24 Steps to a successful startup

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Please note: In the course of the subject, we changed our business model twice, as it became clear that our previous assumptions would not be viable in the real world. The beachhead market also changed along with the business model, and what's most important, the persona for the beachhead market changed from the public to private clinics.

Project proposal for Innovative entrepreneurship

Trend & Inspiration:

Our project is connected to the trend of digitalization and automation. More and more things are done with the help of computers and broadly speaking artificial intelligence. The rapid growth of AI and machine learning allows for an increased and previously unknown level of automation.

Industries connected to software development, data analysis, and logistics are beginning to be saturated with startups and businesses offering digital and AI solutions for problems presented in the mentioned fields.

Disciplines such as medicine still are in a need of increased computerization which would lead to higher patient and health workers satisfaction and disease prevention. The need is even higher if we look at how hospitals in Poland operate. For one, countless hours of high paid workers such as physicians are lost due to inefficient methods of patient data transportation.

Complete digitalization of medical data in a centralized system would dramatically lessen the bureaucratic burden of nurses and doctors. Such a structure would also allow for easier access to medical data for medical workers operating in various medical facilities.

All of this precious and incredibly valuable, for development of medical science, data can be gathered and used as easily for statistical analysis as for creation of advanced AI which would serve as decision support systems for doctors.

Proper project proposal:

We would like to create an easy and intuitive system for complete management of patient medical data. We know that such solutions already exist but they are often outdated and designed regardless of the opinion of medical workers. Another problem troubling the field is the lack of internal integration between such systems, that's why we would like to create a new system that would be simple and fast to use as well as take into account improvements proposed by medical workers. Internally, it would be designed in such a way to scale well with data analysis and AI implementation (that's the final goal of the project).

However, the proposed above field disruption would likely be nearly impossible without sufficient funds and influence, that's why we think it is important that we try to convince one of the well-established medical corporations to introduce the system for their and patient benefit. As an example, we could provide simple concept services that would be able to archive medicines to be prescribed and check for the current and future interference between them.

1. Market Segmentation

Firstly as a naive attempt we try to segment the market into the four characteristics

1. Geographics: Poland -> Inner cities, in which private medical companies such as Lux Med have clinics. For example Poznań, Warsaw.

   a. It is worth mentioning that such segmentation isn't that limiting, as we are developing software which isn't limited by physical borders.

2. Demographics:

   a. Age: Young to middle age physicians. The same with the patients. The older they are, the more beneficial the system would become for them, but harder to use.
   b. Gender is irrelevant.
   c. Education: Campaign for markets can be focused for patients with a higher degree of education as they would be more keen to use such a system.
   d. Social status: Irrelevant
   e. Family: Irrelevant
   f. Life stage: Later life stages, as older people tend to require more medical attention and would benefit more from the platform.

3. Psycho-Geographics:

   a. Lifestyle: Patients: Patients connected to medical fields, interested in their health and healthy lifestyle.
   b. AIO: Patient interested in health and medicine, believing in change and taking their health into their own health. Patients looking for increased insigith in the treatments they recieve.
   c. Values: People who value knowledge and growth of technical abilities.
      i. As a result, we should market the product to liberal people and people who vote left, as there is a higher probability that they would be interested in apps developed by us.
   d. Concerns: Physicians concerned with improving their work quality and patients concerned with their. health.

4. Behavioral:

      a. Usage: Physicians use it as their tool in work. Patients want to
         manage and read their medical history.
      b. Life-cycle state: System is introduced as brand new for the patient,
         and as a rework for physicians.
      c. Intent: Physicians intending to improve and lessen their workload.
      d. Occasion: People contracting rare sickness, people who have
      developing cancers, - > people requiring chronic medical attention.

2. BeachHead Market

The project, although really helpful in principle, would be really hard to implement for both all types of medical fields and patients. The software must be used by as many medical staff as possible to ensure working between medical institutions. Our first iteration of the software does not need to include all patients at once. Many patients may be reluctant to share their personal health information especially when they do not visit medical institutions that much. That's why we think that it would be beneficial for us to first introduce the software for only a chosen group of patients. This group should consist of people who need regular medical help with chronic diseases. They would benefit the most from this software as they would have insights into their current and historical medical records. Medical staff would also benefit from this approach as one can get lost in loads of medical records. Our software would suggest what type of actions should be taken and / or what type of diseases a patient can develop in the future.

Step 3: End User Profile

As we mentioned in our last meeting our main target would be a group of people who need regular medical help with chronic diseases. One of such chronic diseases can be diabetes. We think that people suffering from this disease are in varying ages so our software would be used and tested by young and elderly people. Although we are not focusing on users with a specific age range, it is rather beneficial that as many users with a wide range as possible use our software. This group of people would benefit from regular reports about their health and summary about them. We can imagine that our software could help people by helping better control proper blood sugar levels. We think that people using medical care have income big enough to use our software so that shouldn't be a problem.

Step 4: Addressable Market (Tam) Size for the Beachhead Market

https://stat.gov.pl/obszary-tematyczne/ludnosc/

1. There are about 2.9 mln patients who suffer from diabetes. (Source: https://pacjent.gov.pl/artykul/cukrzyca-w-liczbach)
2. There are about 38 poles in Poland.
3. 7.63% of Poles suffer from diabetes.

Grupa LUX MED w liczbach	
Łączna liczba placówek	ponad 270
Łączna liczba lekarzy w Grupie LUX MED	ok. 8 000
Łączna liczba pracowników	ponad 18 000
Szpitale	13
Łączna liczba pacjentów Grupy LUX MED	ponad 2 500 000

2 500 000 patients of lux med.

And about one million medicover patients.

3.5 mln * 7.36% = 266 000 possible patients who could use our application.

Source: https://superbrands.pl/wp-content/uploads/2014/09/medicover.pdf

Ludność w Polsce według grup wiekowych w milionach

Grupy wiekowe	2007		2019
0-17	7,5	→	6,9
18-29	7,5	→	5,3
30-39	5,4	→	6,2
40-49	5,1	→	5,6
50-59	5,7	→	4,7
60 plus	6,9	→	9,7
RAZEM (w mln)	38,1		38,4

Źródło: ciekaweliczby.pl na podstawie danych GUS

266 000 * 53% (Age distribution) = 142800

Estimated price for app? Around 20 złotych

TAM = 285000 pln

Naive assumption of the similarity of probability distributions was assumed for the calculation.

Thus calculation might be extremely off/biased.

Step 5: Profile the persona for the beachhead market

As we stated before, our main beachhead market would be a group of people with diabetes. As for the persona representing such a group we think that it would be an adult (age between 25 - 55) that is rather keen on using technologies. Although the place of birth of such a Persona doesn't really matter as long as he / she is able and willing to use the software, we think that people born in bigger cities are more keen on using new technologies than people born in the countryside as the use of new technologies is much more integrated into bigger cities. The representative should also come from a middle (or higher) class family. Such families should have enough money for their members to take care of their health. As we know, coming from a middle or upper class family does not ensure that you will take care of your health as we can point out a lot of examples of people coming from wealthy families and ending poorly, we think that education is a rather crucial aspect of such a Persona. People especially with higher education tend to be more focused on their lifestyle in general (there are of course some exceptions to this rule, as always) so such a person would be more keen on using our

software for monitoring his / her personal medical history.

Step 6: Full life cycle use case:

Why don't current products meet needs? They don't exist. Currently all we have is mObywatel which allows you to view your drug prescriptions and luxmed app which allows you to see your results.

On the side of the patient our app would allow:
- View your personal medical history
- View your drug prescriptions, information about drugs
- View change in time of your medical parameters
- Would allow for input of your medical data such as glucose level, BR, and other

On the side of the doctor:
- Used during the visit to present information about the patient
- Used to prescribe drugs, smoothen the process
- Used to create a notification for patient
- Used in analysis and of medical examination
- Used for diagnostic purposes.

The patient buys the product, when they are notified by luxmed, that they can do so. They are recommended by the private clinic, to monitor their health more closely. They will most certainly tell their friends about it, to present their medical data and it's change in time.

The user will get annoyed easily, so it is most important to make the app as simple to use as possible, data gathering can be smoothed via the use of IA. (For example, we could use computer vision to scan the results of blood pressure measurement or glucose level measurements.

Step 7: High-level product specification:

Medical records digitalization:
Product specification

We believe in a data transparency and accessibility. Unfortunately as of now you as a patient cannot easily see your history of medical records and that's where we come with help.

We present you data accessibility.

With the cooperation of private medical institutions such as LUX MED or Medicover we can offer you possibility of digitalization of your personal medical records. Every visit to the doctor with the information about current health status will be sent to our system keeping your data easily accessible by you and medical staff*.

*Your data is only shared to the medical institutions currently cooperating with us and only for those you choose to share the data with.

Decrease of paper work time

50%

Time needed for admitting the patient can take a lot of time

Error reduction rate

20%

Medical staff entering the data can make a lot of errors which can be easily noticed and fixed through use of our software

Not only you benefit from digitalization of your medical history but also doctors treating you have easier job thanks to our artificial intelligence system integrated with our system processing your medical history.
It helps to create fast diagnosis based on the history as well as give quick summary of it reducing the time needed for a doctor to diagnose the problem.
Don't wait, apply to us for more information about our product and its benefits!

Step 8: Quantifying the Value Proposition

Firstly we will estimate quantifiable gain for the specialist side of our product users - physicians. The most valuable asset of any doctor working in Poland is time. Now we will try to estimate the amount of time that the average doctor can save. We estimate that our AI system will allow for the reduction of at least 50% (up to 75%) time needed for use of PMS.

Type of the software	Time per visit	Time using patient management system	Time for patient
Current implementation	15 minutes[1]	4-9 minutes[2]	11 - 6 minutes
Smart implementation using AI suggestions	15 minutes	2 - 4.5. (1.5 - 2.25)	13 - 11.5 minutes

Assuming that the average doctor sees about 40 - 60 patients a day[3], and works 4 days a week. On average she/he can save from 21 hours to 56 hours per month using our system. It is worth noting that those are very optimistic prognosis, and likely in the beginning in the first month physicians would have to spend a bit more time to adjust to the new system.

Some benefits are uncountable. For example, such a system would lower the stress of the medical workers thus resulting in higher quality of service resulting in improvement of patient health. Doctors could spend more time diagnosing and analyzing rather than using TMP.

About 25% of all errors when admitting the patient are caused by obtaining insufficient information from patient medical history[4]. Our software (hard to estimate by how much) would greatly lower that risk, as it would analyze the patient history for the doctor. This might be a little far fetched but it seems that our solution could save human lives, or at least prolong life of certain individuals.

Data analysis provided by the software will reduce the time spent by doctors doing redundant paperwork, but will also increase the amount of information available for doctors to diagnose the patient.

What about value added for the patient?
　　1) Benefits stated above would result in the rise of quality of medical service.

Weight	Glucose	Blood pressure
1 times a week	2 times a day	1 time a day
1 minute to note the data	1 minute to note the data	1 minute to note the data
4 minutes per month	1 hour	30 minutes

　　2) Time saved while scheduling a visit (although already implemented).
　　3) Huge amount of time is saved while trying to access your medical history.

4) Time saved when trying to access the medical information.

5) Data provided by the patient would increase the likelihood of correct diagnosis and treatment by the doctor which would increase the chance of being in good health.

[1]https://www.tvp.info/18329897/90-pacjentow-w-siedem-godzin-sredni-czas-wizyty-to-45-minuty
[2] Based on interviews with Doctors known by us.
[3]https://www.rynekzdrowia.pl/Uslugi-medyczne/Ogromne-kolejki-do-lekarzy-rodzinnych-Kumulacja-wszyst kiego-co-mozliwe,226866,8.html
[4]https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1490182/

Step 9: Identify your next customers

Personas:

1. **Janek Śliwka** - male with type 2 diabetes, aged 52 with vocational education. Born in a small city < 25k inhabitants in a middle class family. Not really into new technologies that much but is curious about using some of them.

2. **Mateusz Piekarski** - male, no chronic disease, aged 24 with higher education. Born in a small city <25k inhabitants in a rather working class family. Really cares about his health and is into new technologies.

3. **Zofia Sochacka** - female, no chronic disease, aged 27 with higher education. Born in a medium sized city (300k - 500k inhabitants) in a middle class family. Sport lifestyle, cares about her health, visits medical institutions quite often. Rather okay with new technologies.

4. **Łukasz Sochacki** - male, autoimmune disease, aged 36 with higher education. Born in a medium sized city (300k - 500k inhabitants) in a middle class family. Sport lifestyle, cares about his health. Into new technologies.

5. **Bartosz Mruk** - male, no chronic disease, aged 33 with high school education. Born in a small city <25k inhabitants in a medium class family. Sedentary lifestyle (little physical activity), very familiar with technology.

6. **Dagmara Michalec** - female, no chronic disease, aged 25 with higher education. Born in a small sized city <25k inhabitants in an upper class family. Comes from a rich family that does not save money on expenses associated with health.

7. **Michał Lamprecht** - male with type 1 diabetes, aged 24 with higher education. Born in a medium sized city (300k - 500k inhabitants) in a middle class family. Sport lifestyle, visits medical institutions often. Keen on using new technologies helping with quality of life.

8. ...

Step 10: Define your Core

We would like for our secret ingredient to be extreme automation, so that the system would know before the physician thinks about something he needs. Much how the Chinese Wechat keyboard works, it predicts and suggests, even before typing anything based on current trends. We would track movement of every user, and then calculate probabilities to determine their most likely next move and suggest it to them. Automation, automation and more automation built using data analysis and AI.

Step 11: Chart your competitive position
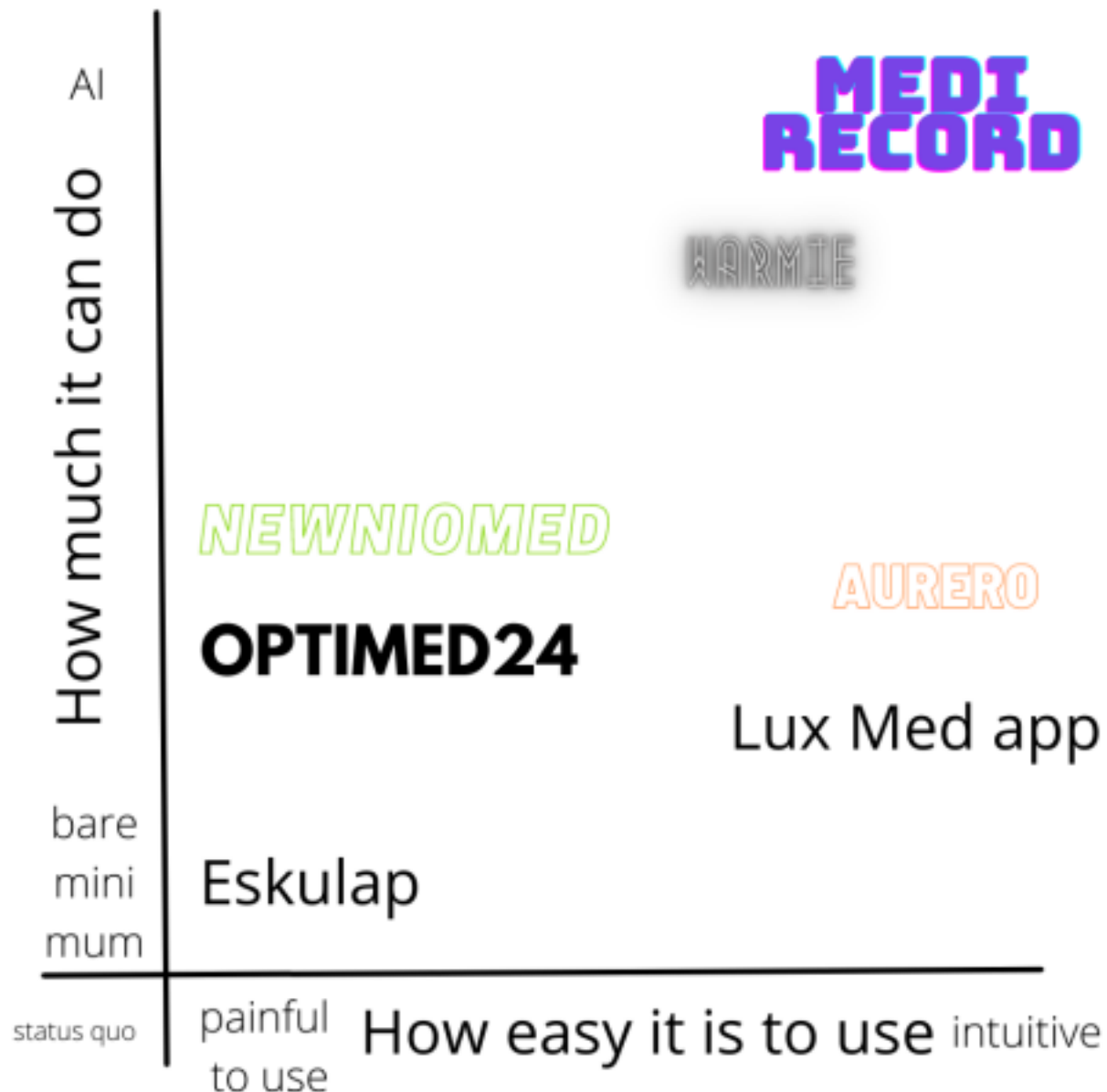
Step 12: Determine the customer's decision-making unit (DMU)

The champion - person who wants to buy the product
The end user - person who will use the product
The primary economic buyer - person who pays for the product
In our case there is only one champion - a patient who wants his/her medical records but he (the champion) is also our end user. However it is not the only end user, our

secondary end user is a doctor (or any other person of medical staff) who benefits from our software - less time spent on reading through medical records, faster diagnosis, more time for each patient, etc. He doesn't pay for our software, he's also not a primary end user but greatly benefits from it. The primary economic buyer is once again our champion, as it is a personal decision to buy and use our software from the patient perspective.

Step 13: Map the process to acquire a paying customer

The time it takes from presenting our product to the purchaser is really hard to estimate. Our software is usable the moment a customer pays a fee but making our software known to people is really the hard part. Acquiring new customers is rather tricky. Directly there are no costs for acquiring new customers. There are of course indirect costs. We think that the most important technique to acquire new customers is through advertisement and other forms of promotions.
Another form of getting our app known is through influencers. Nowadays influencers are a great source for generating new customers. People are using a lot of social media like facebook, instagram or even youtube which is really a place where we could promote our software and its helpfulness.

The biggest problem would be the start. After some initial group of customers it should be easier to get even more of them, assuming of course that our software will live up to our and our customers expectations.
Unfortunately for us to be successful we need to heavily focus on different forms of advertisement and it's going to cost us a lot. At start we suspect that we would be losing a lot of money - a lot of spendings on advertising, influencers and further software development and a small number of customers. Our first real income would be only possible through successful advertisement so that could be our primary obstacle that could have disastrous consequences.
Of course there are other obstacles like our software not living up to customers expectations but we think that with enough data and market analysis that obstacle can be neglectable.

We would like to introduce a new approach for our start up!

How will customers determine they have a need for our product? Time saved by medical workers. Physicians are usually paid by hour, so reduction of hours spent would result in cost reduction.

How will customers find out about your product?
Through a demo presentation before DMU?

How will customers analyze your product?
Free demo for the duration of the trial period.

How will customers acquire your product?
We will make an agreement between private clinics and us - software providers.

How will customers install your product?
Very difficult process, integration will be the hardest step and requires pages of analysis and instructions.

How will customers pay for your product?
The clinic will pay for the software through a given annual agreement.

Who are the key players from the DMU that will be involved?
CEO, CTO, panel of consulting physicians?

What is their influence on the process?
The champion is the most important person.

What is their budget authority (amount and type)?

How long will it take to complete each component you identify? Very straight forward process. At the beginning we probably will have only one client.
1. Demo preparation - 1 Year
2. Demo presentation - 1 week
3. Agreement 1 month
4. Integration: 3 months
Very rough estimation.

Step 14: Calculate the TAM size for follow-on markets

Let's recall the calculation done for beachhead market:

60 plus	6,9	→	9,7
RAZEM (w mln)	38,1		38,4

Źródło: ciekaweliczby.pl na podstawie danych GUS

266 000 * 53% (Age distribution) = 142800
Estimated price for app? Around 20 złotych
TAM = 285000 pln
Naive assumption of the similarity of probability distributions was assumed for the calculation.
Thus calculation might be extremely off/biased.

We came with the total sum of 285000 pln's per one subscription payment billed probably annually. It only accounted for patient's of Luxmed who have diabetes.

Now we can modify some assumptions. Firstly, assuming our old model, we can just say that all clients of lux med or other big private clinics would use our app, but realistically, not all of the people would agree to pay the fee. It's hard to estimate how many would be, but let's assume an optimistic 25%, then it would give us about 0.4m (including cut for cut regarding age distribution) users keen to pay the annual fee. This accounts for 8 million But would Lux Med or other clinic allow us for collection of monthly fee? Anyway in that scenario we could upsell, meaning bill for the app annually or maybe also for additional futures (8 million per year). In this case we have broadened the market with adjacent markets. So TAM for follow on markets = 8 million per year in the very optimistic scenario.

We believe the path of making the physicians pay is the wrong one. Maybe the private clinic should pay? In the year of 2018 it is believed that Lux Med revenue was 2 billions of złotych[1]. They could pay us an annual fee for the rental of our app. But I guess the negotiated payment per user would be smaller, so they could pay us up to 10 million per year for our service. But the choice is clear, that soon enough they would strive to make their own solution.

As you can see, it is very hard to reach the suggested number of one billion dollars. Whole Lux Med is making 2 billion dollars per year, and it is the biggest clinic in Poland. Even if every working pole would download and pay our annual fee, it would only generate TAM = 240 millions, but that's just impossible.

[1] https://healthcaremarketexperts.com/aktualnosci/lux-med-najcenniejsza-marka-medyczna-w-polsce/

Step 15: Design a business model

Taking into account key factors, we would like to use the following business model. We decided to present this in a graphical form.

Business model plan for Medirecord

Step 16: Setting our pricing framework

In step 8 we have calculated that each Doctor could save up to 22 hours per month. Each physician hour cost lux med probably around 50 złotych. For example, the Lux med site states that about 15 thousands medical workers work for them. So our system in the most optimistic case would allow to save: 15000 specialist * 22 hours * 12 (number of months) * 50 = 198 millions of złotych. * 20% = that gives us roughly 40 millions. Now we would like the price to be based on the number of patients, (as our operational costs would scale with the number of patients). Thus we have 40 mil / 2,1 mil (number of lux med patients) = 19 pln per year per one patient. If it comes to the price of drug recommendation, to encourage pharmacology companies, it would be based entirely on the number of drugs that they are able to sell thanks to us. Price of premium apps is so low, to encourage customers, as the more patients using our app, the more keen the clinic will be to use our app. We assume that data reselling will marginally add up to our revenue.

	Clinic	Pharmacology Company	User	Data reselling
Estimated price	19 pln per patient per year	0.5% per price of drug recommended that was sold	10 or less pln to unlock premium features per year	Depending on the organization
Business model	Annual subscription	Advertising	Freemium	Data reselling

Step 17: Calculate the lifetime value (LTV) of an acquired customer

So the average profit we'll make on a new customer including factors such as revenue streams, costs, customer retention rates and so forth is rather difficult to show including all the aforementioned factors. Revenue stream for each customer would be around 10 per month as a monthly subscription.
Customer retention rate would be much lower on the start of the business and would grow in next years. At the start our business would be new and probably not all of our customers would want to stay with us so we suspect that the ratio of active users that continue their subscription to total number of active users at the beginning of each year would rather small as a lot of people would subscribe to test our solution and then leave.

Step 18 and 19: Map the sales process to acquire a customer and calculate the cost of customer acquisition (COCA) :

We've decided that it's best for us to answer step 18. and 19. as a whole. So firstly mapping the sales process to acquire a customer. In the short term, our primary focus would be to create demand for our product. As we stated before, we are planning to create a demo of our product, of our software that anyone can see, including both clients* (about that in a moment) and test it. We need to contact clinics directly but we suspect that at first they won't be really interested as the market is really unsure. That's why we think that the most important for a short term are patients. As we mentioned earlier our business model changed a bit. Now our primary client is not a patient itself but the clinic. Let's call the clinic a direct client. Why? Well because we also have indirect clients - patients. We think that to acquire a new client (clinic in this case) we should do it through the patients. If our solutions and software are known to people, they will in turn start to look for clinics that apply our software. Through this we might get a chance to acquire our primary direct client - a clinic. The costs of acquiring a new primary (direct) client are ommitable compared to acquiring new indirect clients as well as some expenses for our software development and environment maintenance. To get our software known to people we are going to need some salesman as well as other forms of advertisements. External staff (salespeople in this case) are effective but pretty expensive. The median monthly salary of such staff is around 6000PLN[3] per person (with a medium experience). We are going to need a lot of such people to keep our software known at start so it's going to cost us a lot. The second one and probably the most important category would be advertisement itself. We stated before we would mix between traditional advertisement as well as through influencers. Advertisement could be done through Google for example. One of the forms used by Google is the so-called CPC technique (cost per click) which basically works as follows: when a user clicks on our ad we get charged with a small amount. This amount averages $0.5 to $1 per click[1]. On average, businesses spend around $9000 per month. With this rough estimate, assuming the worst case ($1 per click) we would generate around 9000 potential new indirect customers. There are also influencers but it is rather hard to even roughly estimate real costs associated with them as it really depends on the influencer itself as well as the contract between us and them.

The third category would be the website itself. We are planning to create the website ourselves so it would drastically lower the prices of creating and maintaining the website. The costs associated with it would be servers though. We would need to host our website on an external server which cost varies drastically by the server. The price could be as low as $1000[2] paid annually to as high as above $7000. We suspect that at the start we would be paying lower fees but they would increase in the long term. Basically all things mentioned would stay the same, except maybe lower amounts of advertisement through salespeople as well as probably increased expenses on server hosting for our website. As a medium term plan we would also begin to focus on client management as a way for us to ensure that we can retain existing customers and create additional sales opportunities for them. With the long term on the other hand we would shift our focus to more of client management than acquiring new clients (of course it would not stop at this point). We would also need to adjust our software to the competitors that would surely appear if our solutions will prove to be successful (and profitable).

• How will the target customer learn that there is a solution to this problem they have, or learn there is the opportunity they did not previously know about? - Through successful advertisement as well as working demo.

• Once the target customer knows about your business, what is the education process that allows them to make a well-informed analysis about whether to purchase your product? - It does not apply to our software, as our target customers in this case are our indirect clients. They should convince a clinic that they should use our software.

• How do you collect the money? - Annual subscription for the clinic as well as some other potential ways of making more profit (reselling patients' data that would be anonymized of course, contracts with producents for certain drugs to promote it over other - respecting moral standards, etc.)

[1]- https://www.webfx.com/blog/marketing/much-cost-advertise-google-adwords/
[2]- https://www.hostersi.pl/blog/jaki-jest-koszt-utrzymania-serwera/
[3]- https://wynagrodzenia.pl/moja-placa/ile-zarabia-przedstawiciel-handlowy

Step 20: Identify key assumptions

1. Clinics would actually want to partner with us, not develop the software themselves.
2. Physicians would agree to use our software, and would be able to do so.
3. It is legal to gather so much data, for training and development of decision intelligence systems.
4. We will be able to create a safe and reliable system where customers' data is protected.

5. Our system would be able to work as a broad interface for many medical software solutions.
6. Current hospital and clinic hardware is able to run our software. 7. It is possible to create such a sophisticated AI system based on online learning and personal adjustments with so little money. 8. We would be able to actually contact the clinics, to present them with the demo.
9. We would be able to manage demo development paired with work life. - without any experience it would be very hard to land funding, so we would have to finance ourselves on our own.

Step 21: Test key assumptions

Brief reminder of our key assumptions and their tests:

1. Clinics would actually want to partner with us, not develop the software themselves. - **it is fairly easy to check as we can look for any solutions that resemble our software or look at offers of clinics.**
2. Physicians would agree to use our software, and would be able to do so. - **simple statistics (poll for example) would suffice for the overview if physicians would agree to work with us.**
3. It is legal to gather so much data, for training and development of decision intelligence systems. **- some reading about current data usage laws would be required but it is actually legal to use (with consent) user's data (especially if it is anonymised).**
4. We will be able to create a safe and reliable system where customers' data is protected. **- this assumption is not so easy to test as some technical issues and specifics come into play but we would need to investigate current solutions for keeping data safe. It would probably include some encryption technology for sensitive data.**
5. Our system would be able to work as a broad interface for many medical software solutions. **- to test this assumption we would need to look into currently used medical software solutions and look for their architecture and how they could be incorporated into our software (or maybe not incorporated but just made them compatible with our solution).**
6. Current hospital and clinic hardware is able to run our software. - **It is "simple" as hardware requirements software that will be possible to run on personal computers, so hospital / clinic hardware should suffice as well. We can test it on our not so powerful personal computers.**
7. It is possible to create such a sophisticated AI system based on online learning and personal adjustments with so little money. **- it is also a hard assumption to test (easily) just as point 5. Our main focus of testing the assumption would be to research some AI models or architectures that are (were) created with low-money input.**
8. We would be able to actually contact the clinics, to present them with the demo. - **The test would require us to contact directly or send some form of inquiry to the clinics and see the response.**
9. We would be able to manage demo development paired with work life. - without any experience it would be very hard to land funding, so we would have to finance ourselves on our own. **- Test is fairly easy as we would need to plan our work - life balance and find out how much (and when) time we could spend on our**

startup project. Our work (as a team of two at start) would not need to be synchronized as we could work on different features. As for funding we would need to calculate our operation costs and other potential sources of expenses and then we would need to compare it to our current assets.

Step 22: Define the minimum viable business product (MVBP)

It's hard to determine what our MVP should look like, as it's by design of a gigantic software solution that is intended to be used by a huge array of clinics, each of them concerning a different specialization of medicine.

Obligatory function of patient management system:
- Handling of patient admission
    - Access to a patient's personal data, for example about his/her allergies.
        - Inputting patient information
        - Inputting patient symptoms
        - Access to patient admission history
        - Interface connecting our system to the hospital system Eskulap.
    - Inputting patient diagnosis
        - Suggesting diagnosis based on patient symptoms and history
        - Dony by analysis of previous suggestions of other physicians.
    - Ability to write a prescription for a patient.
        - Suggesting medicines based on symptoms, patient history.
        - Adjusting suggested medicine for clinic recommendation, patient personal data
    - Harvesting imputed data, inclusion of it into the database. Implementation of online learning.
    - All of this needs to be intuitive, suggestions should be made in such a way to save a physician's time.
- Data storage
    - Data needs to be stored in an online database.
    - REST service protected with OAuth2
- Online application combining all our futures implemented as microservices. - 3 separate control panels.
        - One for physicians allowing for analysis of 'analyzed' data.
            - Patient history management.
            - Database of symptoms, sickness, medicines.
            - Patient admission.
        - One for clinic management.
            - To be determined by clinic management
            - Batch analysis of physicians work.
            - Batch analysis of diagnosed patients.
            - Management of medical work.
        - One for patient.
            - Simplified database of symptoms, sicknesses, medicines.
            - Access to patient history.
            - Ability to book future meetings with doctors.
- Mobile application combining futures described above.
- Intelligent systems consisting of a series of AUTO-ML solutions, that are able to analyze

and learn from gathered data.
- Interface connecting the software to other medical solutions or machines. For example MRI.
- Interface connecting the software to the current hospital management system, as this is MVP, we won't develop a solution for the hospital.
- Tool that will allow you to gather patient personal data and history from previous databases or probably even from physical forms. (OCR, analysis, data harvesting)

Step 23: Show that "the dogs will eat the dog food"

It might be said that the dogs came to us. As the inspiration for our idea were real problems of doctors, who showed us what should be done and what is wrong with the current system.

There is no doubt that such an application would be immensely successful if only we had political and capital needs sufficed.

Metrics and methods that would allow us to determine if we are going in the right direction:

- Direct interviews with physicians who can determine if the software is suited for their needs
- We could measure if there is a real decrease in time needed for patient diagnosis and drug prescription
- We could also measure if there is a decrease (or increase) in the amount of wrong diagnosis made
- We could check which part of the application capture the most attention of physician by analysis of position of the cursor
- We could check engagement of the patients with the mobile app - measure the amount of information shared from the app.
- Direct meeting with clinic management
- We could gather information from user interviews setting simple in-software polls

Methods and metrics that would allow us to indicate the level of word of mouth our MVBP is creating among customers
- Amount of clinics that agree to meet with us
- Statistics regarding popularity of our app for customers - ratings, and number of downloads
- We can ask the clinic owners directly if they are satisfied with our software
- We could measure of engagement with intra-physicians communication of reports and data analysis performed by us

Step 24: Develop a product plan

Beyond our Minimum Viable Business Product we would need to extend our solution for additional features. We think that one of the most important features both patients and medical staff would like to see is a clarity of the data and decisions based on them. This can be quite hard to implement in MVBP as there are much more important features we need to implement. What we mean by that is that patients would need to be able to see all their data available about them including medical history, all diagnosis, prescriptions, drugs, etc. For the medical staff we think that the clarity of decisions would be critical. People would like to know why our solution proposes drug "A" over drug "B" or why our prediction, based on current patient's data, points to

illness "X" and not "Y". We would need to implement explainable ai (XAI) for this and this is not an easy task. We would also need to adjust and extend our mobile application with aforementioned specifications. As we mentioned during our MVBP there would be a possibility to book future meetings with doctors but we would like to extend the app with additional features. One of them was to create such an AI system that for quite common symptoms and easy to predict illness, would suggest drugs that could help (without a need of prescription) without a visit to the doctor. Of course it would need to be tested thoroughly as if done incorrectly can have disastrous consequences. Of course if our system were unsure about prediction it would not prescribe drugs and would only suggest booking a meeting with a doctor (but a prediction could be saved for further investigation of a medical professional).

Once we had become the standard in a software used by private clinics we planned to move to public hospitals and medical clinics in general. Integrating our solution with already existing systems for private clinics is really demanding but adjusting it for public hospitals will be a much more tedious and harder task. Firstly we would need to figure out a way to integrate multiple new systems into our solution. At this point our software would be developed to the level that changing a lot of stuff in it can be both difficult and costly. We would need to create some generic interface able to integrate our solution with all currently used and potentially emerging medical systems. Both storing and accessing patient data would probably need massive overhaul as we would operate on a much bigger number of patients (private + public institutions).