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EIT Digital Summer School I&E students project report


Catarina Allen d'Avila Silveira, KTH ,catarinallens@gmail.com

Salvatore Fadda, Politecnico di Milano, salvatoref1996@gmail.com

Maria de los Llanos Martinez, marymv2@hotmail.com

Paulina Szymaszek, Aalto University, paula.szymaszek@gmail.com

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# 1. Executive summary

Veronica is a remote Virtual Reality physical rehabilitation solution that enables patients to have access to personalized care from the comfort of their own home while still being monitored by healthcare professionals. Our product is tailored to the younger active population that suffers from strokes, aged 50-65s, in the post-acute phase of treatment, in which the patient is already capable of exercising a multitude of tasks and motion sickness is not an obstacle. The patients have access to our product through private clinics, making us a novel bridge between self-administered home rehabilitation and on-site hospital care.

Vronica stands out from similar products for its gamified and engaging feel. It was build from day one from a user-centred point of view and backed up by new findings on mirror therapy for rehabilitation of skills. It is incredibly more time and cost efficient and it allows for further analytics on patients progress not possible on traditional physical therapy.

We could not have developed Vronica in the two weeks of our summer school without the help of our mentor and business development professional specialized in Accelerating the growth of innovative companies, Siim Saare. Anneli Lebert, a Lead Therapist in the Ambulatory Department at North Estonia Medical Centre, also gave us feedback on our product more than once and revealed it to be essential in shaping up our product. Triin Naudi, who was a mentor for another team, was always available and has first hand experience dealing with patients and physical therapy, so she met with us multiple times to discuss our progress and brainstorming results and also gave us the contact of one of her patients who we would also like to thank, Elen Kirt. Furthermore, we must thank Priit Kruus, the Summer school organiser and Start-up mentor at Estonian Connected Health Cluster, for his patience and guidance throughout the two weeks and finally Sheiladen Aquino from the Strokeless team for providing us with documents and help as we were dealing with the same topic.

# 2. Problem and solution

The case that was handed us was to solve the underlying problems in the sequence of steps that a patient goes through when suffering and recovering from a stroke, from its initial symptoms to its final recovery stage at home accompanied by family members. We

were challenged to think and brainstorm about the users we would be designing for and for each moment of the customer journey they go through in the traditional pathway of stroke rehabilitation and any enhanced alternative might come up with.

In a nutshell, 15 million people suffer from a stroke worldwide each year. Of these, 10 million survive and 5 million are permanently disabled. Although it mainly affects elderly people, 25 percent occurs in patients younger than 65 years. However, there are very limited and mostly one-size-fits-all solutions focusing on the long-term recovery of these younger patients. Generally, individual rehabilitation sessions are expensive and many stroke sufferers find it difficult to commute. We also identified a real need to greatly support and closely monitor stroke patients who often struggle with motivation. Traditionally, stroke patients can choose between physical rehabilitation which can be cumbersome, time consuming since it requires transportation and is just not personalized or , for the most part, particularly focused on motivation or wellbeing. Alternatively, they can purchase expensive equipment or search for existing pre-recorded exercises online to practice independently but be left without the supervision of a professional.

In order to solve the above mentioned problems, we're planning to be the bridge between the patient and the clinicians by providing an innovative approach to rehabilitation turning it into virtual remote physical therapy [6]. We realized the current urgent need for a remote alternative, especially in the light of Covid, where closer F2F interaction is risky and restricted. In fact, since the current pandemic situation , video call physical-rehabilitation were now the go-to option for therapists, somehow validating the feasibility of our concept.

Our solution is a home rehabilitation service for stroke patients in their post-acute phase of recovery providing gamified (both physical and cognitive) exercises witnessed by a real-time avatar mirroring the patient themselves to better engage them in the therapy. For physiotherapists, we offer a digital platform that supports simultaneous monitoring of multiple patients and assessment, comprehensive overview of their progress thanks to automated analytics (both quantitative and qualitative). Our platform is available both through a mobile application (for the patients) or a website, and we also offer F2F support during onboarding and in case of technical issues fostering a collaborative approach.

Below we present the whole user journey from the purchase until the end of usage of our solution.

After suffering from a stroke, the patient needs to stay in hospital for a couple of weeks. Later on, if their state is stable, the patient is prescribed rehabilitation. One of their options for rehabilitation is to go to a private rehabilitation clinic. Once there, in a doctors consultation, if the doctor thinks the patient is well enough to be able to practice independently at home, he may suggest they try our product, VRonica, for a novel, higher-tech and more personalized rehabilitation. If the patient agrees to, he will get

acquainted with all the home equipment (cameras and optionally VR headset) he is taking home and the physiotherapist he will be virtually working with. From then on the patient books slots in the physiotherapist's schedule via mobile application or website according to the treatment plan he has been subscribed to. Alternatively, the patient can exercise whenever they want without booking a slot. Then the exercises will be without specialist supervision but the patient's results will be still saved in the system and visible to specialists. Whenever his session is about to start he can just switch on the wall projection or put on his VR headset and be guided through the movements by an avatar that resembles himself in the VR reality. Seeing yourself executing a movement you cannot yet do has been proved to be extremely stimulating and motivational for faster progress in physical rehabilitation, as coined *Mirror Therapy*. From the physiotherapist's perspective, back at the clinic she/he can monitor several patients simultaneously and both contact or be contacted by any patient during the session. Once the session is over, the patient can have a chat with the physiotherapist and adjust the treatment if needed. During the whole rehabilitation period the patient may have additional physical check-ups at the clinic if need be (however it is beyond the scope of VRonica service). Once the prescribed rehabilitation period (patient's subscription) is over, the physiotherapist decides if the patient needs to prolong it or can finish using VRonica. Data gathered throughout the process may help reach this decision easier. Once the subscription is terminated the patient returns the hardware to the rehabilitation clinic.

### Nature of the innovation in the proposed solution

The innovative aspect of our solution is a really engaging, bespoke, home rehabilitation process, using pioneering technology, a wall projection animated display and/or VR headset combining real time consultation with the physiotherapist for a closer monitoring purpose. Every single gamified 'experience' is tailored to the patient, according to their level of 'ability' (physical and cognitive).

### Role and impact of ICT technology in the proposed solution

The field of VR has developed dramatically over the past decade, yet the innovative opportunities of the technology are still to be explored. Our solution utilises VR to reimagine the stroke rehabilitation process by turning mundane exercises into an engaging experience in which the patient is constantly guided and supported by a virtual avatar. The most updated evidence suggests that specific mirror therapy tasks, when in combination with other types, have the potential to drastically improve the speed and effectiveness of the rehabilitation itself [2][3][4].

Due to the ageing of the European population and the strong association between stroke risk and age, the numbers of people having a stroke continues to rise. Using data from the Global Burden of Disease study 2015, and demographic projections obtained from

Eurostat (statistical office of the EU), approximately a 34% increase' [1]. A faster and better rehabilitation process means a faster back to work reincorporation for the patient and subsequent positive socio-economic impact.

From the well-being perspective, there is no doubt that improved outcomes and widespread use of this type of therapy will provide much relief to not just patients themselves but also to long-suffering family members. It is a win-win situation.

# 3. Business modelling and planning

## 3.1 Business modelling

**Business model (main 'boxes' of the BMC canvas)**

We're aiming for a B2B format in which we get hardware and cloud computing from two different suppliers, we then internally personalize the hardware equipment with our branding, we produce software and manage the database. Once the service is ready, we sell it to private rehabilitation centers. We adopt the subscription model for the software and sell the hardware per item. The rehab centers then provide the patients rehabilitation with VRonica. The patients, in turn, subscribe for the service for a prescribed (by the physiotherapist) period of time. Then they rent the hardware from the hospital and receive physiotherapist support.

**Value proposition**

We provide an innovative approach to stroke rehabilitation through remote and engaging therapy by giving the patients an access to bespoke, fun and gamified exercises. Our solution increases the effectiveness and efficiency of physiotherapists' work by offering them an easy to use digital platform, reducing workload and bureaucracy through automated analytics.

**Industry value chain**

Our value chain begins with purchasing the hardware (VR headsets and cameras) as well as the cloud infrastructure from our suppliers. Later on we build our software upon it and once the service is ready, we sell it to private rehabilitation centers. These centers monitor the patient treatment using our service and customize it for each patient. The client, in turn, subscribes for rehabilitation with VRonica at the center and receives access to the platform and rents the hardware from the center.

**Market segments**

The users of our solution are both stroke patients and physiotherapists working in private clinics. More specifically, the target patients are under 65, who, despite having suffered one or more strokes and being in the sub-acute phase, are now more able (cognitively and physically) and could benefit from this VR therapy as well as the closer guidance, feedback and regular motivational support for a speedier recovery [10]. The physiotherapists specialized in stroke rehabilitation are the second group of users. Their roles and scope of practice has been enhanced and they are digitally aware which make them extremely versatile and marketable in their field of work for the foreseeable future. The customers, in turn, are private rehabilitation clinics (initially) but could also have great scalability potential [5].

**Competition**

Our main competitors are products that provide an alternative to traditional physical therapy such as Nintendo Wii [7], Rewellio [8], evolv [9], Saebo [11].... All of them, however, try to reach all stroke patients instead of focusing on one customer segment thereby not tailoring their product to a specific user. The biggest difference is that they do not connect the patient with a therapist on live sessions nor do they make the rehabilitation experience particularly motivational or gamified.

**Market potential of the proposed business**

The estimated number of strokes in Europe in 2020 is 664.804, of which 166.201 cases happen to people younger than 65. There are 719.000.000 Euros of market potential if we manage to sell our product to 3000 rehabilitation centers in Europe.

**Benefit/competitive advantage of the product or service**

Our competitive advantage lies in the engaging and motivational aspect of stroke rehabilitation rather than just physical progress through gamified exercises. A unique feature of VRonica is the focus on mirror therapy with its own avatar and multiplayers functionalities with family members. We call ourselves ‘A bespoke, enhanced and fun rehab experience’.

In the future, we see a lot of possibilities experimenting with more complex XR technologies or added gear for more interaction. There is also a huge potential in expanding to other healthcare rehabilitation fields. On a later stage, we plan to explore how AI could help measure progress and further adapt each patient's treatment to their pace.

**Ethical, societal, sustainability considerations and impacts of/on the proposed product, service, business**

Our solution has big societal impacts since it aims to increase the quality of healthcare; most importantly it increases effectiveness of stroke rehabilitation. Thanks to decreased time spent on each patient, physiotherapists are able to treat more people, which in turn reduces the cost of treatment. The collaborative and engaging nature of our product, tightens the bounds between family members and makes the patient's recovery a common goal. Additionally, remote rehabilitation reduces the carbon footprint since it eliminates the need of transportation.

## 3. 2 Business planning

**Global market trends**

There's a current urgent need for telemedicine, especially in the light of Covid, where face to face interactions are risky and restricted. Moreover is a real need to greatly support and closely monitor stroke patients who often struggle with motivation. Simultaneously, we can observe increased acceptance of the VR technology. There is also ongoing understaffing in the area of stroke rehabilitation and need to increase the number and capacity of stroke units. [1]

**Go-to-market / market access approach**

We plan to enter the market by establishing partnership with an Estonian private rehabilitation center where we will conduct clinical trials. We've all become familiar with Estonian healthcare system and believe that it is a good environment to start with because of their high technological advancement and widespread digitalisation. Later, we plan to expand our business into other European countries such as Germany, Great Britain, Scandinavian and Nordic countries.

**IPR aspects**

Exclusive and innovative UX coupled with a unique design is our key intellectual property. We will thus protect our brand with a trademark. All the audio and artwork used in our

application will be copyrighted. THe source code is also a subject to copyright, but we leave a possibility of open sourcing parts of it. There aren't any hidden parts in our product that can be a subject of secrecy. Likewise, we didn't identify any technological aspect worth patenting.

**Financial forecast**

A detailed budget plan covering all sources of income, fixed and liquid expenses and estimation of cash at hand is attached to our report.

**Financial and/or social return of the proposed business**

Stroke is preventable, but public knowledge about the risk factors for stroke is low. The impact of educational campaigns aiming to change behaviour is largely short-lived. The proportion of the population with one or more risk factors for stroke is significant. High blood pressure, the most important risk factor for stroke, is significantly under-treated. The proportion of people in total number of stroke events in the EU between 2015 and 2035 is predicted. In 2015, direct healthcare costs alone added up to €20 billion in the EU, while indirect costs of stroke due to the opportunity cost of informal care by family and friends and lost productivity caused by morbidity or death were estimated to be another €25 billion. Reducing the incidence of stroke and the likelihood of long-term disability will help to bring down these costs.

Health insurers and national health authorities rarely offer support for adjusting to life after stroke, such as programmes to support people who want to return to work. In the last 5-10 years most European countries have cut funding of some services that support disabled people, such as training that helps people return to work. VRonica wants to focus on improving this and we expect insurers to to be actively involved in the near future supporting this.

**Contingency planning and risk assessment**

We are aware that there are many possible risks especially while entering the healthcare market. Our solution would require thorough testing and clinical trials before it can be used and this process might need to be substantially prolonged in case of non-compliance.

A big risk is also related to the technology we are planning to use, it can occur that the VR technology or the other devices (cameras, smartphone with application) is not comfortable to use for the patients or that they have problems using it.

Moreover, all the prevailing regulations in various countries will need to be respected and even if our product has been launched in Estonia it doesn't mean we could immediately enter another country's market too.

It may also occur that we don't possess all necessary skills in our team at the beginning of the project and before we are able to hire another employee. Such a situation may be a big obstacle to move forward.

Another group of risks depend on us as a team, such as the possibility to lose motivation or simply lack of time to continue working on the project. Moreover, we are also located in four different countries and no one is physically in Estonia where the first clinical trials would be performed. That would be a big barrier to overcome.

**Strategy for funding**

The launch of VRonica will require a €10.000 FFF round during the last quarter of 2020 to allow us to buy some hardware for testing. In Q2 2021, we plan to get an estimated initial prototyping grant of €50.000 from grant programmes like Horizon 2020. Using this money, our team could accelerate the development of the prototype, hire first employees, pay the office rent and buy additional hardware. In Q4 2021, we want to apply for a research grant of (estimated at €35.000) conduct first clinical trials and publish the results. A seed round of €250.000 in the next quarter will allow us to expand our team. We plan to receive Series A funding of €500.000 a year later (Q1 2023), which would allow us to hire marketing and sales specialists and start reaching out to clinics. The series B funding is planned for Q1 2024 and would be primarily needed for strengthening the marketing and sales operations, as well as increasing customer support capacity.

# 4. Business development process

Our idea has evolved a lot since the beginning of the project until the end. Especially at the beginning we had many different unstructured ideas and couldn't decide what to focus on. Our mentors led us through the whole process and eventually we managed to properly validate and narrow down our solution.

From the very beginning we were sure that we want to work on gamified rehabilitation of stroke patients at home using VR technology.

One of the first questions we needed to answer was who our target customers are - we have initially thought of 40-80 years old people who are in their sub-acute phase of recovery, already at home and have recovered some of their abilities.
Simultaneously we contacted specialists asking which levels of injury are most predominant and what kind of movements are needed in stroke rehabilitation which patients could do independently. Here, a physiotherapist Anneli Lebert from North Estonia Medical Centre shared her expertise with us. At the same time we conducted a research of existing alternatives learning which companies are already on the market and what are their products. We also thought about a differentiating point of our solution. At this point an idea of focusing on mental health occurred.

After analyzing all these aspects we agreed that we would like to focus on advanced VR technology creating the new Immersive VR therapeutic Wii. As we also called it, The new Atelier Des Lumieres in your living room for therapeutic experience.

In our team we also discussed who would buy our solution and we thought that it may be too expensive to be purchased by individual clients therefore we decided to sell it to high end clinics that bet on advanced technology.

After the next meeting with the expert when we verified our idea, we already knew that we were not going in a good direction. Elderly people would be overwhelmed with an immersive VR tech and may have difficulties using the devices. It was suggested to us to make the VR headset optional.

At this point our mentor helped us to proceed and recommended us to think about a minimum viable product we would like to offer and told us not to solve all problems at once but to find a niche and concretely specify who is the target user of our service.

This led us to creation of exemplary user personas; we've come up with examples of imaginary stroke patients, describing some demographic information, their lifestyle and problems they are facing. We realized that it would be the best for us to target younger stroke patients (under 65) who would be able and eager to use technology and like to have some kind of motivational boost in the form of a game.

Another meeting with the team mentor verified our to-date ideas. We were told that the high end clinics setting is the most complicated and expensive roadmap we can choose. It is very hard to get in due to the need of many clinical validations and it is a complex and risky process.

We agreed together that it would be good to sell our product to rehabilitation centers instead. We confirmed this idea with an example of a company working in the same field, Nirvana, whose customers are also rehabilitation centers. We were also told by the mentor to focus rather on a simple technology, on becoming cheaper and maybe later expanding the business to B2C model.

The mentor also suggested that our value could be not the technology but rather the platform to connect patients to staff during remote therapy and that we should prove that our solution makes the rehabilitation process shorter, more engaging and user friendly.

This led us to an idea of having two versions of the product: a set of cameras to track the patient movement plus a wall projection or a VR headset, depending what the patient prefers. We did research to find out what are the prices of such a technology and it occurred that the VR headsets, which we assumed to be very expensive, are becoming cheaper and can be purchased for around 400$.

We have also discussed which business model to adopt whether it should be a subscription model between the end user and the clinic and the software licensing model between us and the clinic or two subscription models. We eventually chose the second option because the license model includes an up-front cost but often doesn't include system upgrades, maintenance, customer support, or even an IT structure and they all need to be handled by the customer. We would like to handle all those issues on our own and thus unburden the rehabilitation centers from additional work, which may be even impossible for them to handle due to lack of technical expertise.

According to it, the rehabilitation center would purchase the hardware (cameras, VR headsets) from us per unit and at the same time subscribe to have access to our platform. The patient, in turn, would pay the monthly subscription fee to the center during the period of his rehabilitation and rent the hardware from the center.

At the end of our project we also had an opportunity to talk to a former stroke patient, Elen. She was happy to share her experience with us and commented on our idea.
In her opinion it is very good to have someone assisting you during the rehabilitation process and confirming that you are performing the exercise correctly (in our case it would be the remote consultation with a physiotherapist). She also mentioned that it is a great idea to exercise with an avatar or any other virtual person that can motivate and encourage you.

Regarding the idea of gamification, she would like to play games, get some points but she also added that other people may don't want competition and feel frustrated if they don't succeed so it would be great to have option which mode of exercises to choose either game based or just doing for doing (we thought this comment very useful and it was taken under consideration while creating the final solution). When it comes to the VR glasses, she couldn't use them due to balance problems, she felt confused when walking.

Elen admitted that it is important to see own limbs when exercising to have a confirmation that you're doing it right and she said that the VR headset would be good as an optional service. The idea of engaging the family in the exercises was received enthusiastically.

Throughout these weeks we were helped and advised by the following professionals :

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|---|---|
| 1. Siim Saare  | , a business development professional specialized in Accelerating the growth of innovative companies by mentoring us and challenging our own biased conclusions, always available to take time out of his schedule to tend to our doubts on a daily basis. |
| 2. Luis Miguel Silveira | , the son of a patient who had suffered from 5 consecutive strokes and walked us through what recovery was like each time, what main obstacles had to be overcomed to even incorporate Rehabilitation into the lifestyle and his thoughts on our raw initial ideas of a product during a phone call. |
| 3. Triin Naudi   | , a product manager testing new treatment pathways for ischemic stroke patient rehabilitation who gave us some general feedback on more than one occasion and also put us in contact with anneli Lebert. |
| 3.Anneli Lebert   | , a physical therapist who has, since the pandemic restrictions have been imposed, has converted on to a fully virtual mode of therapy and was both enthusiastic and hesitant about our solution, which gave us a lot information to work with. We talked with her on 3 different occasions. She also gave us the contact of one of her patients, Elen Kirt. |
| 4. Elen Kirt (patient) | , a recent patient from North Estonia Medical Centre had a call with one of our team members and opened up about her struggles during recovery, mainly motivational ones which helped us refocus our unique value proposition and incorporate a strong emphasis on wellbeing |
| 5. Priit Kruus   | , one of the Tallin Summer School organizers who gave us incredibly helpful feedback and gave us the opportunity to practise our pitch with him and then restructure the parts that were still lacking. |

Our way to work in a team was pretty fair, we worked all listening from others opinions and we decided all based on a voting system where the most supported idea was carried forward. Obviously we had conflicts but in all these 2 weeks we never had a real difficult conflict, we just had small ones especially in the main decisions. We honestly resolved every time with discussions where listening to all members' opinions was the priority and then we worked together on these. We were always inclusive, and we are happy to say that our team worked together without any real team conflict at all.

The main thing that we have to do next in our project is to reflect better on our customers, trying to interview more people and analyzing all data collected, then decide how to reduce costs basing on a better knowledge of the customers and users priority, probably a SWOT analysis could the the better way to start working. After we had a cost reduction we can move on the software implementation and the building of the information system we need, defining them in both business and technical ways. Finally we have a starting plan for the start-up building process, with a more feasible product that could be near to be launched in the market. We should then contact (find) the stakeholders and certify the product from a clinical point of view, then study a marketing campaign and find the first buyers.

As future works of our project we can implement more options and in particular we can expand the application for more rehab typology where the patients can be included in our customer segments. We would also explore AI for helping in measuring progress and further adapt each patient's treatment to their pace, using for example machine learning and data analysis algorithms.

# 5. Self evaluation

Each team member has to write a short reflection (1 page each):

- Team organization, roles and process
- Your own contribution to the project
- Learning experience: what did you learn? (content, applicability of methods and tools, process)
- What did you miss with respect to your own competences?

SELF -EVALUATION
MARIA DE LOS LLANOS MARTÍNEZ

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I was initially a self-appointed Team Leader (my idea gathered momentum at the time) and three other members joined it afterwards: Paula Szymaszek, Catarina Allen and Salvatore Fadda.

After brief introductions and having analysed the team's work preferences, strengths and weaknesses, we decided to all get to know each other first,  and subsequently agree and allocate roles and tasks according to preferences and abilities.

Being a clinician myself and actively involved in other healthcare projects involving emergent and persuasive technologies, I happily took the role of researcher and tried to dive myself into the vast world of stroke rehabilitation. All of us really needed to do that to later on have some consensus with regards to finding a problem and a solution. We quickly realised stroke rehabilitation involved a complex and lengthy treatment plan, led by a multidisciplinary team and approach, run at both public and private settings and that our solution needed to be approved by all stakeholders involved. Not a simple task! Finding a niche solution wasn't easy and required lots of initial research. Luckily , there was a very encouraging list of evidence-based studies from which we could base our solution upon.

The first few days we learnt about the lean canvas development and implementation and how our business model should be backing up our solution at each step of the process. Our mentor Siim kindly provided useful links for this which helped us shape our innovation journey. We also understood how to implement the Design Thinking process. Everything had to be intertwined.

I quickly found out I am more of an ideas person, happy to concentrate on the Why, the user's journey, identifying both the impact of this innovation within the different healthcare systems ( Estonia and UK thought at first) and taking into account our known stakeholders whilst being truly patient-centred. The financial and business side of the project never appealed to me at all. First lesson learnt: I had to learn about this …and quickly! (at least for this project). I also understand that in real life, having a strong, eclectic and motivated team focused on each business aspect is paramount for the success of a start-up and it is not always easy to find straight away. We must be adaptable too.

Finding a niche problem wasn't easy either. There were many and we needed to find one as soon as possible. I was definitely not a procrastinator!. The more we searched, mentors were constantly encouraging us to narrow even more our search for a targeted solution and focus on specific rehabilitation tasks which could be effectively implemented with VR and to a specific demographic and patient segmentation. We needed to understand inside-out the complex rehabilitation process and find our competitive advantage as soon as possible. We literally began week two and we were still searching. Surveys were made to gather professionals' feedback and interviews agreed.  I understood our limitations: this was an insurmountable task to be achieved with just a few days left. Our MIRO board reflects our project development very well, especially our initial thought process. It was a very useful tool for us to be able to easily brainstorm, pour our

research in, and reach consensus to build upon.
https://miro.com/app/board/o9J_koYb0wE=/

I personally thought that a younger stroke segment (40-55yo) with more post-stroke abilities (cognitive and physical) would be our 'easier' target for us from a business model point of view. The only way we could fit this project in would be focusing on a medium-high socio-economic group of patients, able to reach this pioneering gamified treatment within a private setting and really eager and motivated to get better and be reincorporated to work. We desperately needed a 'foot on the door' though, an opportunity to validate even further our project by being involved in a pilot program, hopefully within a public setting. Estonia's main hospital offered possibilities as VR had been recently implemented in some rehabilitation programs and mentors kept encouraging us to try. I realised in the UK this project would be unthinkable at this moment in time although luckily, there are currently some hubs exploring this and moving into this direction at Imperial College London. Would Estonia's main insurance be also interested in covering this treatment whilst running our pilot? Most likely not. Who could give us an opportunity? We needed to find some money first! Too many questions and so very little answers…the life of a start-up.

We were not easily deterred, though. We decided to propose our solution as narrowly as we could, knowing that we were going to need a fair amount of investment to start with. We were honest with our value proposition, validating at least the strong potential for implementation with stakeholders involved (patients, clinicians, surveys made and Doctors we spoke to using similar technology but for just cognitive/mental health rehabilitation).

I am actually quite impressed about the amount of work and research we were able to do in such a short period of time and with the several external unforeseen commitments and health impediments which ended up slowing up our progress a bit. The enthusiasm and commitment towards the complexion of this project was staggering! I wish we could do a follow-up!

I have to personally thank the whole team for the organisation of this online course. I think it was excellent and fantastically executed within the timeframe given and it could not have been done better. You covered all aspects of the journey… Intellectual, creative, entertainment, physical and emotional. You guys rock! You set the standards for future learning virtual courses high now for me! (and a future visit to Estonia is overdue :)). How come nobody talked about my favourite Estonian music group 'Ewert and the two dragons?'. My heartfelt thank you to all for this experience.

SELF -EVALUATION
Catarina Allen d'Avila Silveira

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I joined this team because I was quite certain I wanted to work on this topic: My grandma had suffered from 5 consequential strokes so it is logically very close to my heart to ease any patient's recovery ! Maria's idea to make it more gamified and to include something within the XR spectrum really appealed to me.

I didn't realize at first the world we were diving into as we stumbled upon the mountains of research and different contrasting feedback. We soon realized we could spend months on it and not get much done which was a bit of an obstacle. We were very good at debating and bringing ideas to the table but I also felt that we were also quite passionate and emphatic about our user so it was hard to make any decision without reading an overwhelming amount of information or making surveys to actual patients in several countries. Given that that was not an actual viable possibility within our time frame, I think we took a little longer in the ideation and diverging process than ideal but we managed to define VRonica as we first all wanted and felt the user could benefit from.

Throughout the summer school, I felt that I lacked the business skills to better shape our product in order to sell it. Our pitch had to be restructured and practiced a few times until it contained the numbers and the content any investor is looking for when first coming into contact with a novel product. We had the nice branding and the customer journey very well defined, which i am very confident i had an essential role in, but the economics side was not there to begin with.

Because no one in our group was particularly strong at this business side of things, though, i felt that we all stepped up a bit and i felt that i learned a bit about how to develop it for a new venture. I also felt like i learned a great deal on how to ask for help and feedback from absolutely anyone related to the topic I'm working on. I was incredibly impressed and greatly thankful for the amount of people willing to take time off their schedules to answer our questions and even provide us with their own thoughts on how to improve our own ideas. The mentoring in this programme was definitely the one thing that stood out for me. Lastly, although Maria was mostly the one researching things, specially when it came to medical related things, and then Salvatore to technological things and Paulina budget and grants things, i was absolutely amazed at the amount of information the four of us were able to read, summarize and gather in an efficient and comprehensive way. Being a randomly constructed group simply drawn together by a barely sketched solution, we managed, though different ways of communicating, being and working, to come up with a product based on literature and real patients and both

healthcare workers and innovators feedback. I must say I am quite proud of what we did and happy with the rewarding experience provided by the Tallinn summer school.

SELF -EVALUATION
Paulina Szymaszek

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I joined the VRonica team because I found the topic and problem to solve very interesting. I haven't had experience with virtual reality before so I thought it would be a challenging experience but also a great chance to learn new things.

Together with my teammates we were all equally engaged in the research and ideation process. We were all actively participating in the team meetings and brainstorming sessions and all ideas were discussed with everyone. I think we formed a very good team which could instantly start cooperating well. During the project we had some ups and downs but we constantly moved forward. At some point we were overwhelmed by too many different ideas and couldn't decide how to narrow down our solution. Fortunately, the experts we've talked to, could quickly help us out by giving us feedback.

When it comes to my own contribution, I have interviewed a stroke patient which gave us lots of valuable input. My other tasks included cost and required funding as well as market and revenue estimation. Although finances are not my strong point, I managed to improve my skills in this area.

My background is data science, however due to time constraints we didn't go that deep into the data handling and data privacy related issues during the summer school. It was a part I slightly missed however I believe that my experience would be needed if we continued working on our project later.

During the project I learnt a lot, especially how to work under time pressure and how to use time efficiently. We also needed to quickly discover who is good at what to properly distribute tasks between us. That was also a very useful experience since there will be many situations that require teamwork with newly met people.

I also learnt a very important rule that should be respected while developing new solutions, namely, never jump straight into the solution nor assume you are right unless you validate it with specialists. Thus I convinced myself that humbleness and empathy are very important features of innovators.

Regarding the topic of our project, I became familiar with various methods and technologies used in the field of stroke rehabilitation. It was extremely beneficial to talk to professionals in this area such as a physiotherapist, who worked very closely with our team and a former stroke patient, who was willing to share their experience with our team.

Thanks to their support and engagement, we gained lots of domain specific knowledge in such a short period of time.

Lastly, I learnt a lot about startup financing and all cost related issues. The necessity to become responsible for it in my team, motivated me to quickly understand how to solve the financial issues. Thanks to that I also discovered that I need to become more proficient in this area and it convinced me to improve my skills.

SELF -EVALUATION
Salvatore Fadda

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Starting from my past experience in VR and in UI design I decided to join the idea of Maria, so I became part of VRonica team. What we really are is difficult to explain in a nutshell, but the main idea on which we focused our thoughts was "HOW CAN WE IMPROVE REMOTE STROKE REHAB USING VR TECHNOLOGIES?".

Now let's move on to how we really worked during these two weeks, we firstly decided to adopt the Design Thinking approach for searching the idea and the Lean Startup approach for validating it. Then we started a super-session of brainstorming where we found mainly 2 different solutions to our problem, one using Immersive VR (glasses and gloves) and the other using non-immersive VR (digital screen, cams and movement sensors). We worked on the former and we finally defined our customer segments, helped by tools as Personas and Customer Journey.

After that, we did our first pitch focusing on how our product works and on our customers; defining communication channels, customer experience and our value proposition.

But something missed, we needed to find our competitors and define a real business model, understanding better the market and our costs structure. That was the main focus of our second week.

Our team was not easy to manage, we probably failed on the organization of the work, we failed some stages because we weren't aligned, but with time a team of smart people with many different competences as ours and with the help of start-up professionist as Siim can start to work effectively, and in my opinion with just some more expert opinions and few time we could have understood our lacks and fix them, finding a smarter way of work and transforming our project in a butterfly, hoping to become not a Unicorn but a Camel.

I already had experience with start-up, marketing and business strategy. So many of the new arguments that we found were familiar to me. But not for all our team members and I understood how a team gap could inflict you as you have it. That made stronger in me what being part of a team means. In particular, I helped in business reflections and to design the technology structure.

In Summary, I'm really proud of our work, we did well and our idea, in my opinion, has super high potential. I learned a lot from this summer scholl, for real, I understood better how to work with people and how to manage different ideas and different visions, it is not easy, and it is a must to know if you want to be a great entrepreneur, so I'm really happy, and I will hope do similar experience more times in my life, maybe without covid-19 issue.

# 6. References, web links


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