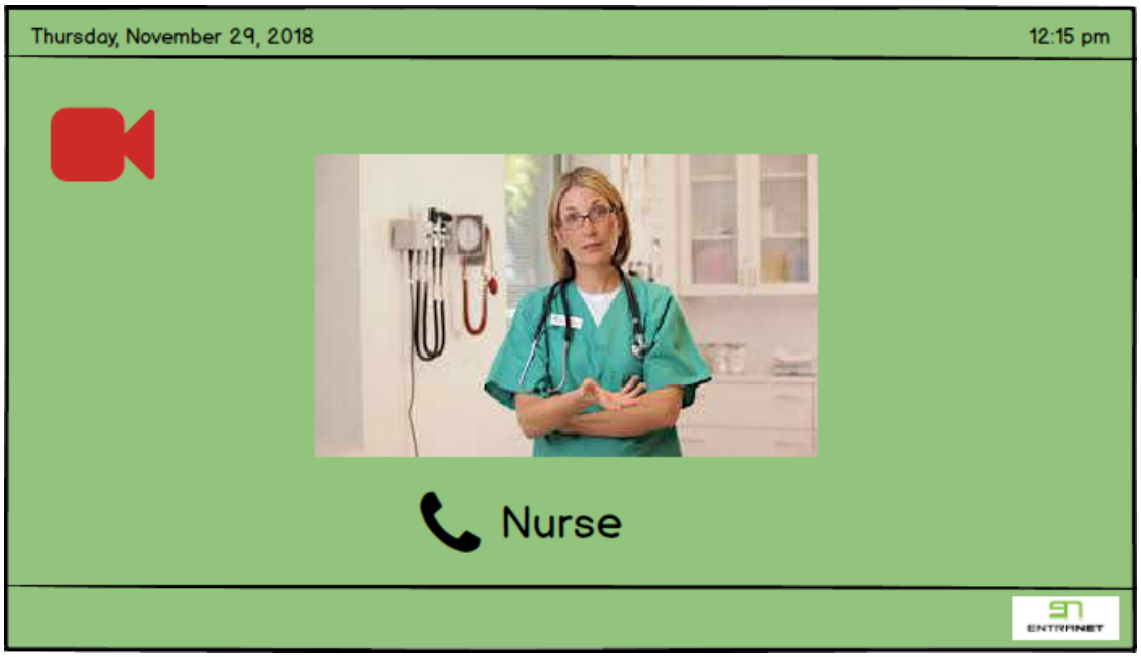



**Figure 5.4:** "Video call with the nurse" screenshot

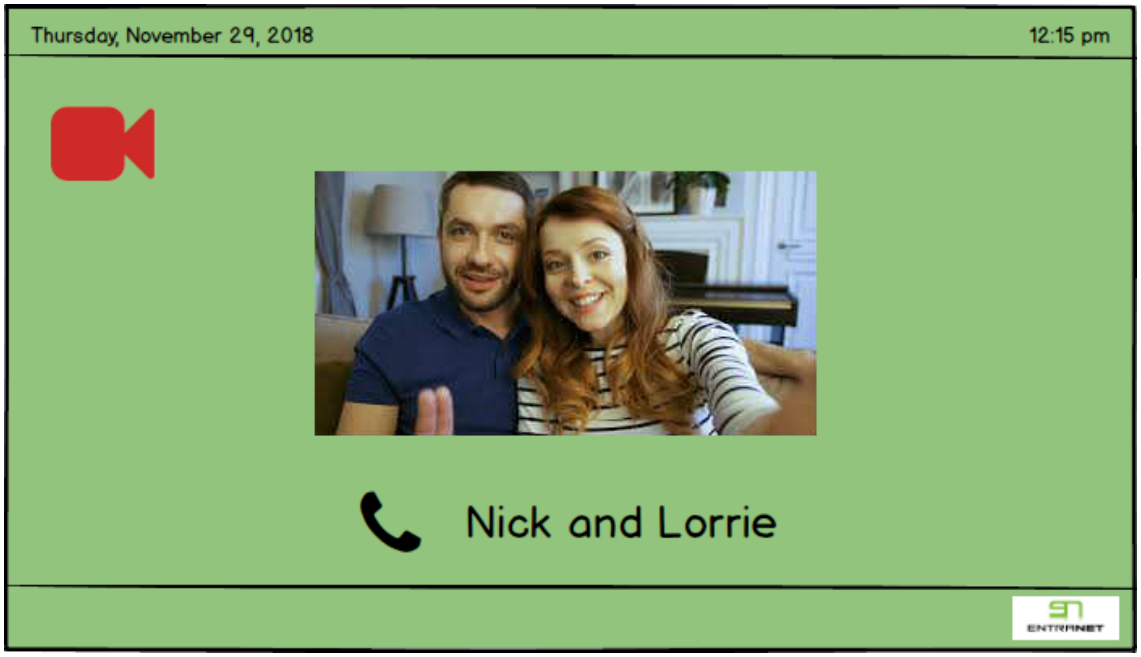



**Figure 5.5:** "Video call with patient's friends and family" screenshot

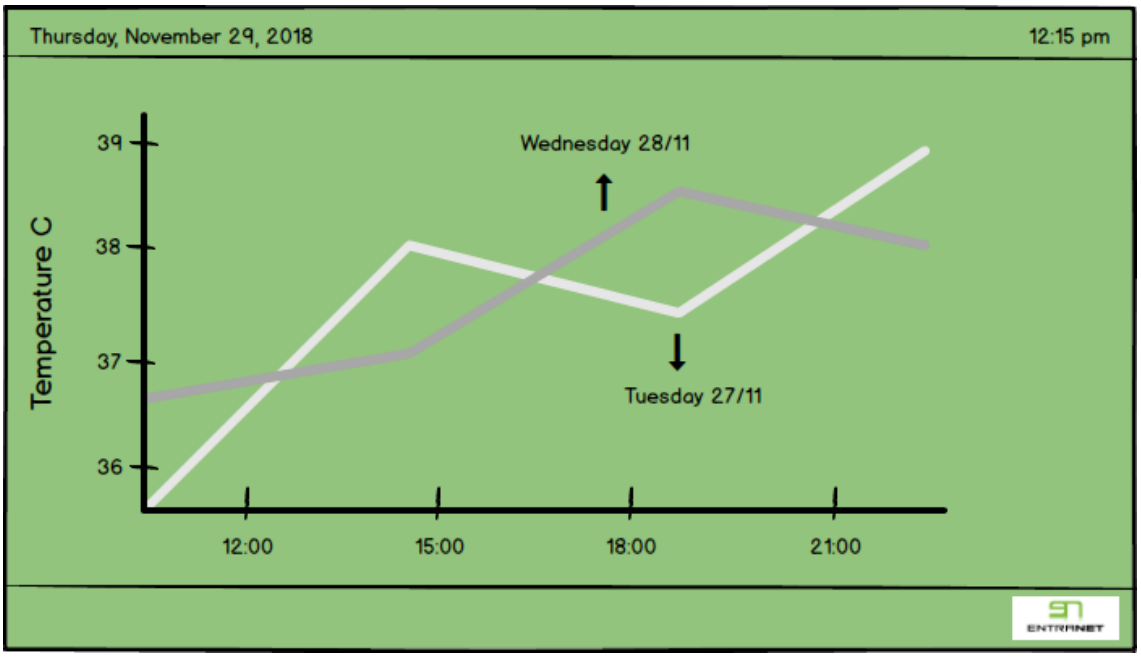



**Figure 5.6:** "Pantient's temperature chart" screenshot

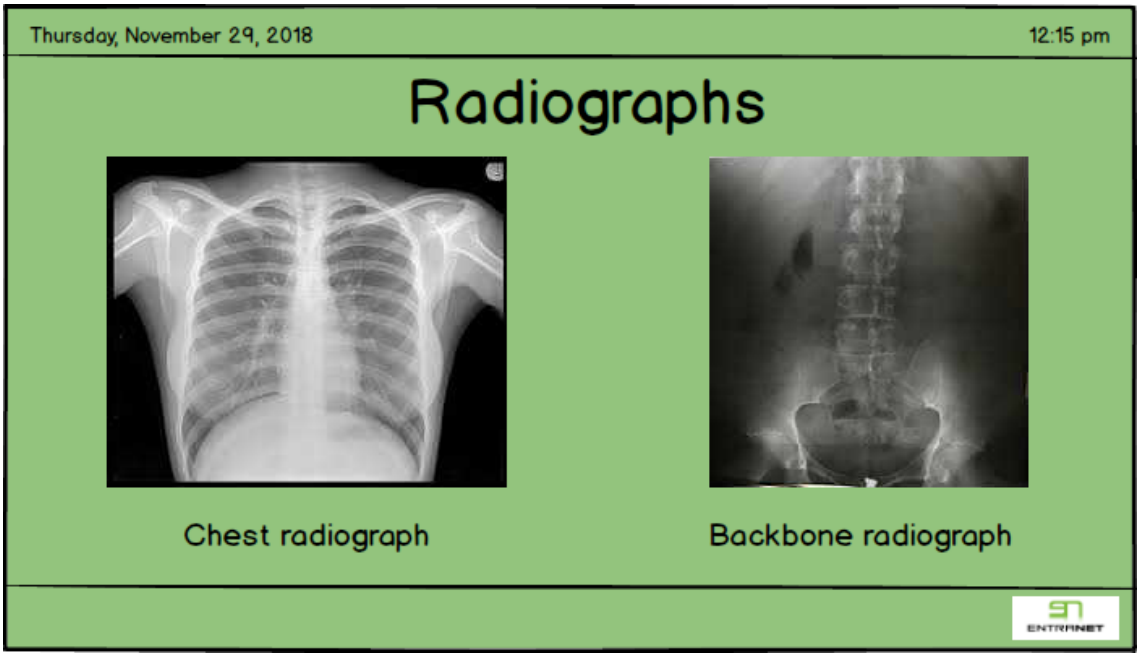



**Figure 5.7:** "Pantient's radiographs" screenshot

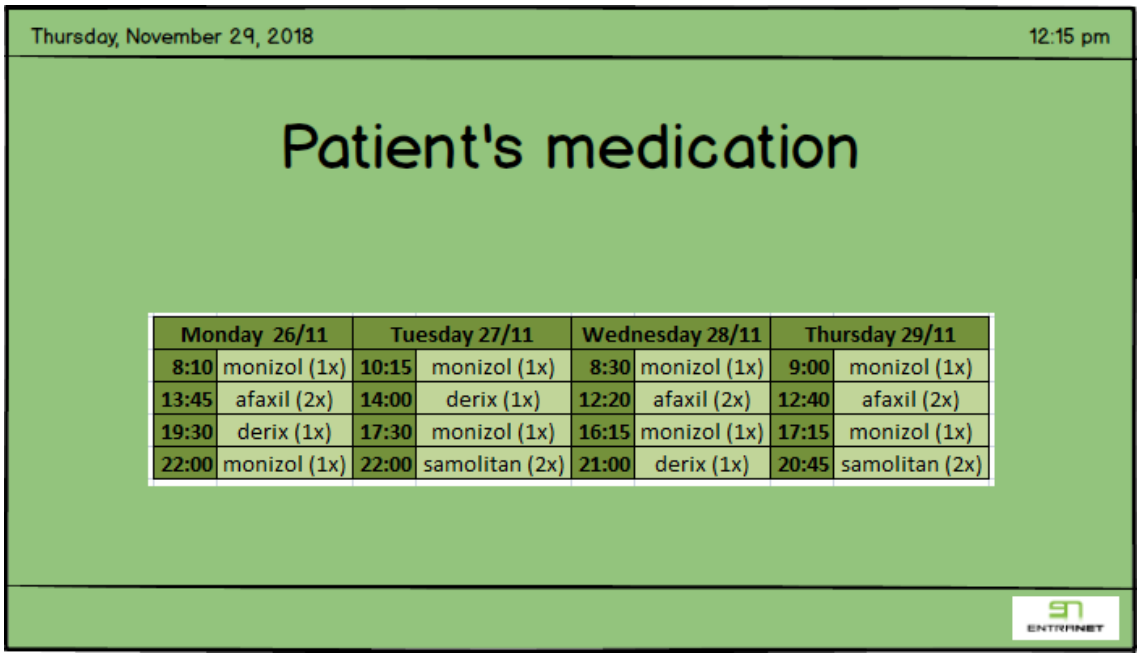



**Figure 5.8:** "Pantient's medication" screenshot

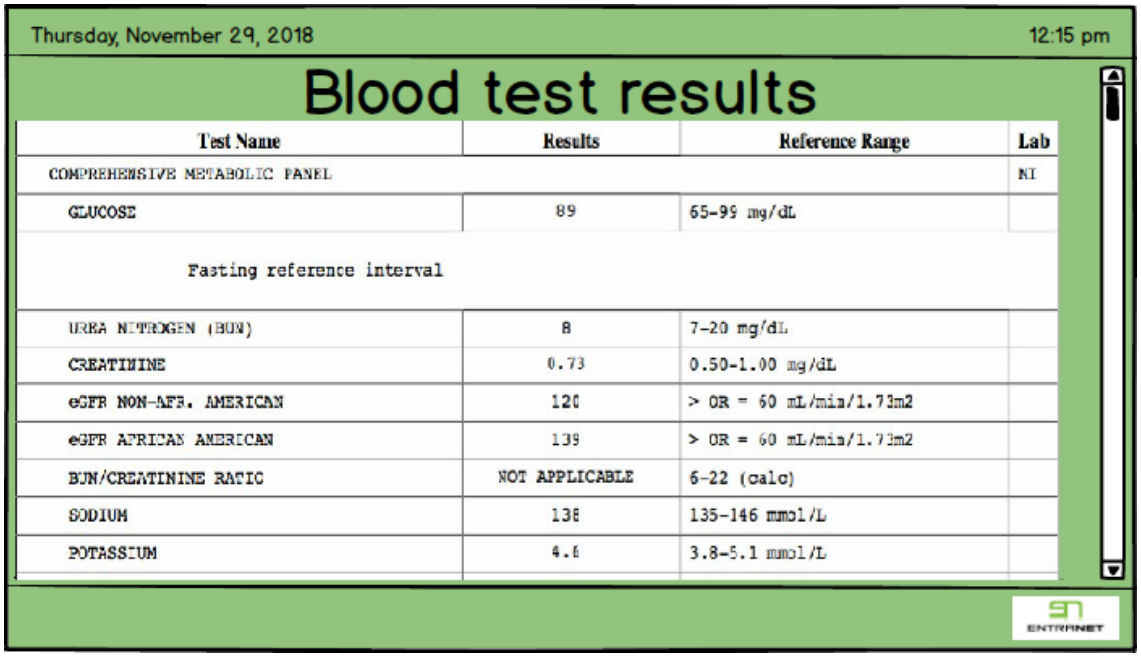
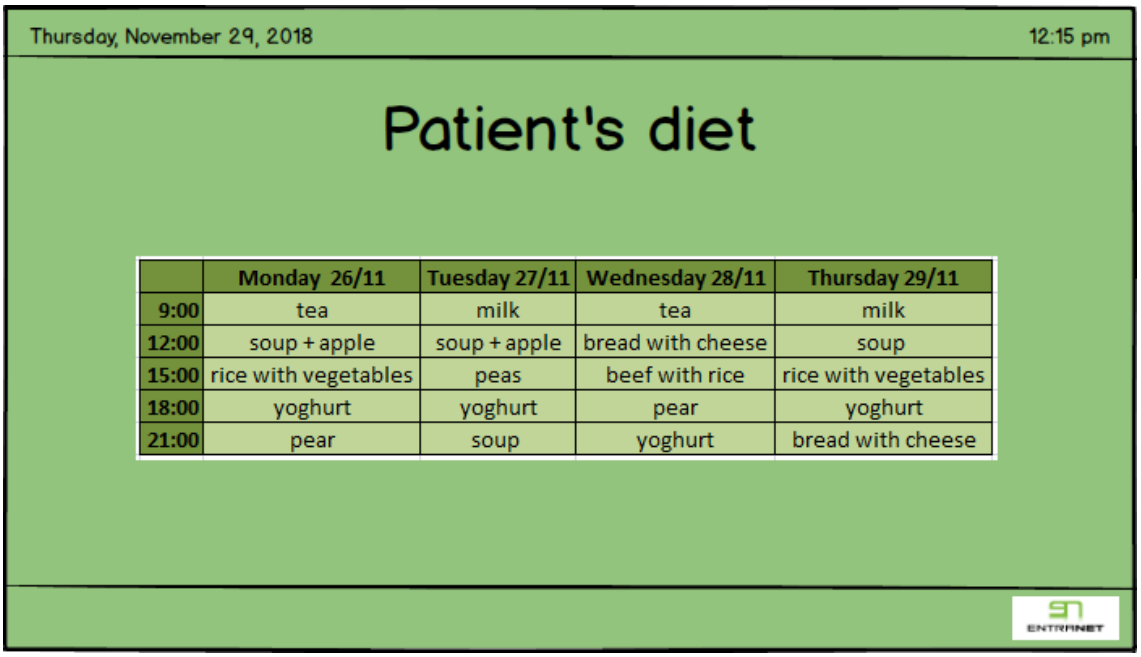



**Figure 5.9:** "Pantient's blood test results" screenshot




| | Monday 26/11 | Tuesday 27/11 | Wednesday 28/11 | Thursday 29/11 |
|---|---|---|---|---|
| 9:00 | tea | milk | tea | milk |
| 12:00 | soup + apple | soup + apple | bread with cheese | soup |
| 15:00 | rice with vegetables | peas | beef with rice | rice with vegetables |
| 18:00 | yoghurt | yoghurt | pear | yoghurt |
| 21:00 | pear | soup | yoghurt | bread with cheese |

**Figure 5.10:** "Pantient's diet" screenshot

## 5.3 Defining the value proposition

The digital assistant for health care centers is a product that aims to cover the needs and create value to multiple end users. Nurses, carers and doctors working in hospitals, rehabilitation centers and ALFs, patients or elders that are hosted in these health care facilities and people that own and manage them, are all going to benefit from using the product.

The benefits for the nurses are the following:

- The quality of their services can be improved.
- They will be able to filter what the patients want before running to their room. Check if it's something that can be done from a distance. Check if it's something that they are responsible for or if someone else is and send the relevant staff. They can save time that could be spent delivering true patient care.
- Overcrowding by visitors can be reduced and their work will be less obstructed, owing to the camera that allows patients to communicate at a distance with their loved ones.
- It is easy to use. No special skills are required.

The benefits for the doctors are the following:

- They will be independent from the nurse during the visit to the patient's room, their job will be easier.
- The product will put an end to illegible patient's cards.
- They will have easy access to useful information about the patient.
- Overcrowding by visitors is reduced and their work is less obstructed, owing to the camera that allows patients to communicate at a distance with their loved ones.

- It is easy to use. No special skills are required.

The benefits for the patients are the following:

- They will be able to talk to their loved ones anytime and for as long as they want through the camera system, without being constrained by the visiting hours.
- They will have something that will help the time pass and they won't focus on their health issues.
- They won't argue with the other patients in the room about which TV program to watch.
- They will be more independent inside their rooms.
- They will have peace of mind that in case of an emergency, help will be immediate.
- The product is easy to use, especially for elders whose vision is impaired and are not familiar with technology.

The benefits for the owners are the following:

- The staff will be more productive since the room/elder/patient check will be easier and faster.
- The product will increase the quality of the patient's life through increasing the quality of the offering services. Patients, doctors and nurses will be happy.
- It's easy for the end users to use it.
- They will be better than competitors.
- They will attract more customers and keep their rooms full.

In order to have a more clear picture of the benefits created by the product for the different actors, an example of a full life cycle use case was created. It describes various situations in a health care center, before and after the new solution is implemented.

| **Before** | **After** |
|---|---|
| The patient wants to turn the lights on. He shouts "Nurse!". The nurse comes to the room, the patient asks her to turn the lights on and she does it. | The patient wants to turn the lights on. He says "Eliza", the digital assistant avatar appears on the screen, he continues "Turn the lights on!" and Eliza does it. |
| The patient wants a painkiller. He shouts "Nurse!". The nurse comes to the room and he asks for a painkiller. The nurse goes to another room to take it and returns to give it to the patient (she visits the patient's room twice). | The patient wants a painkiller. He says "Eliza", the digital assistant avatar appears on the screen and he continues "Call the nurse!". The nurse receives the video call on the central computer, accepts it and talks with the patient. She takes the painkiller and gives it to the patient (she visits the patient's room once). |

| | |
|---|---|
| The patient wants to surf the web with his smartphone but the battery goes off. | The patient wants to surf the web and does it without being dependent on battery or constrained in the small smartphone screen. |
| The patient wants to watch a specific TV program in the common TV but the other patients either want to sleep or want to watch something else and they argue. | The patient wants to watch a specific TV program in his individual screen. He just wears his ear pads and chooses what he wants to watch. |
| The doctor visits the patients and wants to check a patient's temperature measurements. He looks for the illegible A4 page that includes them or asks the nurse to give it to him. | The doctor visits the patients and wants to check a patient's temperature measurements. He says "Eliza" and the digital assistant avatar appears on the screen. He continues "Show me the patient's temperature chart" and it is instantly displayed on the screen. |

**Table 5.1:** An example of a full life cycle use case: Before and after

## 5.4 Defining the core

Unlike most of the framework's steps that focus on the customers, this step takes a look deep inside Entranet, reaching its core. What is it that makes Entranet special compared to other businesses? How will Entranet make it difficult for future competitors to copy later on? What are the barriers to entry?

Entranet's core is that the company is always there for the customer. The product will be customized to each customer's particular needs. It will be flexible and not a ready-to-buy package. The developed voice recognition technology can understand 20 different languages and if the customer wants another language, he'll have it. Entranet is present 24/7. If the customer needs something, it doesn't matter if it's during weekend or during the night. The company will solve the problem.

As for the company's core technology, this is the exceptional algorithm that can isolate the user's voice command and at the same time reject the ambient sounds and noises. It means that the products are effective and trustworthy and that customers are always pleased with the product. Additionally, Entranet has all the know-how around the interaction between humans and technology, which is something proven by the multiple awards gained even from its first years of existence. These aspects are what put Entranet ahead of the technological competition.

## 5.5 Competition

Regarding competition for Entranet's new product idea, there is nothing like this on the market right now. There are no direct competitors. One could say that a potential competitor could be the existing smart devices combined with either Amazon echo or Google home, but the truth is that none of them offers a customized solution as easy-to-use as Entranet's. Not to mention how puzzling it is to connect all the system together

and make everything communicate with each other.

Maybe the only competitive factor is the existing situation, the ways that the various health care centers operate for now. For example, the push of the emergency button to talk with the nurse, the extended use of paper for keeping the patient's record, the patient/elder using his smartphone, having one single TV for more than two patients etc. So, it seems that the product may will swim in the blue ocean.

# How can the customer acquire the product? 6

This chapter explores who are the individuals that decide on the product purchase, maps out the process to acquire a paying customer for the product and sets the short term, medium term and long term sales cycle strategies.

## 6.1 Customer's Decision Making Unit (DMU)

At this point it is of vital importance to find out who is going to decide if the product will be purchased or not. Most of the times, it's not just one person who shapes the decision, especially in a B2B (Business-to-Business) environment. Of course there is always someone who makes the ultimate decision but there is also a group of individuals who can influence the purchasing decision and have to be convinced that the product is worth buying.

The DMU of a buying organization constitutes its buying center ([Kotler and Armstrong, 2016]). It includes all the individuals that have a saying in the purchase decision-making process such as the individuals that make the purchasing decision, the individuals who influence this decision, those who carry out the actual buying and of course the users of the product or service.

Bill Aullet recognizes two different roles in the DMU, the primary roles and the additional roles. These roles are shortly described below and applied to the case of the digital assistant for health care centers.

The primary roles in the DMU include the following:

- **Champion**: it is the individual who needs the customer to buy the product. Usually but not necessarily, the champion is the end user.
  Regarding the digital nurse, champions are the end users. Doctors, nurses, carers, patients and elders want the DMUs to make the purchase. When it comes to public facilities, managers/administrators are also the champions who want governments to approve funding and acquire the product.
- **End user**: it is the individual who is ultimately going to use the product and for whom the product will create the value described in 5.3.
  The end users of the digital nurse are doctors, nurses and carers that work in hospitals, rehabilitation centers and ALFs and also patients and elders that are hosted there.
- **Primary economic buyer**: it is the individual who makes the ultimate decision for the product purchase. It's the one whose signature makes the purchase possible.

Usually the primary economic buyer is also in charge of the budget control.
The primary economic buyers of the digital nurse for the private health care centers are their very owners. In the case of public health care centers it could be either the managers/administrators or the government. For example, if a public hospital has a budget available, it's up to the administrator if he will give money for the product purchase. If there is no budget available, then the primary economic buyer is the person from the government who is responsible for approving public funding for the hospitals.

The additional roles in the DMU include:

- **Primary and secondary influencers**: they can influence the decision-making process of the primary DMUs. The primary influencers play an important role in the decision-making process, while the secondary play a less important role.
  The secondary influencers for the digital nurse's primary DMUs are the media including newspapers, TV or online blogs that may comment that some health care centers have successfully innovated with the digital nurse that made their job easier. Such publications can influence the primary economic buyers to acquire it as well. The role of the primary influencers might be played by friends or colleagues of the end users who already have a positive experience of the product. Friends and colleagues will influence the end users and the end users will ask the primary economic buyers to come by the digital nurse.
- **Person with veto power**: this person has the ability to reject any purchase for any reason.
  A person with veto power is the person who is responsible for pubic funding approval for public health care centers. In case he thinks that GDPR issues may come up, he may use this power to avert the purchase.
- **Purchasing department**: even after the primary economic buyer has decided a purchase and signed for it, this department can block the purchasing process based on certain rules, set by the company, since their role includes minimizing costs.
  Normally, larger health care facilities have a purchasing department. On one hand, their role is to cut down costs (also validated from the interviews) and save as much money as possible. On the other hand, in order to stand out and be competitive, innovation is necessary. So, it is not expected from the purchasing departments to be a big hurdle in the sales process.

## 6.2 The process to acquire a paying customer

Having declared who is the customer and who will make the purchasing decision, it's time to plan the process to acquire a paying customer. Of course it's necessary to know who the potential customer is but the real challenge is to turn a potential customer into a paying customer and convince him to buy the product.

Having a first contact with a potential customer is not even close to actually having a paying customer. There is a distance between these two points and it is the sales cycle. The length of this cycle needs to be as short as possible so as not to waste a startup's limited resources. The longer the sales cycle, the higher the cost of customer acquisition

and the less possible to create a sustainable business.

The process to acquire a paying customer for the digital nurse includes the following steps:

- Contact the secretary of the health care center by visiting or through a phone call and ask her to contact the CEO or the pertinent manager, so as to inform him about the innovative product that will put their company ahead of their competition.
- If the secretary's answer is positive, the CEO will immediately be contacted in the way that the secretary suggests (phone call, email, face to face meeting, online meeting). If the secretary's answer is negative, the CEO will be directly contacted based on the contact information available on the website. If both phone number and email are available, the first contact will be through email and if not answered, through phone call.
- If the CEO's answer is positive, a meeting will be arranged to get in more details about the product and how it can solve the existing problems. During this meeting, a simple version of the product has to be available in order the CEO to better understand the product. In case the CEO is interested in installing the product, when it's ready, he can be asked for the permission to talk to end users working at his company in order to get constructive feedback and customize the digital nurse based on their specific needs.
- If he gives the permission to talk to the staff, short individual interviews will start right away.
- After the necessary feedback is gathered, it will be presented to the CEO and hopefully he will also sign a letter of inquiry to buy the product. After that, Entranet will write an offering form and sign it along with the purchasing decision maker.

It has to be stated that the time line of the process to acquire a paying customer for the digital nurse has to be short enough so that the product can be ready until July 2021. The reason for that is because Entranet along with its partners have been approved for funding for this product and they need to have it ready within three years starting from July 2018.

## 6.3 The sales process to acquire a customer

The next step is to shape the sales process of the product, which includes carrying out the sales, giving visibility to the new product, explaining the customer how it works and what value he gains from using it and helps the entrepreneur understand how he will enter the market. It is often broken down into three time periods: short term, medium term and long term sales channels and all three of them are described below, applied for the digital nurse.

**Short term**

The main focus of the short term sales strategy is to make the product known and create demand for it. So, it is necessary to directly interact with the customers with face to face and one-on-one presentations in order to make them understand your offer and your unique value proposition. At the same time, it's a process that can reduce uncertainty, validate what the customer really needs and learn how to proceed with the product. It's also the

beginning of the sales process, where the entrepreneur tests his business idea on the market and tries to get it moving.

The short term sales cycle for the digital nurse includes interviews with doctors, nurses, carers, physiotherapists, patients and owners or managers of public or private health care centers. The first contact with them will primarily have the intention to understand their needs, present the product and get constructive feedback to make improvements, but it's also the critical starting point of preparing the market for the product entry. Once the first prototype is ready, Entranet will be able to exhibit it at trade shows and gain visibility.

Both direct salespeople and web-based techniques will be utilized for this purpose. Direct salespeople will be hired to do that job so as to leave more precious time for the founders to cope with core operational aspects of Entranet. Furthermore, informative e-mails about the digital nurse and its benefits will be sent to other health care centers that are not very approachable.

**Medium term**

The short term sales cycle will create the necessary demand for the product, while the medium term sales cycle will focus more on order fulfillment and client management. Client management includes making sure that the existing customers are happy and trying to retain them. Entranet will of course continue the direct sales but part of the demand will be created by word of mouth. 70% of sales will be done through direct sales and word of mouth, while the rest 30% will be done through the website, since Entranet will have more time to improve the website and make it better for the customers. This 30% does not imply the purchase of the product at the push of a button since it's a B2B environment and the digital nurse is a customized solution. What it implies is that the customers will approach Entranet and not vice versa.

**Long term**

The long term sales channel will include very little demand creation (30%) mainly by participating in trade shows around the world, while most of sales (70%) will be made by customers contacting Entranet. The company's main role will be to fulfill customer orders and continue with client management to retain the existing customers.

# How can money be made off the product? 7

As of now, the end users have been defined and both the product and the value propositions have been defined. So, Entranet knows how to create value for the customers, regarding its new product, but how can this value creation be translated into a sustainable business? How can money be made off the new product?

This chapter explores a potential business model for the digital nurse, considers various pricing strategies for the product and attempts a first estimation of two really important business metrics, which are the customer lifetime value and the customer acquisition cost.

## 7.1 Business model

"A business model describes the rationale of how an organization creates, delivers and captures value" ([Osterwalder and Pigneur, 2010]). It's time to put everything together and summarize the new venture in one template called "The business model canvas". It consists of nine building blocks, which describe a company's thinking of how to make money. Below, each one of the building blocks are first described and then applied to the digital nurse's case.

**Customer segments**

This building block includes the customers that the company wants to serve. They are groups of people that will gain value from acquiring and using the product.

The people for whom the digital nurse will create value are nurses, carers and doctors who work in public or private hospitals, rehabilitation centers and ALFs, elders and patients that are hosted in them and owners or administrators of them.

**Value propositions**

It includes the value that the company or the product offers to the customers. The problem it aims to solve. The reason why customers prefer this product compared to other similar products on the market. The benefits they gain from acquiring and using it.

The main benefit that nurses and carers gain from using the product is that they can save a lot of time, time that can be spent delivering true patient care resulting in better offering services. In addition, their work is not going to be hindered by visitors, since the product may reduce the number of visitors.

It's going to be easier for doctors to check the patient's condition while visiting them

without being dependent on the nurses or paper notes. Access to information will be easier than ever.

Patients and elders become more independent inside their room, being able to control the lights or beds without the nurses' help and right when they need it. The communication with the nurse will be easier and faster than ever. They will feel their loved ones near them, since the communication with them will be easy and without time restrictions. Also, the individual TV and the internet access will definitely offer them peace of mind, since they will have something to distract them from their condition and health issue.

The owners of the private and the administrators of the public health care centers will increase the quality of the offering services, keeping both staff and customers happy, not to mention that the innovative product will make them more competitive.

**Channels**

Channels explain how a company delivers the value propositions to its customers. It's how they come in touch with the company and how they come by the product.

The customers of the new product will be able to reach Entranet either through its website and e-shop or by visiting its office space.

**Customer relationships**

This building block describes the type of relationship the company intends to establish and nurture with each different customer segment.

Entranet's relationship with its customers will be based on reliability and trust that the products will operate properly and the company's 24/7 presence. Entranet ensures that it will always be there for the customers, no matter if they need to replace or fix something at 3am on Sunday.

**Revenue streams**

It explains how the company generates revenue. How the customers are willing to pay. How the company gets money out of the customers' pockets and put them in the company's treasury.

The one-time up-front charge for the digital nurse will include the hardware sale and the software installation and use. There will also be a recurring annual fee for the server hosting service, while new services, product features or new smart devices will be charged extra.

**Key resources**

The "key resources" building block represents all these assets that are necessary for the new venture to work. These resources can be financial, physical, human or intellectual.

Entranet will need to obtain the hardware and also a warehouse or a place to store the inventory.

**Key activities**

The "key activities" building block can be compared to a to-do list with the most important actions that need to be taken in order for the whole business model to work.

What's really needed at this point is to talk to potential end users and find out their real needs so that the product features can be defined for each use case. Once these steps are done, Entranet needs to have the hardware produced and assemble it including the software, so that the final product be ready.

**Key partnerships**

Key partners are the external network of other companies, suppliers, individuals or organizations that the company needs in order to optimize its operations, reduce the risks and deliver value to the customers.

The most important partnership for the digital nurse is a hardware manufacturer that will be able to transform the product idea into a tangible product.

**Cost structure**

It includes the major costs that the suggested business model entails. Achieving the key activities, delivering value, creating partnerships or sustaining customer relationships can be costly. All of the building blocks involve costs and the most important of them are listed in the "cost structure" building block.

The main expenses for the digital nurse include the cost to build the hardware, the rent for the physical space in which the inventory will be kept and also the travel costs to reach potential customers and show them the new product.

After the description of the building blocks, the business model canvas was structured (Figure 7.1). Instead of making four different canvas' (one for each customer), only one was made, including the perspectives of all customer types. A different color was used for each one of them. So, red refers to nurses and carers, blue to doctors, green to patients and elders and orange to the owners and administrators.

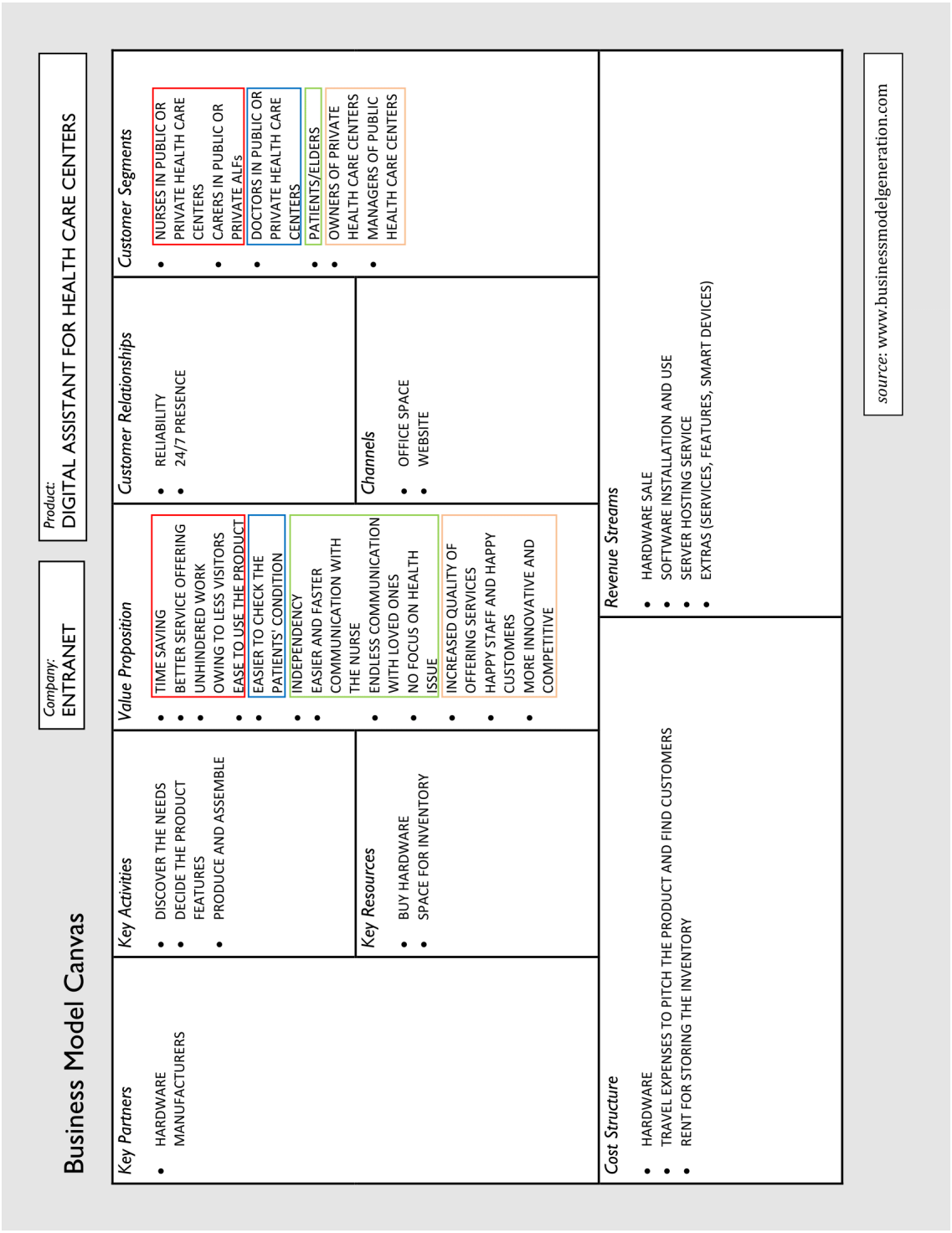



**Figure 7.1:** Business model canvas for the digital assistant

## 7.2 Pricing strategy

As defined in marketing science, "price is the amount of money charged for a product or service or more broadly, price is the sum of all the values that customers give up to gain the benefits of having or using a product or service" ([Kotler and Armstrong, 2016]). The latter version of the definition suggests that what businesses should sell to customers is

value and not price. By selling value, customers are willing to pay a higher price for a product owing to the greater value they gain.

In marketing, there are three main pricing strategies namely the customer value-based pricing, the cost-based pricing and the competition-based pricing strategy. Each of them follows a different logic and uses a different base to shape the product or service price. All three of them are discussed below in more detail.

**Customer value-based pricing**

"Customer value-based pricing is setting the price based on customer's perceptions of value rather than on the seller's cost" ([Kotler and Armstrong, 2016]). The buying process is an exchange. Customers give something of value to them, which is money, to get something of value for them, which are the benefits from having the product. This pricing strategy focuses on deeply understanding how much value the product creates for the customer and then shaping the right price that can be justified by the gained value. Value-based pricing sets the price ceiling, above which the consumer won't buy.

**Cost-based pricing**

"Cost-based pricing involves setting prices based on the costs of producing, distributing and selling the product plus a fair rate of return for the company's effort and risk" ([Kotler and Armstrong, 2016]). The total costs considered to set the product price in this pricing strategy include the fixed costs and the variable costs. The fixed costs are the ones that are stable and not dependent on the production or sales level, for example, rent, heat or salaries. The variable costs are the ones that are changeable and dependent on the production or sales level, for example, energy or raw material used for production. The sum of these two costs make up the total costs that a company wants to cover with the product price. After deciding the total costs, what happens in this type of pricing is adding a markup to these costs depending on how much profit the company wants to earn. Cost-based pricing sets the price floor, below which the company's profits suffer.

**Competition-based pricing**

"Competition-based pricing involves setting prices based on competitor's strategies, costs, prices and market offerings" ([Kotler and Armstrong, 2016]). This pricing strategy assumes that customers will assess the product's value, based on the prices of competitive similar products. It means that if the customers' value perception on the company's product is higher than on a competitive product, then the company can charge a higher price, otherwise the company has to provide the product at a lower price.

At this point it is necessary to discuss the differences between the two first pricing strategies. As shown in (Figure 7.2), cost-based pricing is product driven. It begins with designing what the company considers to be a good product, sets the price by adding the desired profit to the product costs and tries to convince buyers for the product value. Value-based pricing follows the opposite process. It begins with understanding the customer needs and value perceptions, sets the price that captures them and then designs the right product.

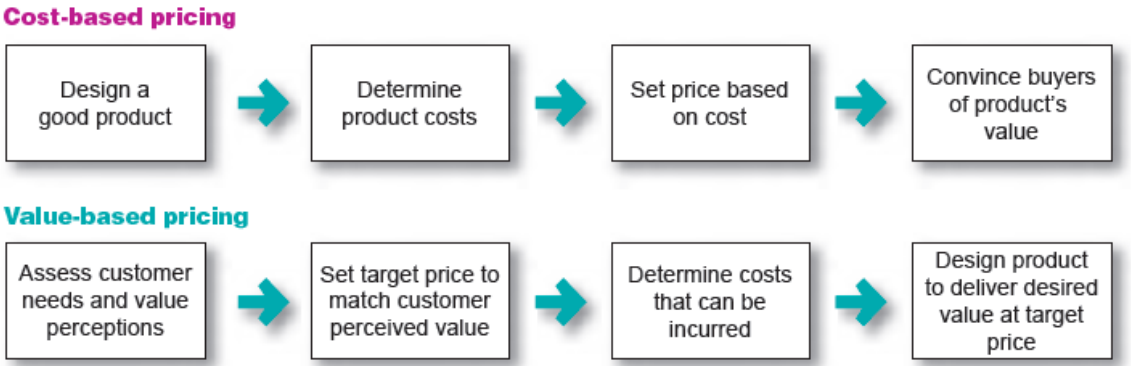



**Figure 7.2:** Value-based pricing versus cost-based pricing ([Kotler and Armstrong, 2016])

In Entranet's case, it is highly recommended that the company follows a customer value-based pricing strategy. Translating value perception into a price is an extremely difficult task, but if the validation process shows that the digital nurse is valuable to the end users, then Entranet can justify a high price. What's more, the company has already managed to set prices on other innovative products when nothing similar existed on the market then, so it can definitely do it again with the new product.

Choosing a pricing strategy for a new product is of utmost importance for any kind of business. The reason for that is the big impact the price can have on profits. But setting a correct price for your product is not an easy task. The entrepreneur should find the golden mean between attracting as many customers as possible and as much revenue as possible.

At this early stage of the digital nurse's development process, the goal of the pricing strategy chapter is not to set a price for the product but to outline the basic points that Entranet should take into consideration for putting a price on the product. These points are presented below:

- Early testers should be treated with a flexibility in pricing. These are the first customers that will give Entranet constructive feedback on the product and will help the company make necessary improvements. They need to be given a better offer and kept satisfied, because they will be beneficial to the company and spread a positive word of mouth. This pricing flexibility could mean for example, a discounted up-front charge or even a low-cost or free trial period of the product.
- Giving away the product for free, even to early testers, is a wrong move to make, since they might think that the product value is low.
- In case Entranet sells its product to someone in a lower price for some reason, an agreement should be signed from both sides that the pricing terms will be kept confidential, so that it won't allow future customers demand the same pricing for them.
- When customers are used to paying a certain price for a product, it's easy for them to accept a lower price but a lot difficult to accept a higher price. So, it is better for Entranet to start with a high price and offer discounts, when necessary, than start with a low price and increase it later.

- The pricing framework will probably keep on changing in these early stages, while Entranet will be experimenting and getting feedback from the market.
- As production increases, the average cost per unit decreases. This means that the bigger the order for the digital nurse, the lower the production costs.

No matter which pricing strategy Entranet will follow and what price will put on the product label, it has to ensure that customers will gain superior value for the chosen price.

## 7.3 The Lifetime Value of an acquired customer

The lifetime value of an acquired customer or LTV is a crucial point in the business development process that allows the entrepreneur to check the viability and sustainability of the business. Simply put, the LTV is the expected total revenue from an individual customer, discounted the cost to return money to the investors over time. Along with the LTV calculation, comes the cost of customer acquisition or COCA. Both of them have to be estimated and compared in order to determine how viable the business is. The goal is to minimize COCA and maximize LTV at a point where the ratio between LTV and COCA is at least 3:1 ([David Skok, 2012]). According to Bill Aulet, the reasons why the LTV has to be substantially higher than the COCA are the following:

- The COCA doesn't incorporate business costs such as administration, product development or finance.
- Despite all the efforts of an entrepreneur to make realistic calculations of the LTV and COCA, the results are usually overoptimistic.
- Things do not always go as planned owing to internal or external factors such as an economic recession, product delays or competitive reaction.

Due to the above mentioned points, the 3:1 ratio acts as a safety net to make sure that the new venture is viable and to improve the odds of a sustainable business.

For the calculation of the LTV, a handful of variables are considered. All of them are explained below in general terms and particularly for the case of the digital nurse, as well.

**Time period**

The time period for which the LTV for the digital nurse is calculated, is five years. According to Bill Aulet, "when projecting more than five years out, the compounded cost of capital for a startup is so high that it negates what value your customer provides you beyond five years".

**Revenue stream: Screen and smart devices**

This is a one-time revenue stream, since the customer will be charged up-front to purchase the screens and the smart devices that will communicate with the screens and also the installation and the software that will support the system.

**Life of product**

Regarding one-time revenue streams, the product life is the time period that the product is expected to last before the customer will order a new one to replace the old one or

discontinue the product use. As explained below, in case of Entranet, a five-year period is selected.

**Price per customer**

This is the price that one customer will pay for his first purchase of the product. It is expressed in DKK/customer.

$$\text{Price per customer} = \text{Units per customer x Price per unit}$$

The price per product is always correlated with the order volume. Since the digital nurse will not be a shelf product but a B2B product, the larger the order, the lower the price and vice versa. On the contrary, no matter if the customer needs 5 or 100 products, the infrastructure and installation costs are the same. According to Entranet's rough estimations, for an average order of about 40-70 products per customer, the product price will be shaped around 8.953 DKK. The detail in this price and all the prices that will follow in the LTV calculation chapter, emanates from the currency conversion (from Euros to DKK).

An average order of 55 units per customer is selected and the price per customer is calculated as follows:

$$\text{Price per customer} = 55 \text{ x } 8.953 = 492.415 \text{ DKK}$$

Since the various pricing strategies have been discussed earlier in this chapter, an issue to declare here, is how the price of 8.953 DKK was defined. Entranet has not set a price for the digital nurse yet because it's too soon for the company to know the value it will create to the end users. Regarding new products like this, it's almost impossible for the creator to know the price beforehand. The price used in the calculation above for the digital nurse was provided after a lot of insistence, so that the LTV could be estimated. The company used the cost-based pricing strategy to calculate this price, but again this is a rough estimation just for this project and the final price may differ significantly. The same goes for all the numbers that the company shared for this project such as the gross margin.

**Next product purchase rate (beyond year 0)**

Regarding one-time revenue streams, the next product purchase rate is the percentage of customers that will repurchase a product to replace the existing one when its life has come to an end and it can no longer be used. It's actually the percentage of customers that will be satisfied with the digital nurse. It can be assumed that this rate will be 75% for the digital nurse, leaving a 25% for the customers who may be not completely satisfied with the product or in case competitors enter during these five years and customers may want to also try the competitive product. It is considered 75% for both revenue streams.

**Gross margin**

Normally, it is the price of an individual product minus the production cost of an

individual product but it is often expressed as a percentage of the final price. This cost does not include R&D or sales and marketing costs.

$$\text{Gross margin} = \text{Price - Production cost}$$

Since both price and production costs can be hardly estimated, gross margin is estimated as a percentage for both revenue streams. Considering the great value that the product is expected to offer to the end users and based on Entranet's rough estimations, the gross margin could fluctuate between 35% and 50% for both revenue streams. An average price of 42,5% is selected for the calculations.

**Profit**

It is the price of each revenue stream, multiplied by the gross margin for each year. It is expressed in DKK per customer.

$$\text{Profit} = \text{Price x Gross margin}$$

Regarding the recurring fee annual profit, the yearly fee and gross margin are also multiplied by the retention rate.

**Revenue stream: Server hosting fee**

This is a recurring revenue stream, which includes an annual fee for the server hosting service.

**Price of yearly fee**

It is the amount of money that each customer will pay for a year of service expressed in DKK per customer per year. According to Entranet's rough estimations, there will be a recurring annual fee of about 224 DKK - 1.119 DKK per product per year. Choosing an average price of 672 DKK, the average yearly fee for one customer is:

$$\text{Price of yearly fee} = 672 \text{ DKK x } 55 \text{ beds} = 36.960 \text{ DKK}$$

**Retention rate**

Expressed in a yearly rate, the retention rate is the percentage of customers that keep on paying the recurring fee for a product. It is possible that customers break the contract before the end of the recurring fee period and this is something that should be considered when estimating the retention rate. Because of that, the retention rate for the digital nurse is estimated to be lower than 100% and at 80%, leaving a 20% as a safety factor. Of course, the retention rate for year 0 is 100% as all of the customers will pay the first year's fee in order to use the product.

**Sum of profits**

It is the sum of profits across both revenue streams per year, expressed in DKK per customer.

**Cost of capital rate**

It is how much it costs an entrepreneur to get funding from investors, in form of equity or debt and is expressed as a yearly rate. Investors use it in order to decide whether the return for their investment is worth the risk they take. It is the minimum return that investors expect for funding a startup and regarding the digital nurse, it is 5%.

**Present value above cost of capital**

This is the reduced profit per year owing to the interest rate that investors put in their investment for the startup and is expressed in DKK per customer. The following formula is used to calculate the present value:

$$\text{Present value} = \text{Profit x (1 - Cost of capital rate)t},$$

where t = number of years after year 0

**Net present value of profits**

That's actually the LTV expressed in DKK per customer. It's the sum of all present values above cost of capital from year 0 to year 5.

The following table (Figure 7.3) includes the above-mentioned variables with the prices regarding the digital nurse.

| DKK | Year 0 | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|---|
| **Revenue stream: Screen and smart devices** | | | | | | |
| Price per customer | 492415 | | | | | 492415 |
| Next product purchase rate (beyond year 0) | | | | | | 0,75 |
| Gross margin | 0,425 | | | | | 0,425 |
| Profit | 209276 | | | | | 156957 |
| **Revenue stream: Server hosting fee** | | | | | | |
| Price of yearly fee | 672 | 672 | 672 | 672 | 672 | 672 |
| Retention rate | 1 | 0,8 | 0,8 | 0,8 | 0,8 | |
| Next product purchase rate | | | | | | 0,75 |
| Gross margin | 0,425 | 0,425 | 0,425 | 0,425 | 0,425 | 0,425 |
| Profit | 285,6 | 228,5 | 228,5 | 228,5 | 228,5 | 214,2 |
| | | | | | | |
| Sum of profits | 209562 | 228,5 | 228,5 | 228,5 | 228,5 | 157171 |
| Cost of capital rate | 0,05 | 0,05 | 0,05 | 0,05 | 0,05 | 0,05 |
| Present value above cost of capital | 209562 | 217,1 | 206,2 | 195,9 | 186,1 | 121616 |
| Net present value of profits (LTV) | **331984** | | | | | |

**Figure 7.3:** LTV calculation in DKK

So, the LTV of an acquired customer through the first 5 years, is expected to be around 331.984 DKK. In Appendix B the same table can be found, expressed in Euros/customer.

## 7.4 Cost of Customer Acquisition (COCA)

After the calculation of LTV, it's time to calculate the cost of customer acquisition or COCA. COCA is the cost associated with a company's effort to convince a consumer to purchase its product or service ([Margaret Rouse, March 2010]).

COCA is based on the sales process and it varies over time following the sales process changes. Aulet suggests the COCA calculation over the short term, medium term and long term that will allow the entrepreneur to watch how it's trending over time. A typical way to distinguish the three periods is to find one COCA for the first year of sales, one for the second and third year of sales and one for the fourth and fifth year of sales. After the calculation of the three above-mentioned costs, the COCA graph should look like the one in Figure 7.4. The vertical axis represents the COCA and the horizontal axis represents time. COCA should decrease over time.

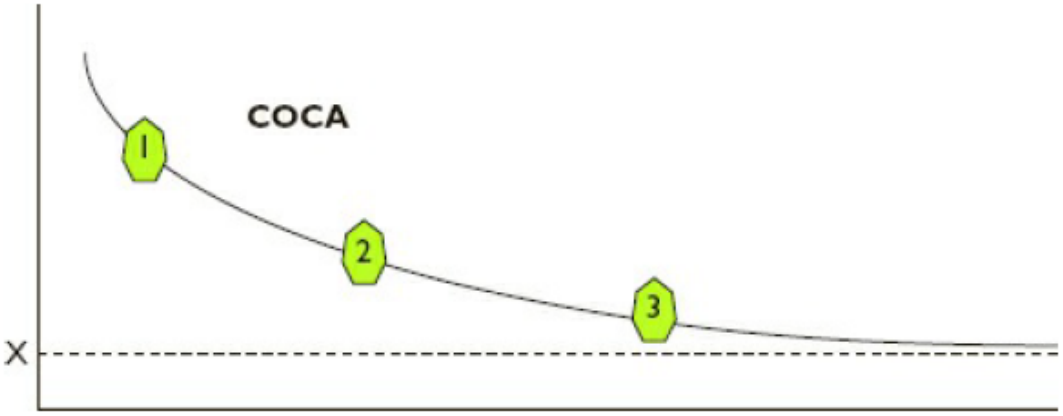



**Figure 7.4:** The COCA curve over time
([Aulet, 2013])

COCA can be calculated as follows ([Aulet, 2013]):

$$COCA(t) = \frac{TMSE(t) - IBSE(t)}{NC(t)}, where:$$

- t: the time period for which the COCA is calculated.
- COCA(t): the cost of customer acquisition for each time period expressed in DKK per customer.
- TMSE(t): the total marketing and sales expenses for each time period expressed in DKK. It has to be declared that TMSE do not include other expenses apart from sales and marketing, for example, R&D or administration costs. Sales and marketing key costs include mobile phone bills, internet data charges, trade show expenses, travel, entertainment, consultants, technical sales support, sales representatives, marketing campaigns etc.
- IBSE(t): the install base support service for each time period expressed in DKK. This is the cost of retention of existing customers and it is subtracted from the TMSE

only when IBSE is an appreciable part of it. Regarding the digital nurse calculations, the IBSE is considered negligible.

- NC(t): the number of new customers for each time period, that the company will close a deal with. These are the actual customers that will receive the product and pay money to the company.

As explained earlier in this chapter, both LTV and COCA are very important metrics for a startup. They have to be calculated and compared in order to make the company's sustainability potential more transparent. A typical LTV-COCA chart for a sustainable business, normally looks like the one in Figure 7.5. It is logical that at the beginning of the sales process COCA is higher than the LTV and over time LTV increases, while COCA decreases until it's not just less that the LTV but a lot less than it (remember the 3:1 ratio). An issue of utmost importance here, is how long it will take until the COCA equals and drops below the LTV or else how long it will take the business to be cash-flow positive. The red area represents this money loss.

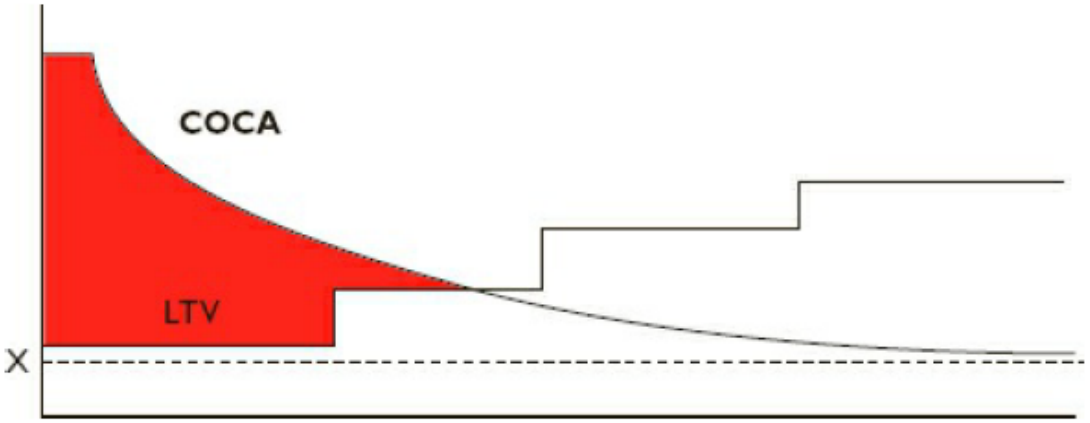



**Figure 7.5:** The LTV-COCA chart
([Aulet, 2013])

Quantifying the sales and marketing costs and calculating COCA is an arduous task and an accurate COCA estimation is extremely hard, since there will be a lot of assumptions when choosing the sales and marketing costs. For that reason, two different approaches were chosen in order to estimate the COCA for the digital nurse. The first one, takes into consideration the 3:1 ratio, meaning that LTV$\geq 3COCA$, and suggests what the maximum COCA should be within the five-year period.

$$\text{LTV} \geq 3COCA \Longrightarrow COCA \leq \text{LTV}/3 = 331.984/3 = 110.661 \text{ DKK (14.820 Euros)}$$

This means that the maximum amount of money spent to acquire one customer should not exceed the price of 110.661 DKK for the 5-year period. Otherwise, Entranet risks eliminating the chances of creating a sustainable business with the digital nurse.

The second approach, tries out an actual COCA calculation by estimating the sales and marketing costs and using the COCA formula presented above. Three different scenarios

were created (Figures 7.6,7.7,7.8). All three of them have the same marketing and sales budget and what differentiates them from one another, is the number of new customers. The range of the prices used, was chosen after a research for each key item. But still, it is stated again that these prices may differ significantly from the real prices in the future.

| Scenario 1 | | | |
|---|---|---|---|
| **Marketing and sales items** | **Year 1** | **Years 2 and 3** | **Years 4 and 5** |
| Number of salespeople | 1 | 1 | 1 |
| Salespeople salary | 71712 | 143424 | 143424 |
| Tech support salary | 62748 | 125496 | 125496 |
| Travel | 74700 | 149400 | 149400 |
| Entertainment | 37350 | 74700 | 74700 |
| Trade shows | 67230 | 134460 | 134460 |
| Consultant | 8964 | 0 | 0 |
| Communication | 5229 | 10458 | 10458 |
| Total | 327933 | 637938 | 637938 |
| | | | |
| Number of customers | 1 | 3 | 5 |
| **COCA (DKK/customer)** | **327933** | **212646** | **127588** |

**Figure 7.6:** COCA scenario 1

| Scenario 2 | | | |
|---|---|---|---|
| **Marketing and sales items** | **Year 1** | **Years 2 and 3** | **Years 4 and 5** |
| Number of salespeople | 1 | 1 | 1 |
| Salespeople salary | 71712 | 143424 | 143424 |
| Tech support salary | 62748 | 125496 | 125496 |
| Travel | 74700 | 149400 | 149400 |
| Entertainment | 37350 | 74700 | 74700 |
| Trade shows | 67230 | 134460 | 134460 |
| Consultant | 8964 | 0 | 0 |
| Communication | 5229 | 10458 | 10458 |
| Total | 327933 | 637938 | 637938 |
| | | | |
| Number of customers | 4 | 11 | 19 |
| **COCA (DKK/customer)** | **81983** | **57994** | **33576** |

**Figure 7.7:** COCA scenario 2

| Scenario 3 | | | |
|---|---|---|---|
| **Marketing and sales items** | **Year 1** | **Years 2 and 3** | **Years 4 and 5** |
| Number of salespeople | 1 | 1 | 1 |
| Salespeople salary | 71712 | 143424 | 143424 |
| Tech support salary | 62748 | 125496 | 125496 |
| Travel | 74700 | 149400 | 149400 |
| Entertainment | 37350 | 74700 | 74700 |
| Trade shows | 67230 | 134460 | 134460 |
| Consultant | 8964 | 0 | 0 |
| Communication | 5229 | 10458 | 10458 |
| Total | 327933 | 637938 | 637938 |
| | | | |
| Number of customers | 6 | 20 | 30 |
| **COCA (DKK/customer)** | **54656** | **31897** | **21265** |

**Figure 7.8:** COCA scenario 3

The following charts show how the different COCAs are trending over time (Figures 7.9,7.10,7.11).

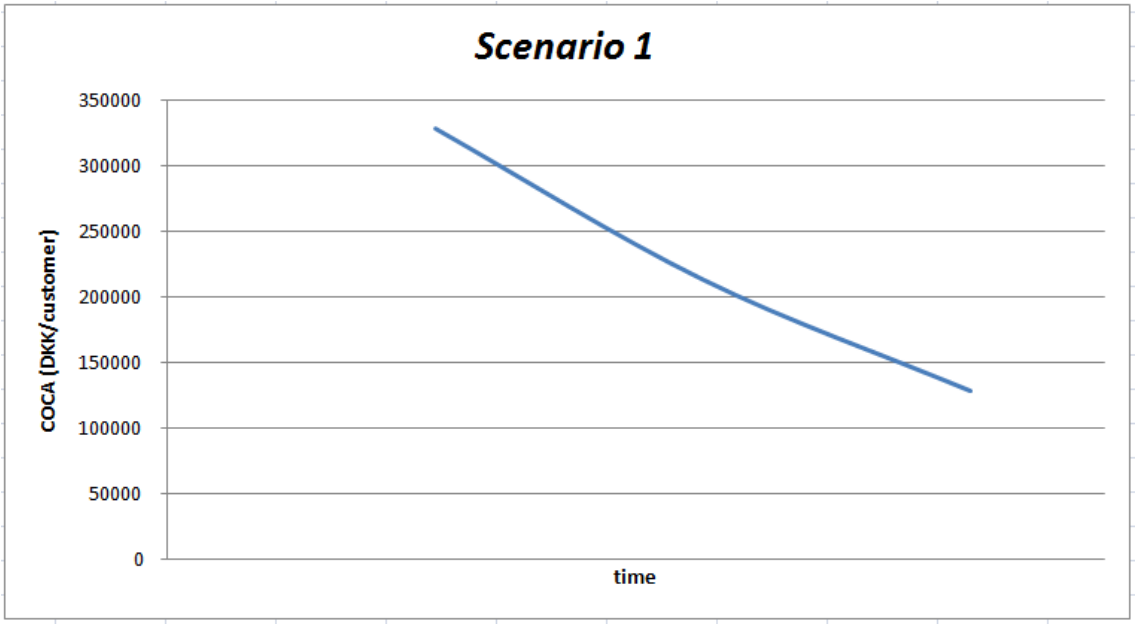



**Figure 7.9:** COCA scenario 1 chart

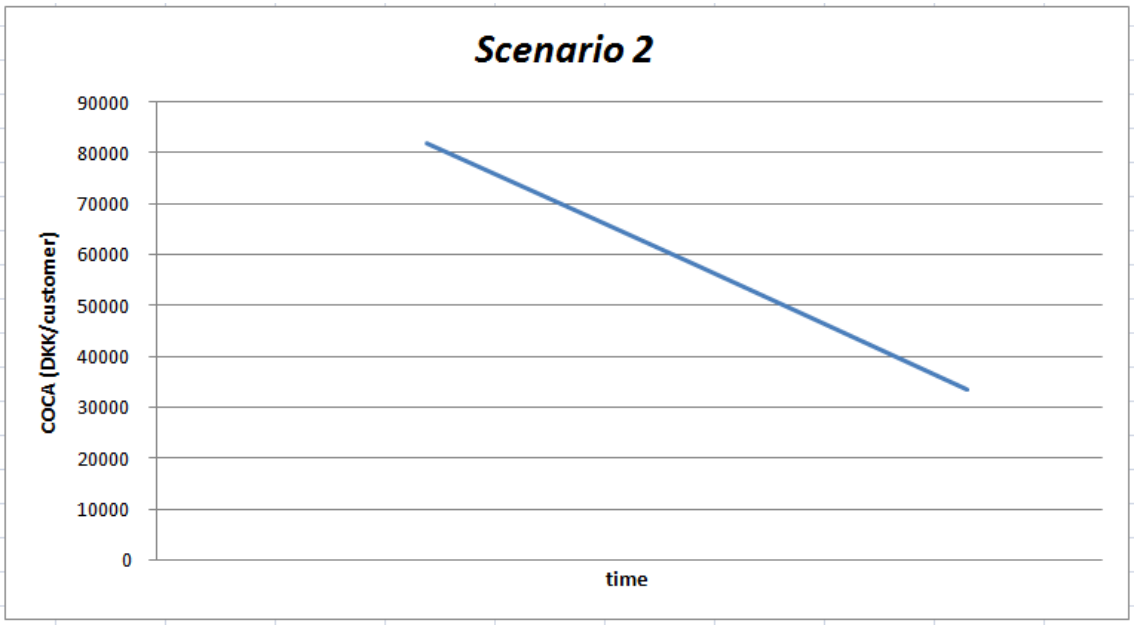



**Figure 7.10:** COCA scenario 2 chart

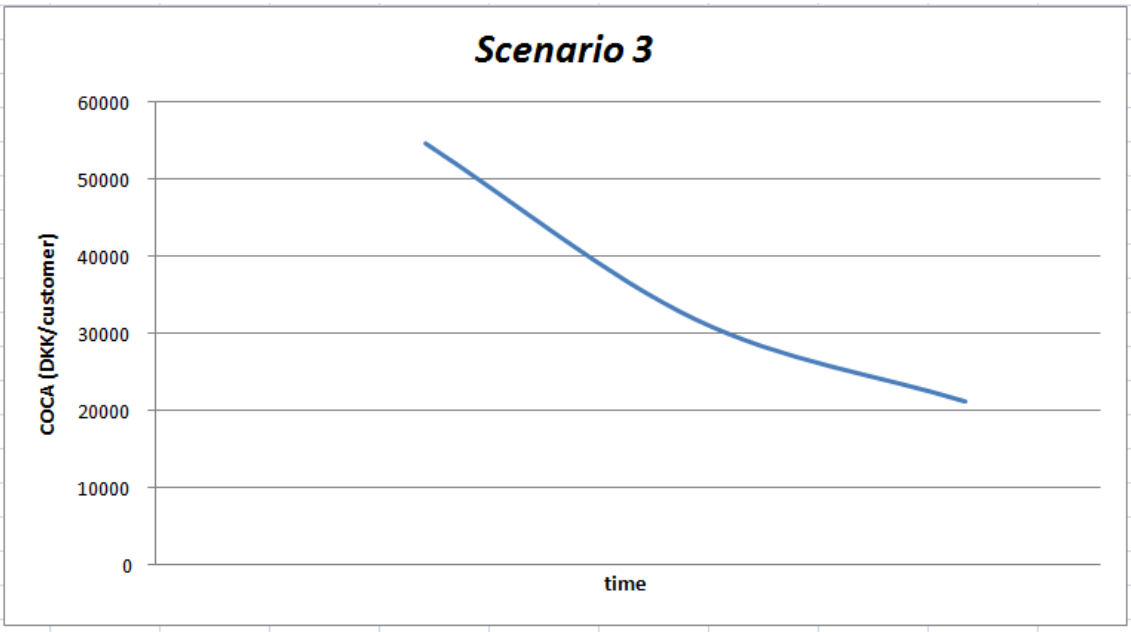



**Figure 7.11:** COCA scenario 3 chart

The fact that they are decreasing over time is a good indicator of a sustainable business but they also have to be compared to the LTV. This is done in the following table (Figure 7.12):

| DKK | Scenario 1 | Scenario 2 | Scenario 3 |
|---|---|---|---|
| COCA FOR YEAR 1 | 327933 | 81983 | 54656 |
| COCA FOR YEARS 2 and 3 | 212646 | 57994 | 31897 |
| COCA FOR YEARS 4 and 5 | 127588 | 33576 | 21265 |
| COCA FOR ALL 5 YEARS | 668167 | 173553 | 107817 |
| LTV FOR ALL 5 YEARS | 331984 | 331984 | 331984 |
| **LTV:COCA (ratio)** | **0,50** | **1,92** | **3,08** |

**Figure 7.12:** LTV-COCA ratio calculation

It is obvious that the most realistic scenario for the number of new costumers (scenario 1) fails to prove that the digital nurse is a sustainable new venture. The only scenario that barely complies with the 3:1 ratio, is the third one (scenario 3), but it is overoptimistic. This means that Entranet should focus on decreasing the digital nurse's customer acquisition cost and increasing its LTV. The way to do it is by making critical changes in the factors that are considered for their calculation. Otherwise, the company can keep LTV as it is and try to go on without surpassing the maximum COCA.

This is why both LTV and COCA are two very important metrics in the business

development process of a startup. They help the entrepreneur realize the problematic issues early in the process and take action before it's too late.

The same COCA calculations in a similar table but expressed in Euros/customer can be found in Appendix B.

# How can the product be designed and built? 8

This chapter includes the important validation process of this project, which is the empirical work carried out throughout this academic year, including the results of the research and the answers to the project objective.

## 8.1 Methodological approach for validation

As explained in the Methodology chapter, the lean startup approach was chosen to be applied for the core of the project, which is the validation of Entranet's new concept.

The validation process in this project consists of one complete implementation of the Build-Measure-Learn feedback loop and follows the below mentioned steps:

- List the things that need to be learned.
- Identify the key assumptions.
- Build the Minimum Viable Product (described in 8.5).
- Test the key assumptions.
- Present the outcomes of the experiments and decide whether to pivot or persevere.

At this point, it is necessary to refer to the data collecting methods used for this project ([Pawar, 2004]). The first method is observation. It includes collecting data by observing observable phenomena. The type of observation used is unstructured observation, which is a purposeful, open and flexible observational approach. This method requires a lot of patience, flexibility and writing the results with focus on selecting the purpose-relevant data.

The second method is interviews. Two individuals are needed: the interviewer and the respondent. The interviewer asks questions and the respondent gives answers. The interviewer records the answers using a voice recorder, video recorder or even by keeping notes. Face-to-face interviews took place for a better interaction. Semi-structured interviews were chosen because they allow the researcher not only to ask the prepared questions but also ask potential other relevant questions in order to attract useful additional information. It is a more flexible process where the researcher can modify or add new questions and gather necessary feedback that would otherwise be missed.

The third method is secondary data. The relevant sub-chapter is called "Preliminary validation", where data are collected from secondary sources like the internet, journals, books, articles or newspapers. Secondary data are data collected by others.

Another method taken into consideration was questionnaires. It is a very popular method for conducting surveys and collecting data. It is an impersonal process, where only the respondents are needed and there is no interviewer. Although it seems an easy process, a lot of attention has to be given in forming the questions in the right way, so that the answers will be useful, serving the purpose of the survey.

In this project, questionnaires were excluded from the data collecting methods owing to the negative experience from the first two semester projects, where surveys with questionnaires took place. One reason for this is that most of the people, who the questionnaires were sent to, ignored it. Only close friends of the group members replied, which means that the number of the respondents was inadequate to draw conclusions from.

What is more, when forming the questions there is a big dilemma: one one hand, the researcher wants to include open questions to get more complete answers but on the other hand, the researcher wants closed questions in order to convince the respondent that answering them will not take a lot of his/her time. Keeping that balance is extremely difficult.

Another reason is that it is not an active method to follow. Preparing and sending the questionnaires does not guarantee the researcher that he will receive answers. It's a risky method. It's like crossing your fingers and hope that somebody will respond.

## 8.2 Preliminary validation

Before implementing the Lean Startup methodology, it is useful to do a short secondary market research that can reinforce and complement the core validation of the product. Secondary market research is "information obtained from market research reports and from indirect sources like the Internet or analyst reports" ([Aulet, 2013]).

An important part of the secondary market research are the data presented in the "Introduction" chapter. All the data and sources regarding the various needs in health care sector and the emerging voice recognition technology serve as preliminary validation of a digital assistant in health care.

Other indicators that validate the interest and need for the digital nurse are the collaborations that Entranet has managed to create so far. The company has already talked with:

- a care home for elders in Thessaloniki. An offer was made and the customer is waiting to be approved for public funding in order to install the system in the care home and close the deal.
- a private rehabilitation center in Thessaloniki, which is going to put the digital nurse in some of the patients rooms, when the product is ready.
- the biggest private health care provider in Greece, who showed great interest in the product.
- members of the World Health Organization in Geneva, Switzerland, who also seemed excited about the idea.

## 8.3 Things to learn

The first step in the validation process is to clarify what needs to be learned. It's the foundation of the whole validation process, that defines the next steps. The Minimum Viable Product, the key assumptions and the experiments are all designed and based on the things that need to be learned.

The digital nurse is an innovative product and nothing similar exists on the market right now. That's why it is crucial to validate that end users would use it, DMUs would buy it and discover why they would use and buy the product.

In no particular order, the list of the things that need to be learned through the first validation round are the following:

- if the owners of health care centers are interested in the product
- if the owners of health care centers are willing to buy the product
- if doctors and nurses are interested in the product
- if patients like the product idea
- if doctors, nurses and patients would use it
- the reason why the owners would buy it (value for them)
- the reason why patients, nurses and doctors would use it (value for them)
- if patients would prefer a health care center that uses the digital nurse compared to a normal one that doesn't
- if owners, nurses and doctors show resistance to change
- if the suggested product features fit the needs
- what are the different needs in different health care centers (hospitals, rehabilitation centers, ALFs)
- what new product features could fit the different needs
- how people feel when talking to a machine

Of course, any additional information or idea gathered from feedback that can be beneficial to the whole development process, is more than welcome.

## 8.4 Key assumptions

Now that it's clear what knowledge needs to be gained from the validation round, the key assumptions need to be identified. Based on the market research and logic, hypotheses are made on the desired outcomes of the validation process. Hypotheses that if proven to be right, then the probability of a sustainable product and business increases.

The most important key assumptions for the digital nurse have been prioritized and are presented below:

1. Patients, nurses, doctors and owners find the product useful.
2. All of them like the suggested features.
3. Patients would use the new product because they would be able to communicate with the nurses quickly and have something to help their time pass.

4. Nurses/carers would use the new product because they could do their job better and would be able to filter patients' calls before running to their rooms.
5. Doctors would use the new product because they could do their job better and they would be able to have the patient's health card available on a screen during their visit to the patient's room, without needing the nurse's help.
6. Owners would buy it because they want to upgrade their services and become more competitive.
7. Doctors and nurses/carers would use it if they had it and they have no problem talking to a machine.
8. Patients would choose a health care center with the digital nurse over others that don't and they have no problem talking to a machine.
9. All of them would add more features to solve more of their needs.
10. The owners are willing to purchase the new product.
11. Staff and owners will not show resistance to change.

Normally, a complete Build-Measure-Learn feedback loop is used to test a single hypothesis. A limitation of Entranet's case is that more than one hypothesis is tested in one feedback loop. The reason for that is that it is possible to test them simultaneously without hindering the validation process. Testing more than one hypothesis at a time helps you gather valuable information and save precious time.

## 8.5 The Minimum Viable Product (MVP)

Once the key assumptions are identified, it's time for the MVP to be designed and built. The MVP is the simplest version of a product that can cause users' and customers' reactions. It is built with the minimum amount of time, money and effort in order to test the key assumptions and receive useful feedback. The logic behind the MVP is that "any additional work beyond what is required to start learning is a waste"([Ries, 2011]).

The MVP has a lot of versions. Depending on the product type and the feedback that needs to be extracted, the MVP can be a ready-to-sell-product, a video explaining how the product works, a presentation, a mock-up, a story board or a simple brochure.

Three different MVPs were created in order to receive the desired feedback from the end users and DMUs.

A Powerpoint presentation was created by Entranet, including all the necessary information about the company, its main product and the new product. This presentation was mainly created for the interviews with the owners of the health care centers, so that they become familiar with the company, its philosophy and products. It was presented to them before the interviews so as to prepare them for the following discussion and it was also presented during the interviews with the end users.

A story board was created, including the mockups presented in 5.2. The story board depicts the interaction between the end users and the product (Appendix C). It shows what appears on the touch screen depending on what they want to do with it. The mockups were created by using Balsamiq software. The story board was shown to the end

users after explaining what the product is about.

A brochure (one-pager) was created to be sent to the owners of the health care centers in order to attract their attention and shortly describe the concept and to some of the end users before the face-to-face interviews. The one-pager shortly introduces Entranet and the benefits created by the product use for all the different actors (Appendix C). A variation of this one-pager was also used for the third semester's SWN.

## 8.6 Key assumptions testing

Actions speak louder than words. All the previous steps are really important and necessary but they are just words on the paper. At this point, actions are taken and key assumptions are tested. Experiments have to be designed in order to gather empirical data that will either validate or refute the key assumptions. As Steve Blank phrased it, entrepreneurs should "get out of the building", start talking to the potential customers and learn from them.

These actions are part of the primary market research, which is defined as "information gained by talking directly with, interacting directly with, and directly observing customers and potential customers" ([Aulet, 2013]). The experiments used to test the key assumptions for the digital nurse include three stages.

The first one is primary observational research. What a better way to start realizing the customers' pain points than observing their ongoing behaviour in real time?

Primary observational research or participant observation or ethnography or fieldwork are four different expressions to describe the same thing: "spending long periods watching people, designed to see how they understand their world" ([Clive Seale, 2004]). The process aims to help the researcher understand what the participants think, how they think, why they do what they do, what makes them happy, what irritates them, what they enjoy, who they fear, how they work or how they interact with other people. This can only be done by "living" with those being studied, watching them carefully, recording what was seen in detail and milking the essence of the whole process. The latter has to be done as soon as possible after the observation and outside the field.

It might seem an easy process, but in fact it is a complicated one ([ESOMAR and de Bont, 2007]). Watching the participants for a long period of time repeating certain tasks again and again, demands constant focus and keeping all of your senses continually engaged. As human beings though, it's normal to be prone to mental or physical fatigue, boredom, selective attention or rationalization of what is being observed. These issues were indeed present during observation, since there was only one observer, but knowing about them helped in tackling them in time and have the best possible result.

Some important aspects were considered before observation ([Ely, 1991]):

- Observe carefully, but just observe. Stay quite, don't talk to people and write down your observations.
- If people ask you what you're doing, be honest but not specific. Tell them that you are observing how they operate as part of your project.

- If people seem to feel uncomfortable seeing you observing and keeping notes, respect them and put your pen and paper or laptop away.

The observation took place in all three different types of health care centers, including hospitals, rehabilitation centers and ALFs in order to discriminate the different needs of nurses/carers, doctors and patients/elders. Networking played an important role in getting permission to enter the health care centers and do the observation.

The second experimental stage includes talking to potential end users, based on the end user profiles presented in Chapter 4. The interviews started by exploiting once more the personal network and after that, by using the so-called "network sampling" technique to find more people to talk to. In qualitative social science research, network sampling is "a form of snowball sampling, in which the originally selected participants recruit others through their own social networks of contacts" ([Chandler and Munday, 2016]). It was named after that because the initial sample group tends to grow like a rolling snowball. Practically, at the end of every interview, the end users were asked to suggest some of their acquaintances for future interviews.

Special attention was paid during the interviews so as to get the most out of them. For that reason certain rules were followed:

- Listen more, talk less. The goal is to get information, so let people talk, do not interrupt and only talk to navigate the discussion.
- Don't talk to them like you're trying to sell something because they're going to change behaviour and not give you valid feedback.
- Don't focus on the product features but on the problem that will be solved. It's difficult for the staff to make even trivial changes in the way they operate, so try to convince them that with the digital nurse, they are going to be more productive, improve the service quality and that it's an easy-to-use product.
- Never presuppose the answers because you may hear something completely different from what you expect. Be open to all different points of view. Diverge and don't converge.
- Valuable feedback may also be obtained from people that are not the end users. For example, patients' family that go for a visit to the hospital or even our close friends and family that have nothing to do with the specific market. Share the idea wherever you are. Share and you shall receive.
- Listen to what people are saying, but also observe their reaction to what you' re saying. That's the advantage of face-to-face interview in comparison to cold calling.
- Interview only ex-patients and not current patients because they are in a fragile situation and giving an interview might be the last thing they want to do. Also, respect the employees and do not interrupt them during their working hours.
- Before the interviews, the respondents were informed about the purpose of the interview, told not to answer if a question makes them feel uncomfortable and of course they were reassured that no personal data will be shared.
- Do the interview within the time frame you promised them. Respect the time they devote to listen to what you want to tell them and don't occupy them more than

needed and promised.

At this point, it is important to note a limitation regarding the applied theory. Both, disciplined entrepreneurship and the lean startup methodologies support that startups should start addressing a small and specific market segment and after its success in this beachhead market, it can expand to other markets as well. The main reason for that is that startups usually don't have neither the knowledge, nor the financial means to address a large market segment.

In contrast to this fact, some of the interviews were taken from individuals coming from different regions or even countries. It is justified by the fact that digital nurse is an international product and at some point the company will have to talk to end users from other countries as well. On one hand, the resources are limited and the company needs to get started. On the other hand, an exploratory market study in various regions is necessary to prepare Entranet for global markets by exploring markets outside of Greece to see how they are different. Once, the first physical prototype is built, this process can be more specific.

After gathering valuable information from the observational research and constructive feedback from the interviews with the end users, it's time for the third experimental stage, the interviews with the DMUs (owners, administrators) of the various health care centers. The truth is that you don't have a business, unless you have a paying customer. That's why it's really important to talk with the DMUs and see if they are interested or better willing to purchase the product and close a deal. But approaching the DMUs is different from talking with the end users. The main points that were taken into consideration regarding the interviews with the DMUs are presented below:

- Tell them about the problems that your innovative product aims to solve, but do not forget that the owners are businessmen. At the end of the day, what they are looking for is a way to either maximize their profits or minimize their expenses, but always keep customers and staff happy.
- What the administrators of the public health care centers want is to improve the quality of the patient's life through increasing the quality of offering services. And this is a good incentive to look for public funding to acquire the digital nurse.
- The competition in private health care centers is fierce. Everyone struggles to grow their market share and keep their rooms full. So, a good selling point is that they will be ahead of their competitors with the digital nurse, since it will help them attract more customers.
- Include in the selling pitch that it's a customized product able to serve them in the ways they want and that Entranet will be present providing supporting services even after the purchase.

The following lists, tables and charts constitute a quantitative and qualitative overview of the the empirical work that has been done and described above. The first table includes some general information about the interviews and observations:

| | |
|---|---|
| **Time period** | October 2018 - March 2019 (6 months) |
| **Interviews average duration** | 20 minutes |
| **Observations average duration** | 1 hour |
| **Number of interviews** | 53 |
| **Number of observations** | 5 |
| **Number of health care centers** | 13 |
| **Number of health care centers in Greece** | 11 |
| **Number of health care centers abroad** | 2 |

**Figure 8.1:** General information about the empirical work

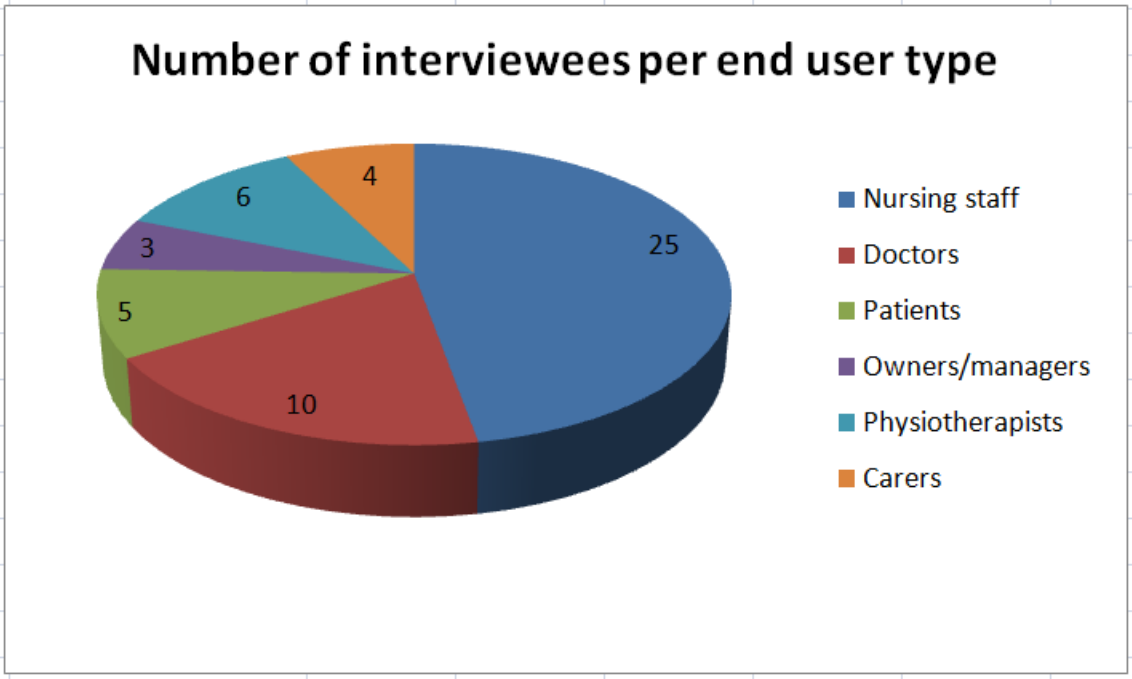



**Figure 8.2:** Number of interviewees per end user type

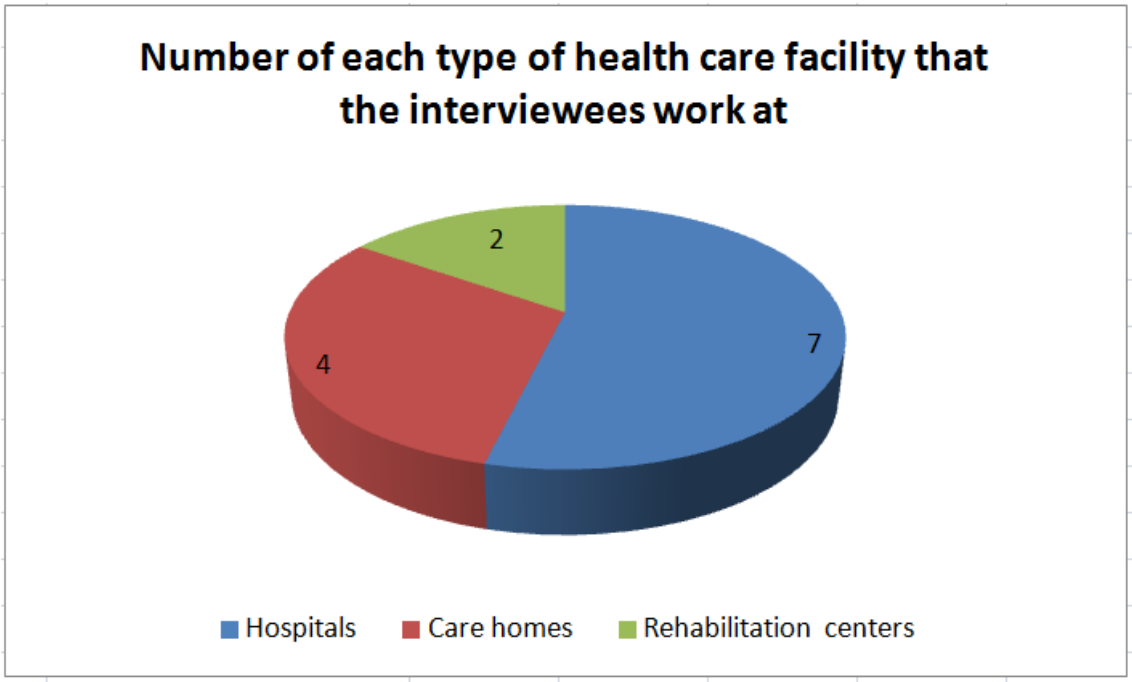



**Figure 8.3:** Number of each type of health care facility that the interviewees work at

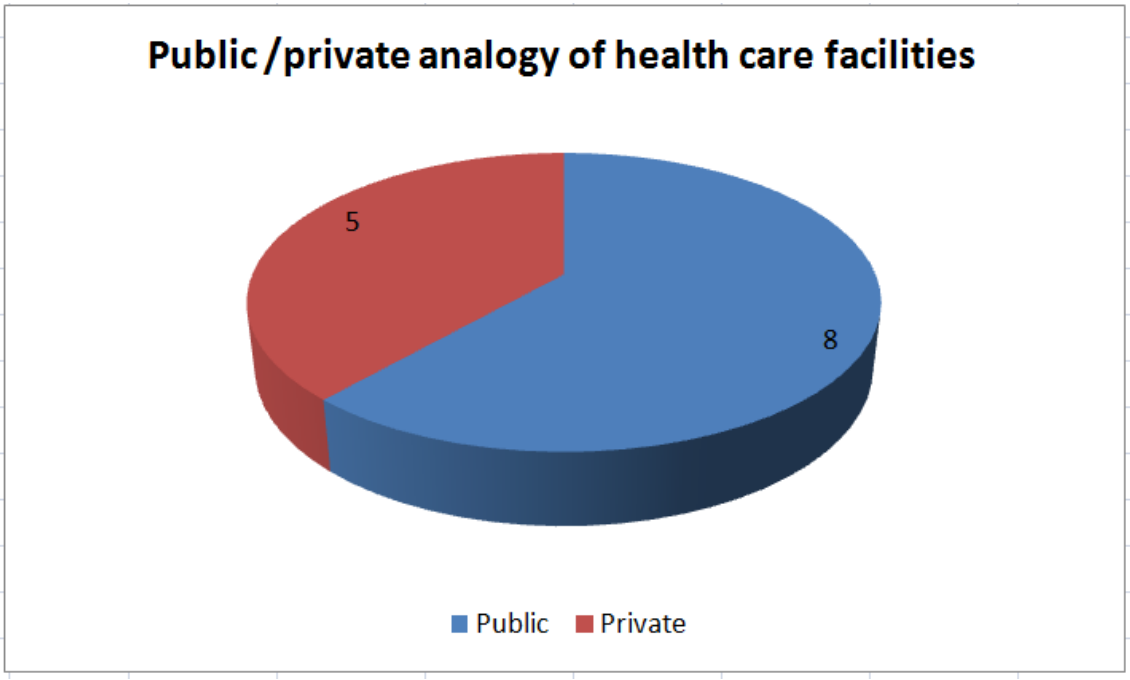



**Figure 8.4:** Public /private analogy of health care facilities

The following list contains the health care facilities, at which the interviewed end users work:

- G.Gennimatas: public hospital in Thessaloniki (http://www.gennimatas-thess.gr/#)
- Agios Dimitrios: public hospital in Thessaloniki

(http://www.oagiosdimitrios.gr/index.php)
- Private care home in the UK
- Ippokratio: public hospital in Thessaloniki (http://www.ippokratio.gr/)
- Papageorgiou: public hospital in Thessaloniki (https://www.papageorgiou-hospital.gr/)
- Diamantidios stegi: public care home in Thessaloniki (https://www.merponky.gr/index.php/diamantideios)
- Agios Panteleimon: public care home in Kilkis
- Professional physiotherapist in Thessaloniki
- Kentro igias Drossatou: small public hospital in Drossato
- Aalborg Universitetshospital: public hospital in Aalborg (https://aalborguh.rn.dk/)
- Arogi: private rehabilitation center in Thessaloniki (http://www.euromedica-arogi.gr/el-GR)
- Genesis: public hospital in Thessaloniki (https://www.genesishospital.gr/index.php/el/)
- Frontizo: private nursing home in Thessaloniki (https://www.frontizw.gr/english/intro-en)

Attempts have been made to get access to more health care facilities but were not fruitful. Some facilities have been contacted but either didn't reply or were not very open to students. These include:

- Papageorgiou: public hospital in Thessaloniki (https://www.papageorgiou-hospital.gr/)
- Mirtia: private nursing home in Thessaloniki (https://myrtiaae.gr/)
- Agios Georgios: private care home in Thessaloniki (http://www.agios-georgios.gr/)
- O kalos samaritis: private care home in Thessaloniki (https://www.kalossamareiths.gr/)
- Agia Kyriaki: private care home in Thessaloniki (https://agia-kiriaki.gr/)
- Panorama: private care home in Thessaloniki (https://www.protipagirokomia.gr/)

The observations for the empirical part of the project took place in:

- Arogi: private rehabilitation center in Thessaloniki (http://www.euromedica-arogi.gr/el-GR)
- Genesis: public hospital in Thessaloniki (https://www.genesishospital.gr/index.php/el/)
- Agios Panteleimon: public care home in Kilkis
- G.Gennimatas: public hospital in Thessaloniki

(http://www.gennimatas-thess.gr/#)
- Agios Dimitrios: public hospital in Thessaloniki
(http://www.oagiosdimitrios.gr/index.php)

The nurses and doctors that were interviewed, worked in the following medical departments:

- Cardiological department
- Otorhinolaryngological department
- Obstetrics department
- Gynecological department
- Urological department
- Pathological department
- Ophthalmological department
- Emergency department
- Surgical department
- Medical laboratory
- Innovation department

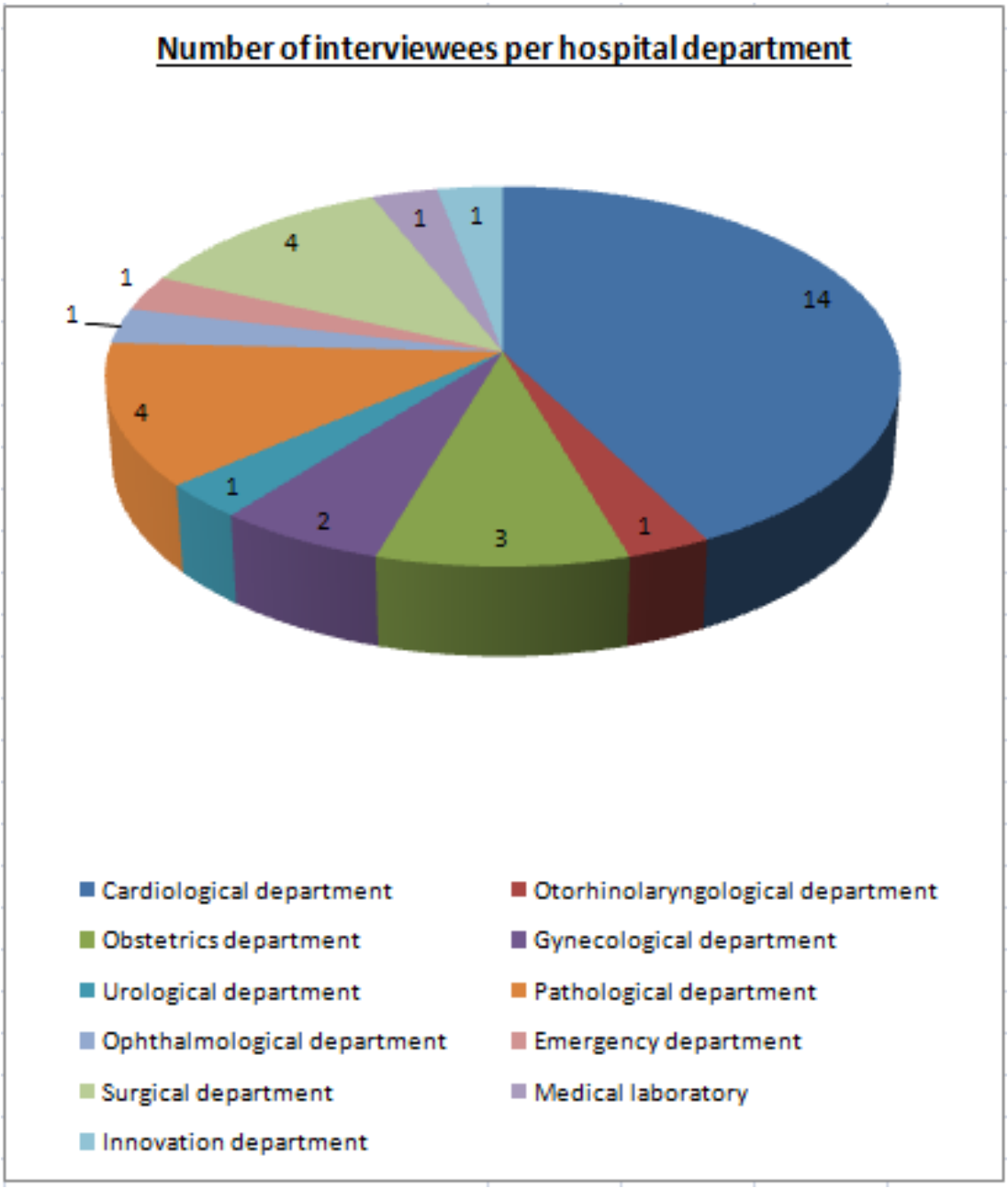



**Figure 8.5:** Number of interviewees per hospital department

All the raw material from the observations and interviews was written down in bullets so that it can be easily read. Almost all of the interviews and observations took place in Greece and were carried out in Greek. So, it was necessary to be translated in English before including them in the project. Owing to the big number of interviews and observations, there was not enough time to translate all of them. The remaining time had to be utilized for more essential tasks for the project completion. However, some of them were translated and are presented in tables in Appendix D.

## 8.7 Data analysis and results

In accordance with the lean startup theory, the next step in the validation process is to examine the data collected from the interviews and observations and generate the results. These results are the outcome of the empirical work and are referred as validated learning.

The results presented here include the answers to two different vital parts of the project, namely the key assumptions and the project objective. Below are presented the key assumptions, each of them followed by the relevant feedback from the interviewees that justify the key assumption's confirmation or disproof.

**1. Patients, nurses, doctors and owners find the product useful.**

Patients didn't seem very excited about the digital nurse. Doctors found the product useful but not necessary for them and surely not for public facilities. Most of the nurses seemed excited about it.

Regarding the ALFs, the product doesn't seem to be useful because only when people are unable to be self-served decide to move to an ALF. And this usually happens when people start having mental issues, which means that either they will not be able to use the digital nurse at all or not use it properly and this is something that may create bigger problems to an ALF.

**2. All of them like the suggested features.**

Patients didn't seem to like most of the features of the product. The communication with their loved ones through video call is something that can be done with their smartphones or tablets, as well as surfing the internet. The patients said that the idea of a personal TV was very good but the use of earpods kind of restricting.

Medication reminders for the patients is a feature that cannot be applied since inside the health care facilities, nurses and carers are responsible for the pills and when they give them to the patients, they need to make sure that they took them.

Half of the doctors asked, didn't fully agree with the speech recognition technology and the fact that the screen should be attached to the beds. They think that the screen could just be used as a touch screen and that it would be better for doctors to have a tablet that offers them portability. Some nurses also prefer a tablet, which they can answer when patients call wherever they are.

What carers and nurses found most helpful is the fact that patients and elders will be able to control their room on their own and that nurses will be able to check what patients or elders need before visiting their rooms.

**3. Patients would use the new product because they would be able to communicate with the nurses quickly and have something to help their time pass.**

Patients stated that they have their smartphones or tablets to help their time pass. Maybe the advantage of the digital nurse would be that it will not need charging. They didn't find the video call with the nurse interesting since nurses visit the patient rooms so often

that they can tell them any time and face-to-face what they need.

According to nurses and carers, most of the tenants in ALFs and a big part of patients in hospitals are too old to be able or willing to use the product.

**4. Nurses/carers would use the new product because they could do their job better and would be able to filter patients' calls before running to their rooms.**

Nurses were excited about the product. It is very important to them to save time and energy and be able, in this way, to offer better services. All of them explained how the digital nurse can cut their walking in half. Today, if a patient calls the nurse to bring him a painkiller, the nurse visits the room twice; once to check what the patient needs and once to bring the painkiller. With the product, the nurse only visits once.

Another advantage of the digital nurse is that when two or more patients call the nurse at the same time, she can quickly talk to them, check what each of them needs and prioritize which one she should visit first.

**5. Doctors would use the new product because they could do their job better and they would be able to have the patient's health card available on a screen during their visit to the patient's room, without needing the nurse's help.**

When doctors visit the patients, they carry with them all the necessary papers with patients' medical data. These papers can be lost or torn but digital data not. Furthermore, when a patient leaves the hospital, his medical file closes and it's not easy to find it in the future if needed. Doctors seem to like the idea of having the desired patient information easily available on the screen anytime they need it. This availability of the data though, is more important than the ease of doing it with voice commands.

Some of the medical examinations have a big size and cannot easily be carried by the doctors, especially when there is a big number of patients. So, according to the doctors it would be better to have them in digital form, inside the digital nurse.

Most of the doctors said that the nurse's presence is necessary and that no product can replace her. Specifically, when a doctor visits a patient, he needs the nurse because the doctor immediately gives her instructions on what to do with each patient for example, which medication to give and how often.

**6. Owners would buy it because they want to upgrade their services and become more competitive.**

None of the managers/owners seemed willing to buy the product or even try it.

**7. Doctors and nurses/carers would use it if they had it and they have no problem talking to a machine.**

What most of the interviewees answered, was that they would try the product if they had it and that they have no problem talking to a machine, given that the product will be easy to use and that it will work properly every time they use it. This means that they would use it only if they were persuaded that it is really helpful and help them save time and do their job easier and more efficiently. Also, most of the respondents admitted that it may

be awkward to talk to a machine at the start, especially in front of other people, but they would get used to it.

**8. Patients would choose a health care center that has installed the digital nurse over others that haven't and they have no problem talking to a machine.**

Patients didn't make the hospital choice based on its available equipment but based on where their doctor works and performs medical operations. So, the existence of digital nurse would not be a criterion for their decision.

**9. All of them would add more features to solve more of their needs.**

Some of the suggested features are the following:
- Doctors want to have available on the screen, information about patients' allergies to specific medication that will be shown with red, bold letters.
- When doctors ask the digital nurse for a specific measurement, for example patient's temperature chart, it's good to be displayed with a green or red background color, depending on whether the patient's condition is getting better or worse respectively.
- Doctors also said that they need a reliable speech-to-text system so that they can dictate all the things that they write during the day, which are a lot because there's a lot of paperwork. What doctors demand is for this system to work perfectly every time they use it.
- Some nurses want to dictate measurements such as patient's temperature to the digital assistant so that it can be instantly saved in the system.
- Some nurses suggested that the digital nurse inform them when the patient's catheter is full or when the patient's liquid medicine (saline) goes off.
- Carers think that it would be helpful if the digital nurse talked to the elders reminding them the daily activities, for example "In 10 minutes it's lunch time".
- Nurses and carers would like to watch the patients and elders through a camera system, in order to check if the are inside the room, if they sleep, if they lie or stand.
- It might be a good idea if the digital nurse could remind the nurses of the patients medication, so that they know when is the next time to give them their medication.

Judging by the small percentage of the people that responded to this key assumption, it is more than obvious that if the end users don't have a first version of the product to use and test, it is not easy for them to suggest new ways that the product could help them. Some respondents, added this fact as a comment, saying that "If don't have the product to try it, how could I know?".

**10. The owners are willing to purchase the new product.**

None of the managers/owners seemed willing to buy the product or even try it.

**11. Staff and owners will not show resistance to change.**

The interviewees that didn't show resistance to change the way they operate, need to be persuaded first, that the product will improve their work. It has to be declared, though, that resistance to change is more obvious when the end users try the new product in their job than when just describing the product to them. Of course, some people admitted that they don't want to change the way they operate but even people that didn't seem to have a

problem using the digital nurse during the interviews, they might have a different reaction when using it in their job.

In other words, it seems that resistance to change will definitely not be a problem, as long as something creates real value to the end users and also regardless of age. If they can do it faster or cheaper, it's valuable.

Based on the feedback from the interviews and observations, the following table presents for each key assumption if it has been validated or refuted. If the percentage of the answers that are in agreement with the key assumption is more than 50%, then the key assumption is validated, otherwise it is refuted.

| Key assumption | Number or respondents | Number of people that validated | Percentage | Validate or refute |
|---|---|---|---|---|
| 1 | 47 | 31 | 66,0 | Validate |
| 2 | 47 | 35 | 74,5 | Validate |
| 3 | 5 | 1 | 20,0 | Refute |
| 4 | 33 | 24 | 72,7 | Validate |
| 5 | 10 | 7 | 70,0 | Validate |
| 6 | 3 | 0 | 0,0 | Refute |
| 7 | 43 | 23 | 53,5 | Validate |
| 8 | 5 | 0 | 0,0 | Refute |
| 9 | 47 | 14 | 29,8 | Refute |
| 10 | 3 | 0 | 0,0 | Refute |
| 11 | 42 | 28 | 66,7 | Validate |

**Figure 8.6:** Key assumptions validation in numbers

Below are presented some general comments on the product, made by the interviewees. These comments are not directly connected with the key assumptions but are worth mentioning.

- It goes without saying that only doctors should have access to the patient medical information through the product. The reason for that is that doctors don't always say the whole truth to the patients, especially if they have the suspicion of something bad. They first need to confirm it and then announce it to the patient.
- A common statement that most of the interviewees made is that no matter how useful the digital nurse may be, it is impossible to cover the sentimental needs of the patients. What patients need is not a video call with the nurse but a face to face contact. They need to feel that someone is there to take care of them. They need not to feel alone in the difficult situation they face. Today, a big percentage of the nurse calls made, are not because the patient really needs something but because he wants to feel the nurse's presence and feel safe. A lot of nurses and carers stated that even if the digital nurse was installed, this patient need would not be covered.
- The product would be more useful for doctors working in oncological departments, since most of the patients are the same patients that keep visiting for reexaminations or their therapy sessions. It might also be a better fit for obstetric departments, where patients are basically young women and pediatric departments, where kids may see it as a game.
- In most of the public health care facilities in Greece, a big obstacle for the digital

nurse to be installed is the fact that little or no electronic health record is kept. A lot of information about the patients are only handwritten but in order for the digital nurse to work, all information has to be in electronic form so that it can be extracted from the central computer and be shown on the screen. Private health care facilities, on the other hand, keep all the patient information electronically and this makes the private facilities a more fertile ground for the product.

- Digital assistant and voice recognition technology seemed useful to the end users but none of them considered them as necessary for the new product. Maybe a trial will prove the opposite.
- A big concern is that if you put screens in the patient's rooms then you avoid human contact and nurses really want to have contact with the patients and be there for them. Although they are charged with a lot of tasks, they can't reach the professionalism of being a nurse without the personal contact. On the other hand, if they can save time with the product, then they are going to have more time to spend with patients. That's why the value of the product needs to be further validated through the real use of the product from the end users.
- The hospitals are demanded to host the patients for as shortly as possible. So if you have a patient for one, two or three days, it is difficult and time demanding to explain how the system works to the patient and maybe the nurses are going to spend a lot of time on that. But in the ALFs tenants live there for a long period of time and it can be a part of their everyday life, which maybe makes the product more applicable there, if the tenants are able to use it.

Extracting valuable information from the empirical work, important insights were generated that also give answers to the project objective questions posed for Entranet's new product. It is reminded that the project objective is to find out what a digital assistant can do, inside a patient's or elder's room. Here's how it can be of help to each different type of health care facility:

**How can a digital assistant help the end users in hospitals?**

A digital assistant in hospitals would help doctors in showing them the necessary medical information of each patient when visiting in their rooms. These information include cardiograms, ultrasounds, blood oxygen levels, medical findings and diagnosis, lab test results, X-rays, CT scans, MRIs, temperature measurements, blood pressure, medication and medical record. Of course, as explained earlier, a prerequisite for showing these data is the existence of an electronic system where these data will be kept. A digital assistant could also save doctors time from writing, if they could dictate for example, their diagnosis to the assistant so that it can turn speech into text automatically.

Nurses are the ones that seem to get the most value out of the product. On one hand, it's the room control by the patients through smart devices. It will be very helpful to the nurses if patients could handle their personal lighting and their bed height on their own. On the other hand, it would be useful for nurses to receive patient video calls before they visit their rooms in order to check what they need. In this way, nurses would save time and energy, which could be spent delivering true patient care. They would also like to have an image of the patient rooms through a camera in the room, especially during their night

shift in order to check if the patients are asleep or if they are uneasy and keep moving on their beds.

Patients would like it if they didn't need to share the TV with other patients. So, having individual TVs inside the digital nurse's screen is something that hospitals need. It also has value for the nurses because when patients argue about TV, they have to intervene and act as referees. Communication with their loved ones through video calls and through the digital nurse is not useful, since it is much easier for the patients to use their smartphones. Older patients that don't know how to use a smartphone, will also not be able to use the digital nurse. The same goes for the internet use, where maybe the only advantage is that the product won't need charging.

**How can a digital assistant help the end users in rehabilitation centers?**

Only one doctor working in a rehabilitation center was contacted. This fact makes it difficult to generalize how a digital assistant could help in all rehabilitation centers. In the case of the doctor asked, he would like to have a digital assistant for a reliable speech-to-text conversion so that he can easier handle the paperwork. For the patients' medical data, he carries a tablet, which works perfectly for him.

Nurses found the digital nurse the same valuable as the nurses working in hospitals.

When the end users were described, physiotherapists were not taken into consideration, since at the start of this project and before the contact with the market, it was not considered that physiotherapists might also find value in the product. Consequently, physiotherapists were not included in the key assumptions either, but six of them were interviewed offering valuable feedback.

When visiting the patients, physiotherapists want to have available on the screen the patients' vitals, the doctor's notes from each patient and the FIM scale chart, which is a graphic tool, used to assess a patient's level of disability as well as change in patient status in response to rehabilitation or medical intervention. In this way physiotherapists wouldn't need to carry with them all the relevant papers and they would save time. They also want to be able to easily video-call the doctor while visiting the patients in order to ask anything that may come up during the visit or therapy session.

During observation, patients didn't seem to need a digital assistant in their rooms. They could easily control the lights in the room, the TV and adjust their bed's height and inclination with a remote control at the one side of the bed, which could easily be reached. Nevertheless, nurses and physiotherapists suggested some features for the digital nurse that can serve patients or both patients and nurses. For example, it would be useful for the patients to have reminders for their therapy sessions. For example, the digital assistant could talk to them saying "Your next therapy session is in 30 minutes. Get ready". Patients could also have access to their weekly therapy schedule, in order to check it when needed.

The communication between patients and their families through the digital nurse and the internet use would not be useful, since patients bring their own tablets and smartphones with them when they go to the rehabilitation center to stay. On the other hand, nurses were positive that the video call between patients and nurses using the digital assistant

would be beneficial to both patients and nurses, because both of them would save time. In contrast to hospitals, the communication with the nurses would be more valuable to the rehabilitation centers, as the nursing staff working there is far less than this working in hospitals.

**How can a digital assistant help the end users in Assisted Living Facilities (ALFs)?**

According to the respondents from the ALFs, it seems that the digital nurse cannot provide much help to its end users. As explained earlier, the people that are hosted in the ALFs, are people that cannot serve themselves because they usually start having mental issues and this is the reason why people close to them decide to bring them to an ALF. People that are able to live alone, don't go to a care home. Regarding carers and nurses, the digital assistant can create no value for them if the tenants are unable to use it. Doctors in public care homes do not need the digital nurse, since they just make some simple measurements such as temperature or blood pressure and in case of a more important situation, the tenants are transferred to a hospital. Doctors in the contacted private nursing home use a tablet, where they keep all the tenants' medical information and they carry it with them. The tablet helps them a lot and a digital assistant wouldn't be useful for them.

# Epilogue 9

This final chapter concludes this effort with the learning gained from the empirical work and the contact with the potential end users and also includes some recommendations for Entranet regarding the next steps for the innovative product.

## 9.1 Learning

While implementing the Build-Measure-Learn feedback loop and processing the data gathered from the first validation round, precious learning has been gained. Learning that lies in a wide array of aspects, ranging from how to approach the potential end users to how to test the key assumptions or improve the product presentation. It could be stated that the knowledge gained from this process can be divided into two categories. The first one is the validated learning that only has to do with the digital nurse and the business development process (described in 8.7) and the second is the validated learning in more general terms that will prevent potential mistakes that happened during this project from occurring again in the future. Some of them are presented below.

The interviews can easily be derailed. In some interviews taken in this project, the potential end users felt comfortable and started talking about the problems they had with their bosses or complaining about the health care system. These issues were not relevant to the digital nurse and often, navigating the interview was not an easy task.

It's extremely difficult to keep the interview short and keep your promise. When the interviewees were contacted, they were also told that the discussion will only last 15 minutes. On one hand, it was a trick to convince them to talk to them but on the other hand, 15 minutes didn't seem too little to present the project and get the necessary feedback. Almost none of the interviews lasted 15 minutes or less. Phones were ringing, people were knocking on doors and the interviewees also had questions regarding the product that the interviewer had to answer.

Interviewing one person at a time is better than having an audience consisting of two or more people. On one hand, having more than one person makes you present only once to more than one person and save some time. On the other hand, when you have two or three individuals at the same time, two are the most probable scenarios. The first one is that one of them is more shy or doesn't want to talk much and share his opinion with the other one. So, what he does is agreeing with what's been said. The second scenario is that they have different opinions and they start arguing on why the one is right and the other is wrong.

Finding potential end users in private and public facilities are two completely different

things that require different approaches. When contacting private facilities, you start with the head of the pyramid, which is the owner. When contacting public facilities, you approach the end users directly and see what they can do for you. When the head of a big public hospital was contacted in order to get the permission and book meetings to talk to the staff, the secretary asked a signed request, which should include the following:

- Which would be the questions for the staff.
- How long would each interview last.
- What is the purpose of the interviews.
- What kind of information needs to be retrieved.
- If the results would be published and if yes, where.
- Who would have access to the results.
- If profit would be made from the results.

After this request would be sent, they would have a meeting -when possible- to decide whether to approve it or not. Most importantly, it was easily understood, that they were not willing to help.

During the whole market research and the contact with managers and owners of private health care centers, it was realized that in a B2B (Business-To-Business) environment, what the customer only needs in order to attract his attention and also convince him to buy from you, is to persuade him that with your solution, he is going to either reduce his expenses or increase his profits. Maybe that's the only thing that matters.

## 9.2 Suggestions

From the validation part, it is obvious that potential end users from the health care sector showed interest in the product. This means that it's not time for Entranet to pivot yet. Now that Entranet has a broad view of the new market it wants to enter, it's time to narrow down to a specific market segment and start small from there. Here is some advice for the company on how it could possibly proceed in the future regarding the digital nurse:

- Entranet should define new key assumptions, build a new MVP as soon as possible and launch a new "build-measure-learn" feedback loop using a simple functional version of the digital nurse. Only by using the product will end users be able to provide more valuable feedback on how or whether it serves their needs.
- This MVP could work as a concierge MVP, meaning that the company should find an early adopter, provide him with it and learn from in-person meetings and end users' reactions. The role of this early adopter could be played by the private rehabilitation center, which is located in Thessaloniki and Entranet has successfully approached it for a collaboration for the new product. The target user for the next feedback loop should be the nursing staff, as the first feedback round revealed that nurses are the ones who are expected to get the most value out of the product.
- Two questions that would be nice to answer at this point are "Private or public health care facilities?" and also "Greece or abroad?". Judging by the validation results, the answer is that no matter if it's in Greece or abroad, in private or public sector,

the prerequisite is that all the patient information must be kept in electronic form. Otherwise, the digital nurse won't be able to work, at least for the doctors. Some of the interviewees had working experience in UK's health care private and public sector and were assured that the English market is more ready for such a product. So, after creating a prototype, Entranet could start contacting health care facilities in the UK.

- What is more, Entranet should specify the value that the customers are going to gain from buying and using the product and set its price based on the customer value-based pricing strategy. The company has to make sure that it will provide superior value to each and every customer.
- It is also crucial for Entranet to devote some time and energy to increase the lifetime value of an acquired customer and reduce the customer acquisition cost. These extremely important metrics have to be reestimated with new prices for the variables until the former is at least three times the latter. These new prices may result from an improved business model or sales process, that will increase the chances of a sustainable business.
- Before moving any further with the digital nurse, Entranet should conduct a thorough research on potential GDPR issues that may come up or consult someone with expertise in this legal area. The GDPR law is new and the company should make sure that all the features of the digital nurse will not offend the end users' or health care facilities' privacy rights.

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# Idea hunt A

Everything starts with an idea. Finding the idea, though, is not something that can be done at the push of a button. It's not something that you can schedule. Ideas are generated at any given time and without warning. Observation and interaction with the environment have a key role to play. The environment includes the natural, human, professional, cultural environment etc., that can stimulate human brain and trigger the ideation process. You don't find the idea, the idea finds you.

But what if there's a need to find one? Then, you need to look for inspiration. The start was made in the second semester, during which inspiration was being drawn from influential videos on Youtube and the television series "Shark Tank", where entrepreneurs pitch their business ideas in front of investors trying to get funding from them.

The first two semesters included two interesting semester project ideas, through which knowledge and experience were gained. What was missing though, was a physical product, something tangible that could be built as a prototype or a Minimum Viable Product and shown to the potential users, in order to get some feedback on what to improve or change. So, the goal of the idea hunt for this semester was a physical product.

## A.1 Sea weed building insulation

The video inspiration worked! Right after the end of the second semester a TEDx talk showed the way. It was an entrepreneur owning a company called "COCO-MAT", that produces luxury mattresses made from natural materials. One of these materials is the sea weed. At the end of his speech, we suggested the audience to do something with sea weed. He highly suggested sea weed as an insulation material.

It was a match for a couple of reasons. It constitutes an idea with a physical product and serves as a solution to an existing twofold problem, the environmental and the financial one.

The financial problem is that large quantities of sea weed are washed up on the shores (Figure A.1) every year and municipalities pay a lot of money to remove them from the beaches. The environmental problem is that the removed seaweed ends up in landfills or gets burned. The solution is thermal insulating products made of sea weed, that boost cyclical economy and sustainability.

**Figure A.1:** Washed-up sea weed in Copenhagen

After a rough research took place during the summer, major challenges stood as a hurdle for going on with this idea. The first challenge was the unavailability of the appropriate sea weed formation (Figure A.2), which is called "Neptune ball" and can mainly be found in Tunisia, Italy and Majorca in Spain. What's special about it, is that it's formed by thin fibers that are able to trap air inside the empty spaces and this immovable air provides the insulating properties to the product. The second challenge was that in order to turn sea weed into product surfaces, extensive and costly R&D is required to find a sustainable material that can make it solid. So even if the available sea weed was used as a material, making it stand would still be an issue, not to mention that it is a time demanding process that could hardly fit to a university project.

**Figure A.2:** Neptune balls
([https://it.wikipedia.org/wiki/Egagropilo, 2018])

## A.2 Reed products

The next idea emerged once more from the desire for physical products and cyclical economy. The idea was to use reeds (Figure A.3) for various products. The problem is that reeds grow everywhere and they are cut down and burned and that at some point, we need to start replacing plastic with natural materials. The solution is reusing reeds for products like furniture, fences, pens or shampoo containers.

**Figure A.3:** Reeds

The idea lacked in ease to copy, the enormous competition coming from the extremely popular bamboo market and the inexperience in building reed products.

## A.3 Airbnb host services

The third idea was something related to the booming adoption of Airbnb platform. The problem is that a lot of people own apartments, but they don't have the necessary time to manage the whole booking and hosting procedures for their guests. The solution is offering host services for those who rent their properties through Airbnb.

The customers are apartment/house/summer house/caravan owners that need someone to completely manage the whole process of renting their properties. They could be busy people, old people or even people that don't want to do it themselves. The services include communication with guests, setting the right price, cleaning and fixing the apartments, supplying them with what's needed for the next guests and key delivery and pick-up. The customers can visit you in an office and the payment is a percentage of the total price on Airbnb.

What slowed this idea down was the great difficulty in finding customers, scaling up the business and the fact that it is too plain and easy to copy. That's why the supervisor suggested to try a pivot to innovate and offer a better value proposition.

# LTV and COCA tables expressed in Euros

B

| EUROS | Year 0 | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|---|
| **Revenue stream: Screen and smart devices** | | | | | | |
| Price per customer | 66000 | | | | | 66000 |
| Next product purchase rate (beyond year 0) | | | | | | 0,75 |
| Gross margin | 0,425 | | | | | 0,425 |
| Profit | 28050 | | | | | 21038 |
| **Revenue stream: Server hosting fee** | | | | | | |
| Price of yearly fee | 90 | 90 | 90 | 90 | 90 | 90 |
| Retention rate | 1 | 0,8 | 0,8 | 0,8 | 0,8 | |
| Next product purchase rate | | | | | | 0,75 |
| Gross margin | 0,425 | 0,425 | 0,425 | 0,425 | 0,425 | 0,425 |
| Profit | 38,25 | 30,6 | 30,6 | 30,6 | 30,6 | 28,688 |
| | | | | | | |
| Sum of profits | 28088 | 30,6 | 30,6 | 30,6 | 30,6 | 21066 |
| Cost of capital rate | 0,05 | 0,05 | 0,05 | 0,05 | 0,05 | 0,05 |
| Present value above cost of capital | 28088 | 29,07 | 27,62 | 26,24 | 24,92 | 16301 |
| Net present value of profits (LTV) | **44497** | | | | | |

**Figure B.1:** LTV calculation in Euros

| Scenario 1 | | | |
|---|---|---|---|
| **Marketing and sales items** | **Year 1** | **Years 2 and 3** | **Years 4 and 5** |
| Number of salespeople | 1 | 1 | 1 |
| Salespeople salary | 9600 | 19200 | 19200 |
| Tech support salary | 8400 | 16800 | 16800 |
| Travel | 10000 | 20000 | 20000 |
| Entertainment | 5000 | 10000 | 10000 |
| Trade shows | 9000 | 18000 | 18000 |
| Consultant | 1200 | 0 | 0 |
| Communication | 700 | 1400 | 1400 |
| Total | 43900 | 85400 | 85400 |
| | | | |
| Number of customers | 1 | 3 | 5 |
| **COCA (Euros/customer)** | **43900** | **28467** | **17080** |

**Figure B.2:** COCA scenario 1 in Euros

| Scenario 2 | | | |
|---|---|---|---|
| **Marketing and sales items** | **Year 1** | **Years 2 and 3** | **Years 4 and 5** |
| Number of salespeople | 1 | 1 | 1 |
| Salespeople salary | 9600 | 19200 | 19200 |
| Tech support salary | 8400 | 16800 | 16800 |
| Travel | 10000 | 20000 | 20000 |
| Entertainment | 5000 | 10000 | 10000 |
| Trade shows | 9000 | 18000 | 18000 |
| Consultant | 1200 | 0 | 0 |
| Communication | 700 | 1400 | 1400 |
| Total | 43900 | 85400 | 85400 |
| | | | |
| Number of customers | 4 | 11 | 19 |
| **COCA (Euros/customer)** | **10975** | **7764** | **4495** |

**Figure B.3:** COCA scenario 2 in Euros

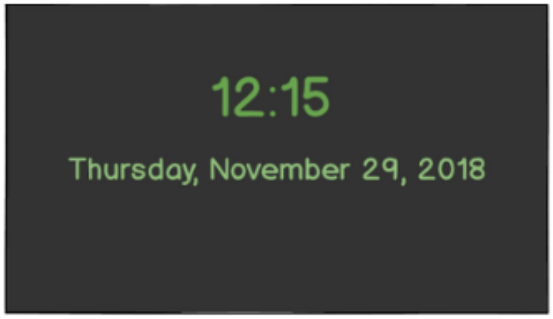
| Scenario 3 | | | |
|---|---|---|---|
| **Marketing and sales items** | **Year 1** | **Years 2 and 3** | **Years 4 and 5** |
| Number of salespeople | 1 | 1 | 1 |
| Salespeople salary | 9600 | 19200 | 19200 |
| Tech support salary | 8400 | 16800 | 16800 |
| Travel | 10000 | 20000 | 20000 |
| Entertainment | 5000 | 10000 | 10000 |
| Trade shows | 9000 | 18000 | 18000 |
| Consultant | 1200 | 0 | 0 |
| Communication | 700 | 1400 | 1400 |
| Total | 43900 | 85400 | 85400 |
| | | | |
| Number of customers | 6 | 20 | 30 |
| **COCA (Euros/customer)** | **7317** | **4270** | **2847** |

**Figure B.4:** COCA scenario 3 in Euros

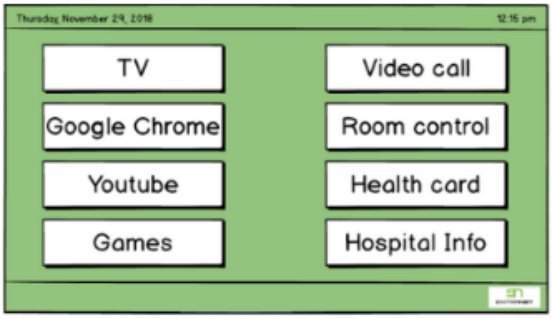
| **Euros** | Scenario 1 | Scenario 2 | Scenario 3 |
|---|---|---|---|
| COCA FOR YEAR 1 | 43900 | 10975 | 7317 |
| COCA FOR YEARS 2 and 3 | 28467 | 7764 | 4270 |
| COCA FOR YEARS 4 and 5 | 17080 | 4495 | 2847 |
| COCA FOR ALL 5 YEARS | 89447 | 23233 | 14433 |
| LTV FOR ALL 5 YEARS | 44497 | 44497 | 44497 |
| **LTV:COCA (ratio)** | **0,50** | **1,92** | **3,08** |

**Figure B.5:** LTV-COCA ratio calculation in Euros

## Digital nurse software: Screenshots

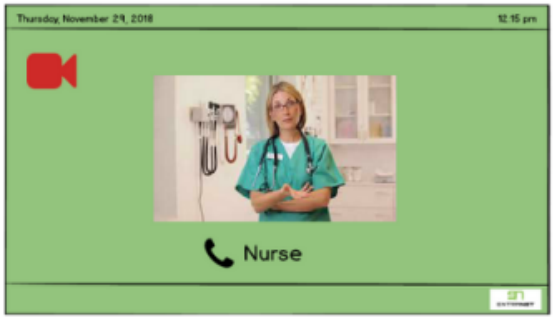



Screen saver is on, when the touch screen is not being used.

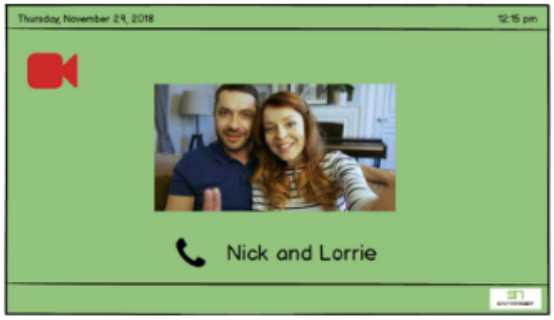



The main menu appears, when the screen is unlocked.

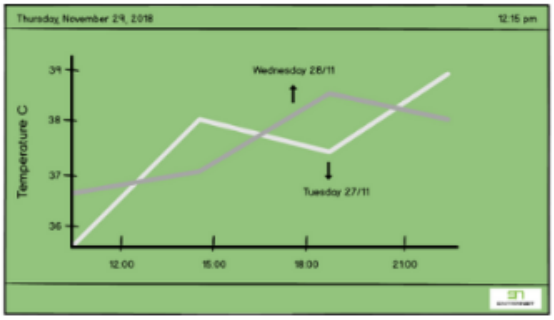
When the user says 'Eliza', the digital assistant appears on the screen waiting for a voice command.



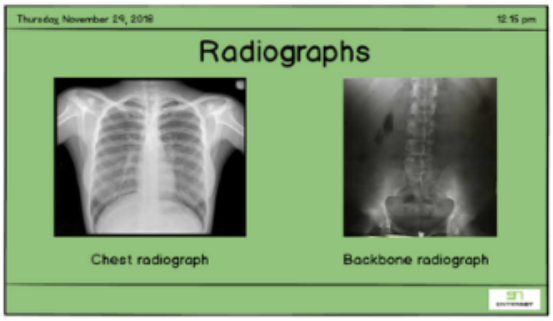

When the patient says 'Call the nurse', the digital assistant video calls the nurse.



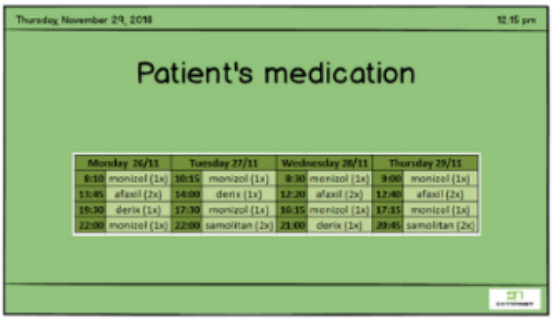

The patient can also video call his loved ones throughout the day.



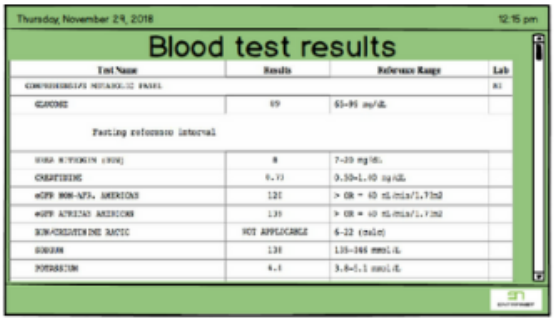

The doctor visits the patient and can ask Eliza for the patient's temperature chart or...



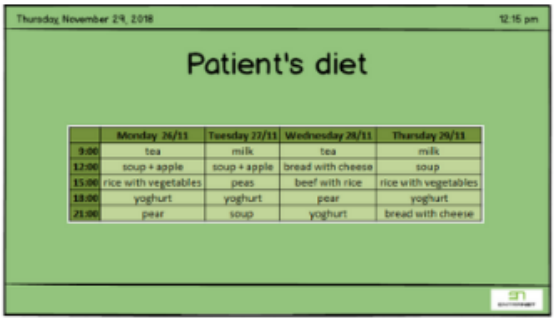

...the patient's radiographs or...




...the patient's medication or...




...the patient's blood test results or...




...the patient's diet.

**Figure C.1:** Story board with screenshots

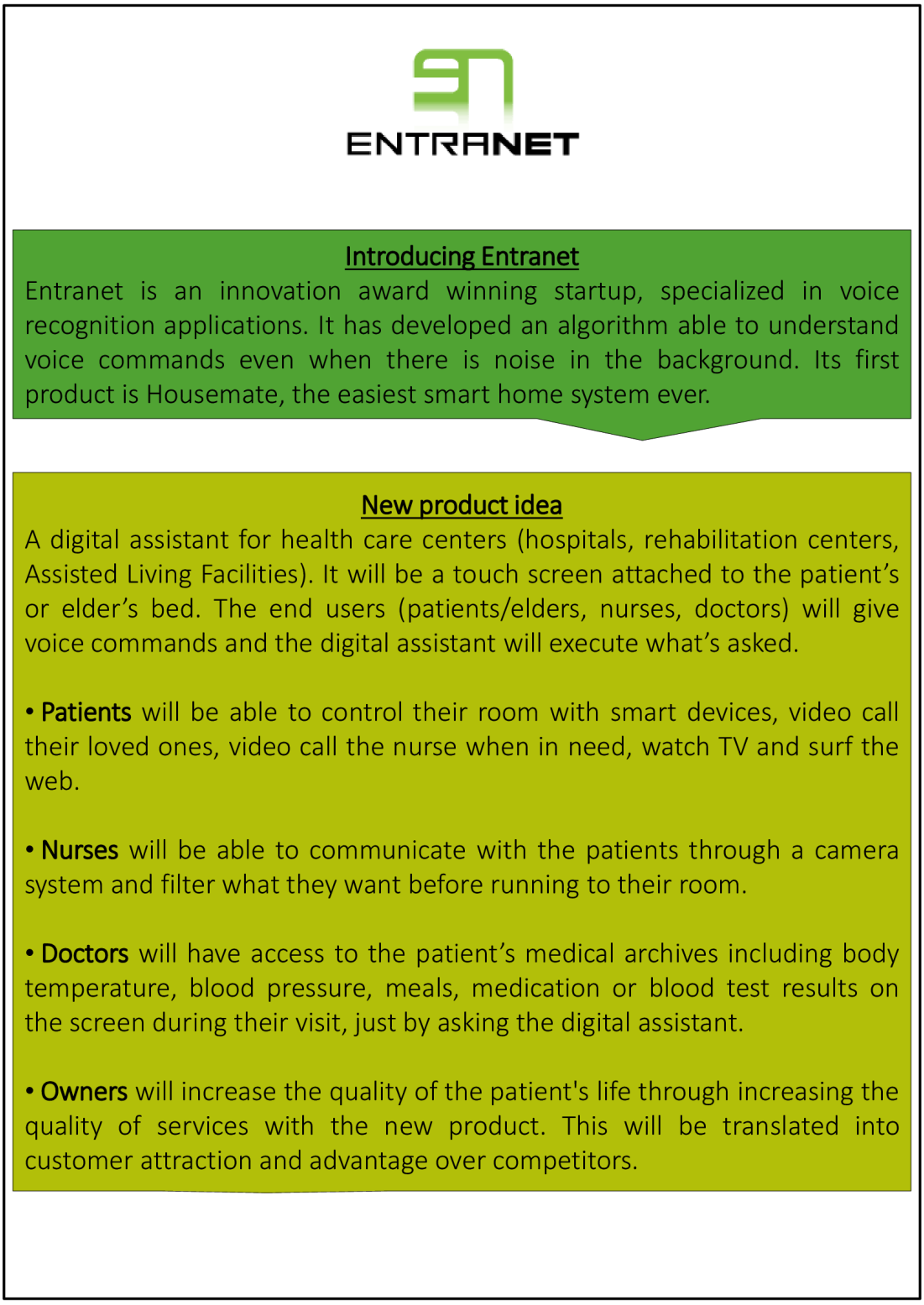



**Figure C.2:** One-pager

# Raw material from validation

D

This Appendix includes the feedback received from the interviews and observations throughout the validation process. This raw material is presented in tables and in bullets in order to be easier to read. These data served as a basis for the data analysis and the results. Not all interviews and observations are presented here owing to the fact that the notes were taken in Greek and the translation of all of them in English would be a huge workload, demanding time that was not as value-creating as the rest of the things that had to be done. Nevertheless, the translated notes provide the reader with a sample to get a good sense of how the interviews were carried out.

| Observation 1 | |
|---|---|
| Health care center | Public nursing home |
| Location | Greece |
| Date | 31/10/2018 |
| Notes | • Staff and tenants were living like a family. There was a good relationship among all of them.<br>• The building was not very big, every room was easily accessible and they were in close contact with each other.<br>• There were signs in the whole building saying that there are cameras inside for safety reasons. After the EU GDPR, a new sentence was added that "there is no violation of personal data". It means that the cameras only watch the common rooms and not the tenants' rooms or bathrooms and that nothing is recorded. There was a room with a screen showing the camera views but it is just a monitor. One week before the observation day, a GDPR inspection was made there.<br>• What the tenants need is the carers to be present. They need more than anything to see them and talk to them. When we got inside the rooms of the nursing home, everyone started talking to us asking us who we are and making compliments. When we turned to leave the room they kept shouting to us "come here" or "I want to tell you something". When we answered that we have to go one of them said "please come here, I need you to give me my bottle of water". |

| | |
|---|---|
| Notes | The nurse gave it to her but she didn't drink. Instead the old lady started talking to her. What they need most is company and the staff knows it. It felt like if the tenants could stand on their feet, they would run to us like kids run to their parents. There was a room with six tenants, the TV was playing but nobody was watching. They just wanted to listen to someone talking, feel that they are not alone. |

**Table D.1:** Observation 1

| Interview 1 | |
|---|---|
| End user | Carer in private care home |
| Location | UK |
| Age | 28 |
| Gender | Female |
| Date | 08/10/2018 |
| Feedback | • Tenants are always calling for the carers to turn the lights on/off and other things concerning the room control.<br>• ALFs are a huge market in the UK. The majority of elders in the UK live in ALFs.<br>• They use a mobile care monitoring software in ipod devices, so that they can have the handout from the previous shift, the care plan for each tenant and be able to evidence care for all service users. Having all the tenant information available anywhere anytime is necessary for carers that saves them a lot of time.<br>• There's a need for intercommunication among the staff members in case something unusual happens to the tenants and the carer needs immediate help or advice on what to do.<br>• She thinks that most of the elders wouldn't be able to use it, since most of them have mental issues or aren't very familiar with technology.<br>• A useful feature of the product for the tenants' rooms would be to remind them of the daily plan, for example, before lunch time or before the activities that take place throughout the day. Medication reminders though, wouldn't be useful since the carers want to make sure that the tenants take their pills, because they have big responsibility on that.<br>• She likes the idea of talking to the tenants through a camera first, check what exactly they need and then act, because often, they ask for things that can be answered at a distance without the need of carer to be present in the room. In this way, she could save some time and energy to spend elsewhere. |

| | |
|---|---|
| Feedback | • The staff of the care home she works, doesn't include doctors. If doctors are needed, they come to the care home, talk to the managers in order to be informed about the patient's situation and health record and then they visit the patient. She thinks that even if the digital nurse was available in the elder's room, doctors wouldn't use it because face-to-face briefing is preferred. Doctors need to know about the patients from a person and managers want to transfer the responsibility to the doctors. |

**Table D.2:** Interview 1

| Interview 2 | |
|---|---|
| End user | Doctor in public hospital |
| Location | Greece |
| Age | 27 |
| Gender | Female |
| Date | 19/10/2018 |
| Feedback | • One of the major issues the hospital is facing is that there is no electronic record for the patients. Everything except for lab results, are only written by hand in a book or papers that often get lost or are difficult and time-consuming to find.<br>• She thinks that it's not a product for public hospitals, especially for University hospitals. Doctors will most probably won't use it because every time doctors are to visit a patient, they don't go alone. They always do it in groups consisted of student doctors, apprentice doctors and the experienced ones. The briefing is done by the first two and the senior doctors ask them questions, so the whole visit is transformed into a small lecture. This is a standard process that makes the digital nurse needless for doctors because they go there prepared.<br>• Another reason why it's not a product for public hospitals is that rooms usually include a lot of patients, even eight per room. This means that even if the patients used earphones, it would still be annoying especially if all of them talked at the same time.<br>• She likes the idea of a light color on the screen, that can instantly help her understand if the patient's condition is improved or impaired. For example, when asking for the temperature chart, a green color on the background could mean that everything's fine and a red one could mean that the patient's temperature is not normal.<br>• She thinks that the digital nurse would be useful for doctors working in private hospital because the number of patients is normally smaller than in public ones and it would help them save time.<br>• It would be weird to talk to a machine when other people are present. Maybe after a period of using it, she wouldn't feel that uncomfortable. |

| | |
|---|---|
| Feedback | • She likes the idea of talking to something in her office, that automatically writes what's said, for example, a diagnosis.<br>• Checking the patient's condition from a distance is not preferred. Doctors and nurses need to go and check the patient face-to-face and see the whole clinical condition.<br>• She likes the digital nurse to show medical examinations like blood sample test results, radiographs etc.<br>• She demands that the product work perfectly every time and there are no delays.<br>• She finds the product useful, but not necessary. The priority for the hospital she works in is an electronic system for keeping information about the patients. |

**Table D.3:** Interview 2

| Interview 3 | |
|---|---|
| End user | Nurse in public hospital |
| Location | Greece |
| Age | 54 |
| Gender | Female |
| Date | 26/10/2018 |
| Feedback | • They use a software which only includes the patient's personal information and lab results.<br>• The basic problem is that everything is written on paper pages, which are often lost or fallen on the floor from the patient's bed.<br>• One of the departments was equipped with a product like the digital nurse for the patients' beds. It was a touch screen, attached to each bed, which could be used by the patient to watch TV or surf the internet and doctors to see the patients health record and lab results during their visit. It wasn't useful for the doctors because they wasted a lot of time using the screen. There are a lot of patients in this university hospital and every morning a team of doctors visits each and every patient. If they don't check the patient's archive before the visit and write down the most important things, they don't have the time to visit everyone. Now, it is only used as a TV as most young patients prefer to use their smartphones for the internet.<br>• There are alarm buttons in the rooms and when the patient pushes it, the nurse can answer from her room and the patients can listen to her. The problem is that when the nurse talks, then all the patients inside the room respond and it doesn't work. That's why they just run to the rooms when they hear the call. |

| | |
|---|---|
| Feedback | • It would be useful if she could watch the patients during the night shift, to check if they are sleeping.<br>• Patients often call the nurses to turn the lights on or close/open the window, so it would be beneficial to both if patients could control the room on their own.<br>• She would like to filter the patient's call first. For example, really often the patients ask for a painkiller. So, the nurse has to go to their room twice. Once to hear that the patient needs the painkiller and once to bring it to him/her. In addition, patients often call by mistake. If nurses could filter, they could save time for someone else in need.<br>• During the visiting hours, it is difficult for her to do her job, because there are a lot of people moving inside the rooms and out. Also, when the visiting hours are over they keep asking visitors to leave.<br>• She would show resistance to change at the start and it would feel weird to talk to a screen but if she had to use it, she would learn how to use it and adapt.<br>• Doctors don't need the nurses before visiting the patients. That's not a reason why a doctor would use the product.<br>• Often, the patient's health card, which is attached to the bed, is illegible, there is not enough space to write all the measurements and there is nothing to show what time each measurement was taken. Storing the measurements right after they are taken and record the specific time of each measurement through voice command would be very helpful.<br>• It might be a good product, but machines will never be able to replace a nurse. When patients call the nurses, it's mainly because they need to feel that someone takes care of them. They need someone to tell them that everything will be fine.<br>• She thinks that young nurses would use the digital nurse, not because they are more familiar with technology, but because most of them focus only on the professional and not on the sentimental part of the job. |

**Table D.4:** Interview 3

| Interview 4 | |
|---|---|
| End user | Carer in public care home |
| Location | Greece |
| Age | 54 |
| Gender | Female |
| Date | 27/10/2018 |

| | |
|---|---|
| Feedback | The care home doesn't accept elders with mental issues. The product would not be used by none of the actors. What elders need is not someone to close the window for them, but to see and talk to someone who comes to close the window. What the carer's job include, is not to talk to the tenants from a distance, but visit them and make them happy just by showing their interest. There are no doctors in the care home. An external doctor visits them once a week, but what he mostly does is comfort and pamper them. |

**Table D.5:** Interview 4

| Interviews 5 and 6 | |
|---|---|
| End user | Nurse and carer in public nursing home |
| Location | Greece |
| Age | 38 and 47 |
| Gender | Female and male |
| Date | 1/11/2018 |
| Feedback | • They keep record of the elders' health but everything is written on paper.<br>• There are no doctors working there. Only in case of emergency, the ambulance is called and takes the patient to the hospital.<br>• Most of the tenants are very old and have mental issues.<br>• During the day, the carers get the tenants up and off their beds and try to minimize the time they lie in bed. So, a product attached to the beds would not make sense for them.<br>• The communication through the product's camera wouldn't work. Regarding the communication with family members, it is forbidden by law to share images from the tenants' personal life inside the nursing home. In case the relatives share or publish such photos, the nursing home can be in trouble. Regarding the communication with the nursing staff, the building is small, they are always in the tenants' rooms or nearby, so it wouldn't be useful for them.<br>• Reminders for medication are not a good feature. All of the tenants who went to live there, did so because they are in need of someone to take care of them. Even with the reminder on, it is still possible for them to forget their pills. Also, the carers want to give them the pills themselves and make sure that they swallow them.<br>• They are not sure if they would talk to a machine. They prefer to use the touch screen.<br>• They wouldn't change the way they work. After almost 25 years of experience, their job is routinized but also optimized.<br>• What the tenants need is company. When they see someone going in their room, you can see the light in their eyes. They are happy. |

| | |
|---|---|
| Feedback | • The carers job is taking care and this is something that cannot be done from a distance. It requires personal contact and psychological support.<br>• The smarthome package for the tenants rooms would be extremely helpful, given that the tenants are able to use it. Making them feel independent would make them feel better. |

**Table D.6:** Interviews 5 and 6

| Interview 7 | |
|---|---|
| End user | Physiotherapist working independently and as a private employee |
| Location | Greece |
| Age | 30 |
| Gender | Female |
| Date | 10/11/2018 |
| Feedback | • When she has new patients, she asks them what they feel, how it happened to them, where they hurt, how long they have their issue. She only asks for medical record in extreme incidents. She reads it and writes it down once. It doesn't make sense to her to check it every time she visits the patient at home.<br>• She used to work with football teams for usual muscle issues and she was doing the therapies, after communicating with the team's doctor. So, she didn't have to check any health record. She was just following the doctor's instructions.<br>• The only problem she has is that she gets nervous before each session because she has to finish what needs to be done in a specific timeline.<br>• She would like to have some data stored in a software. Data like the dates she visited her patients, what therapy she applied, what was the result or how to continue at the next session.<br>• She thinks that the product would be more useful for a rehabilitation center because unlike her, who has standard patients and know their issues, the rehabilitation centers host new patients all the time and it's impossible for those who work there to remember every patient's situation.<br>• The room control via voice command is something necessary for people who cannot easily move. There is no other way to do it. |

**Table D.7:** Interview 7

| Interview 8 | |
|---|---|
| End user | Ex patient in public hospital |
| Location | Greece |
| Age | 28 |
| Gender | Male |
| Date | 14/11/2018 |
| Feedback | • It would be weird to talk to the screen especially if there were other people in room.<br>• He would use it for calling the nurse instead of having someone else do it or pushing the emergency button.<br>• He would use it to surf the Web, because there is no dependency on battery like smartphones, but he would talk with his smartphone to his loved ones.<br>• The reason he needed to call the nurse was to ask for a painkiller or tell her that the saline or liquid drug was going off.<br>• He didn't choose the hospital. He was suggested to a doctor for the operation and this doctor was performing his operations there. So, the decision was made based on the doctor. |

**Table D.8:** Interview 8

| Interview 9 | |
|---|---|
| End user | Nurse in public hospital |
| Location | Greece |
| Age | 47 |
| Gender | Female |
| Date | 16/11/2018 |
| Feedback | • There is a big workload and more nurses are needed in order to cope with it.<br>• Bureaucracy and paperwork are very annoying and time consuming. The doctor's handwriting is usually illegible and she needs to have all the necessary information about the patient in a digital form.<br>• "If only patients could be more independent inside their rooms!". Patients keep calling the nurse for turning the lights on/off, close the window or the curtains. This is extremely time-consuming and tiring as well, because the hallway she has to pass to reach the rooms is very long.<br>• The patients really often argue on what to watch on the common TV inside their room.<br>• Often, patients call her, she goes to their room, they ask for a painkiller but she can't give them one, since there are specific times a day that they can have it.<br>• She thinks that the product would be very useful because nurses would stop spending time and energy on unnecessary things. |

| | |
|---|---|
| Feedback | • Even if someone has a problem talking to a machine, it will be so useful that they won't bother.<br>• Another big problem is the visitors. They keep the nurses busy, asking a lot of questions all the time, demanding an update for the patients even if they are not first-degree relatives. They have an opinion on everything and they make it difficult for the staff to move.<br>• If the patients were in perfect mental condition, she would definitely set medication reminders for them.<br>• They have an intercommunication system, but every time the nurse talks, all the patients start responding simultaneously.<br>• She has worked in facilities, in which there where monitors for the patients' vitals, or liquid drug intake and she knows how important it is to check all the patient's condition constantly and from distance and also be able to act or call the doctor exactly when the problem is perceived. Even if she could check the patients via a camera through the night shift it would be helpful. Check if they are asleep, if they are calm or they keep changing sides.<br>• Regarding the alarm button, a lot of patients push it by accident. It would be useful to first see what's happening with the video call but this is not helpful for all departments. For example, in the surgical departments the nurses have to run to the patients rooms immediately when they hear the alarm. Also, in case it's not a button but a pulling rope, it gets tangled all the time. |

**Table D.9:** Interview 9

| Interview 10 | |
|---|---|
| End user | Doctor in public hospital |
| Location | Greece |
| Age | 33 |
| Gender | Female |
| Date | 16/11/2018 |
| Feedback | • The biggest problem is the visitors. Visitors mean noise, difficulty to move inside the rooms and hallways but most importantly they increase the infections rate, which is dangerous for the patients, since they are vulnerable.<br>• Before visiting the patients, qualified doctors have a file per patient, including their health and medical information, which they read carefully. They use a lot of paper, they may be displaced in the wrong file or they may be lost. Furthermore, it is difficult for a doctor to remember all the medical information of all the patients. It is necessary to have these files in a digital form and combined with the digital assistant, doctors can save time and do their job faster. |

| | |
|---|---|
| Feedback | • It would be helpful if the screen could show the patient's health record and allergies in red color.<br>• At the beginning, it might be weird to talk to the screen but it's going to be necessary, exactly like what happened with smartphones.<br>• It goes without saying that only doctors will have access to the patients medical information including their diagnosis. Doctors don't say everything to the patients. At least not until they are 100% sure about their diagnosis. Even if there is a suspicion about something important, they need to first confirm it and then announce it to the patients. So, she would like to use a card or a pin to have access to the product.<br>• At this point there is a big number of patients that are immigrants and can't communicate with the doctors. It would be helpful to have a translating voice recognition system, that instantly translates what is said. |

**Table D.10:** Interview 10

The next interview was a little bit different from the rest. It did not include an end user but a member of the so-called "Ideas clinic" (Idéklinikken) in Aalborg University hospital. The ideas clinic is an innovation department that aims to bring good ideas to the market, ideas related to professional health care. All kinds of ideas and inventions are welcome and they may come from the clinical staff, patients or relatives. The contacted person was the project manager of this department and the interview aimed to get feedback on the product idea and ask for more contacts in Aalborg University hospital.

| Interview 11 | |
|---|---|
| Contacted person | Member of the Idéklinikken in Aalborg Universitetshospital |
| Location | Aalborg |
| Date | 19/11/2018 |
| Feedback | • Once, they tried to put a product like this in the hospital for doctor use, but it didn't work. It's really simple to extract patient data and show them on the screen, but it's just very expensive to extract the right ones. In order to make sure that the right data are extracted, the software companies had to revalidate some processes in order to be able to carry the CE marking. So, they decided not to go on with this product. |

| | |
|---|---|
| Feedback | • The goal is to save money on everything and they have to work faster, so there is a high barrier to entry in the Danish hospitals. Their biggest issue right now is to get all five regions in Denmark, work with the same software, so that patients' health record is available everywhere in the country.He sees the value when it comes to nurses and patients. It's easier for the patients to have a lot of services in one screen. The nurses don't have to walk all the time. It's just not part of their priorities right now.<br>• A big concern is that if screens are placed in the patient's rooms then human contact will be avoided and nurses really want to have contact with the patients and be there for them. Although they are charged with a lot of tasks, they can't reach the professionalism of being a nurse without the personal contact. On the other hand, if they can save time with the product, then they are going to have more time to spend with patients. That's why the value of the product needs to be validated.<br>• It would be easier to enter the ALFs with this product. The value there, would be higher since the nurses working at ALFs are not as many as in hospitals. Also, an ALF is a smaller organization, less rigid and the legislation is not as strict as in hospitals.<br>• Resistance to change will definitely not be a problem as long as something creates real value to the staff, regardless of age. They haven't had such issues so far. If they can do it faster or cheaper, then it's valuable.<br>• Visiting hours is not a problem for them. Doctors and nurses are not obstructed by the visitors.<br>• Voice recognition technology is not something common in Denmark. So it might be a barrier to entry.<br>• Another barrier is the fact that hospitals are demanded to host the patients for as shortly as possible. So, if a patient is hosted for one, two or three days, it is difficult and time demanding to explain the patients how to use the product and maybe nurses are going to spend a lot of time on that. On the contrary, in the ALFs the tenants live there for a long period of time and it can be a part of their everyday life, which makes the product more applicable there. |

**Table D.11:** Interview 11

| Interview 12 | |
|---|---|
| End user | Physiotherapist in private rehabilitation center |
| Location | Greece |
| Age | 30 |
| Gender | Male |
| Date | 21/11/2018 |
| Feedback | • The screen could show to the patients with pictures how to do specific exercises.<br>• He definitely needs the screen to show him the patients' vital measurements while visiting them.<br>• When the physiotherapists start their day in the rehabilitation center, they get the handover from the previous shift but it's very difficult to remember what happened to each patient. So, it would be useful to have the handover information available on the screen.<br>• In general, when you need some information, you want to have it immediately and this is a need that could be covered with the voice recognition technology. It will help them save time.<br>• He would like to check the patients' FIM (Functional Independence Measure) chart on the screen. Right now they have all the information needed written on papers, which often get lost.<br>• He thinks that doctors would like to check each patients medication on the product's screen.<br>• When physiotherapists visit the patients they often need to talk with the doctors. There is a telephone on the bedside table but it's difficult to reach it because their hands are occupied holding the patients and helping them do their exercises. That's why he would like to use the product to be able to video call the doctors.<br>• It is also definitely useful for nurses, too. They could save a lot of time especially those working at a rehabilitation center, in which the nursing staff is limited.<br>• The patients keep calling the staff for turning the lights on/off so the smart room control would be extremely helpful for the staff.<br>• Patients argue about the TV all day long. So, having their own TV is important.<br>• Nurses would like to watch the patients through a camera to check their clinical picture from a distance, so that they can understand if their condition improves or deteriorates.<br>• At the rehabilitation center all patients have their care plan. They have it available on the bedside table written on a paper. It often gets lost and old people cannot read it, so when they forget the plan, they ask the staff all the time, keeping them busy. Access to the care plan for patients and their companion would be great and time saving for the staff.<br>• There won't be an issue talking to a machine given that end users gain value from it. |

| | |
|---|---|
| Feedback | • This is not a product for all incidents. For example, what physiotherapists want from people with stroke, is to try to move their fingers, because this will help them. If they have the digital assistant and they can do some things without trying to move, it will not help them improve. For example, lowering the bed by pushing a button versus voice command. This is also true about visually impaired people. When they lose their sight or part of it, all the other senses get stronger. So, when they get used to controlling a lot of things with their voice, then these senses don't improve that much.<br>• When doctors visit the patients they carry with them a drawer with all the patients' information on paper and a small laptop. Of course they are updated for each patient before visiting but still, it's impossible to remember each detail. When they need to check something specific, they open the drawer and look for the paper they need, but papers often get lost. So, the product would be useful for them.<br>• Visiting hours is a big problem. There are a lot of visitors that make it difficult for the staff to operate. If the product can decrease the number of visitors, it would be great. |

**Table D.12:** Interview 12

| Interviews 13 and 14 | |
|---|---|
| End user | Nurses in public hospital |
| Location | Greece |
| Age | 37 and 48 |
| Gender | Females |
| Date | 2/2/2019 |
| Feedback | • The workload is huge but the number of nurses is small.<br>• Their job includes a lot of walking, which is exhausting and time-consuming.<br>• Patients call the nurses all the time, often not for an important reason.<br>• Visitors don't respect the visiting hours, they come and go whenever they want, which is something that hinders the nurses.<br>• Mainly young patients use the TV inside the room and they often argue on the volume or what to watch. Individual TV's would definitely work but only with ear phones.<br>• Patients call the nurses all the time to adjust their bed because it can only be done manually and most patients can't do it alone. It would be nice if patients could do it alone. |

| | |
|---|---|
| Feedback | • Video calls between nurses and patients would be very helpful, they would save time and get less tired by walking to the rooms half the times they do now and they would visit the room prepared with the necessary equipment. For example, if the patient calls and says that he thinks he's got fever, the nurse will take a thermometer with her and visit only once. Also, they may call the nurse and if she doesn't visit immediately, they call again and again. If she could see them from the screen and tell them that she will go there but in five minutes, then they would wait without calling again.<br>• Many old people call the nurses and say that they don't feel well because they are scared and want to feel that someone is there for them.<br>• The main reason they would use it is to be able to filter what the patient needs before visiting.<br>• She would like the digital to nurse to play some relaxing music so that patients can sleep easier and without taking sleeping pills.<br>• No matter how helpful the digital nurse may be, they will definitely need some time to adapt to its use and accept it but of course they would use it.<br>• They would like to get a notification when the catheter is full or a liquid drug is empty, so that they can change it.<br>• If they had a prototype there to see and use, they could tell me more about how else it could serve them.<br>• They would like to watch the patients thorough a camera system during the night shift.<br>• Voice recognition technology is more helpful for the patient compared to touch screen. They don't mid talking to a machine as long as it's helpful and it might also give the user more professionalism. |

**Table D.13:** Interviews 13 and 14

| Interview 15 | |
|---|---|
| End user | Doctor in public hospital |
| Location | Greece |
| Age | 58 |
| Gender | Male |
| Date | 5/2/2019 |
| Feedback | • Patients need to feel that somebody is there for them. They need a real nurse and not a digital one.<br>• With or without the digital nurse, doctors will always need a nurse with them when visiting the patients, in order to give them instructions for every patient. |

| | |
|---|---|
| Feedback | • The product would be very helpful for doctors but not during the morning visit, when a team of doctors visit each and every patient because it would slow them down. What he wants to have available on the screen is the patient's medication, medical examinations and vital signs.<br>• Papers with patient's information and vital signs measurements are not illegible.<br>• When a doctor visits a patient, he carries the patient's file, where he can check everything regarding the patient's condition.<br>• The digital nurse would help only to check something specific about a patient and not all of his data at once.<br>• The product's upside is not that it works with voice recognition but that you have the information easily available.<br>• Paperwork may be reduced.<br>• Young doctors would love the product.<br>• He has no problem talking to a machine or changing the way he operates, as long as it offers value.<br>• Medication is given to patients by nurses according to the doctor's instructions and they have to make sure that the patient took the pill. So, medication notification for patients is useless.<br>• When nurse hear the nurse call, immediately run to the patient.<br>• England has a market for the product, because patient's data and medical record are all electronic and it's easier to share these data on a screen. |

**Table D.14:** Interview 15

# Super Wise Network E

What is the Super Wise Network?

First and foremost the SuperWiseNet (SWN) is part of the supervision of students in the Entrepreneurial Engineering (EE) masters program and a networking activity for the program.

So the main purpose is to strengthen the EE student's projects by bringing new eyes and perspectives from invited internal and external people part of the wider SuperWiseNet that we try to build around the EE program.

For people new to the program it is an opportunity to connect, and have a quick look into the on-going work in the program through project pitches and discussions as well as to meet new colleagues.

For people already part of the SWN it is the place to get inspiration and an opportunity to sustain and expand the networking and perhaps be further involved in the program.

As part of the supervision, two Super Wise Network meetings took place. The first one was held in November 2018 and the second in April 2019. Both of them were attended via Skype. The first SWN included a ten-minute presentation, followed by a ten-minute feedback round from the audience, while the second SWN included a six-minute presentation, followed by a six-minute feedback round. For each SWN, it was necessary to prepare a one-pager (Figures E.1, E.3), including the essence of the addressing problem, so that the audience know a little bit about each case, before the meeting. The presentations (Figures E.2, E.4) included the status of the project, the essence of the addressing problem and asking for feedback in specific areas.

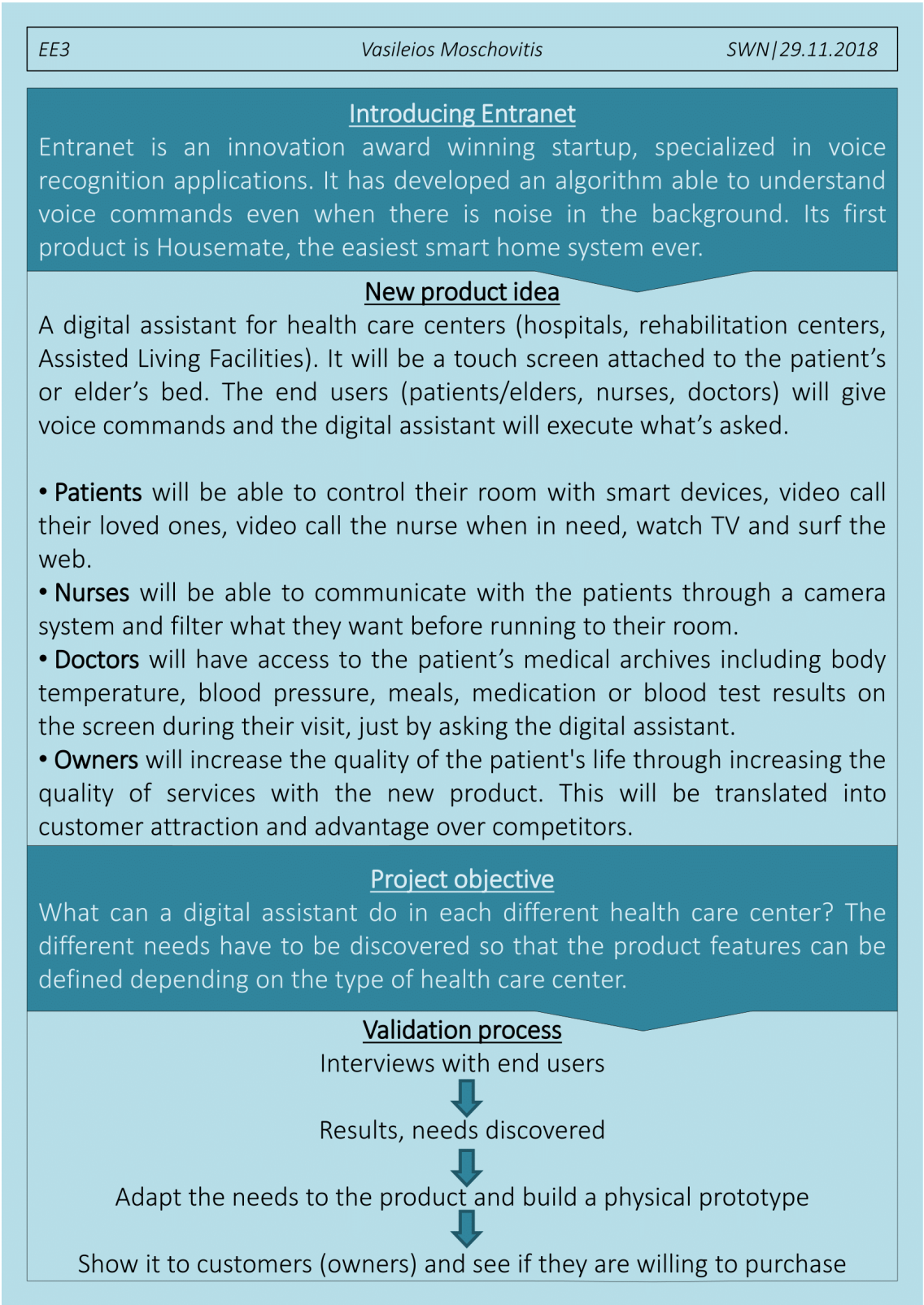



**Figure E.1:** One-pager for the first SWN

## SWN

AALBORG UNIVERSITY

Entrepreneurial Engineering
3rd semester

Vasileios Moschovitis

29/11/2018

## The company

ENTRANET

## The awards

1

NATIONAL CHAMPION 2015, IN INNOVATION

2

awarded by wider

3

SOCIAL CONTRIBUTION AWARD

4

European Commission

## World presence


## The technology

speech recognition accuracy that reaches

97%

and

talk!

## The main product: Housemate

almost plug & play!

## The new idea


Digital assistant

Health care

## The customers

**End users**

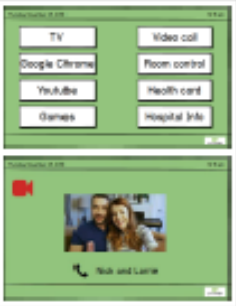
- Patients/elders
- Nurses/carers
- Doctors

**DMUs**

- Owners
- Managers

## Patients/elders

- Room control
- Communication with family
- Communication with the nurse
- Internet access
- TV

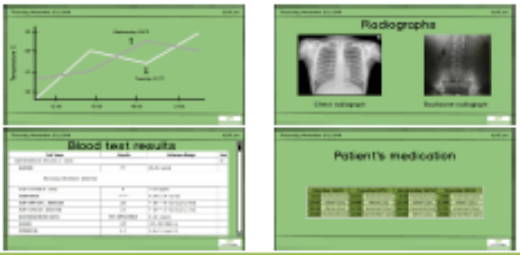



## Nurses/carers

- Communication with the patients/elders


## Doctors

- Access to the medical records and patients' measurements




## Owners

- Customized solution
- Happy staff
- Better services

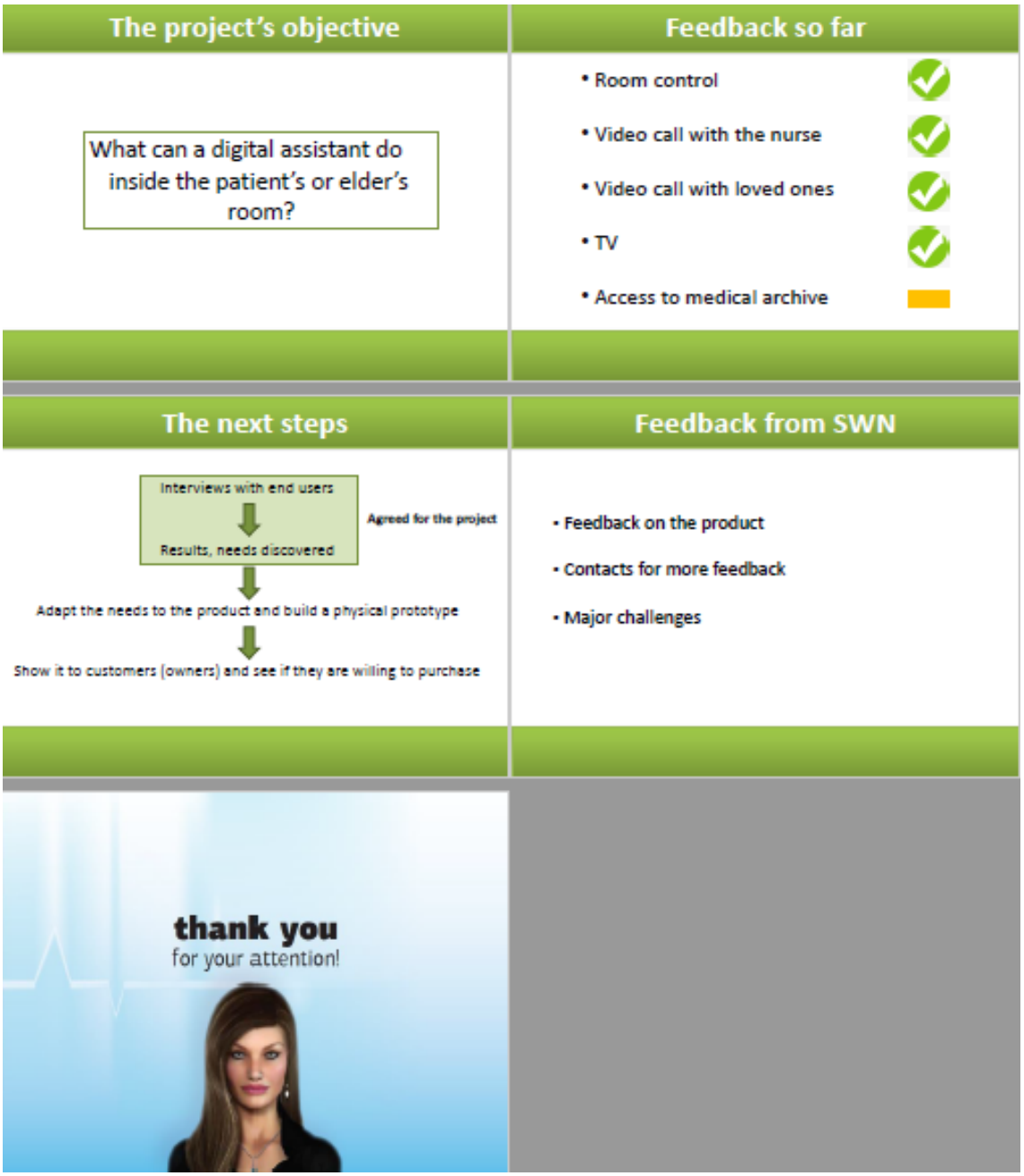



**Figure E.2:** Presentation for the first SWN

EE4 Vasileios Moschovitis SWN|26.4.2019

ENTRANET

Entranet is an innovation leader, developing speech recognition/voice synthesis consumer applications for the interaction between people and smart devices. Its mission is to create and promote innovative technological solutions that make life simpler and easier for everyone.

The startup's new product idea is the so-called "digital nurse". It will be a digital assistant for health care centers (hospitals, rehabilitation centers, assisted living facilities). It will be a touch screen attached to the patient's or elder's bed. The end users (patients/elders, nurses, doctors, physiotherapists) will give voice commands to the screen and the digital assistant will execute what's asked.

"What can a digital assistant do inside
a patient's or elder's room?"

## Validation process

1. What do we need to learn?
2. Identify the key assumptions
3. Build the Minimum Viable Product
4. Test the key assumptions
5. Pivot or persevere

**Figure E.3:** One-pager for the second SWN

ENTREPRENEURIAL ENGINEERING
Super Wise Network
Semester 4
Vasileios Moschovitis
THE STARTUP
ENTRANET
Speech recognition applications
THE GOAL
"What can a digital assistant do inside a patient's or elder's room?"
THE PRODUCT
• product: Digital nurse
• end users: Nursing staff, medical staff, patients/elders
• facilities: Hospitals, assisted living facilities, rehabilitation centers

## THE VALIDATION PROCESS

Things to learn
Key assumptions
Minimum Viable Product
Test key assumptions
Pivot or persevere

## THE THINGS TO LEARN

- if owners of health care centers are interested in the product
- if end users are interested in the product
- value for the owners
- value for the end users
- if patients would prefer a health care center that uses the digital nurse
- if people show resistance to change
- if the suggested product features fit the needs
- discover the needs in different health care centers
- new product features
- how people feel when talking to a machine

## THE EMPIRICAL WORK

| Time period | October 2018 - March 2019 (6 months) |
|---|---|
| Interviews average duration | 20 minutes |
| Observations average duration | 1 hour |
| Number of interviews | 53 |
| Number of observations | 5 |
| Number of health care centers | 13 |
| Number of health care centers in Greece | 11 |
| Number of health care centers abroad | 2 |

## FEEDBACK ON...

- the things to learn
- how to better analyze the raw material


**Figure E.4:** Presentation for the second SWN