

**Analytics as an Isolating Mechanism for Start-Ups with Data-driven Business Models in
the Health Care Industry**

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ANNEX

6th January 2017

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1. Appendix A: Summaries of Expert Interviews



Case #1

- **Date:** 13th October 2016
- **Form of interview:** *In person*
- **Company:** Three year old company providing a digital tool that allows medical doctors to make clinical decisions based on the patients' genomic data in real time within a medical appointment. Sales has started just yet.
- **Expert:** Founder and CEO
- **Key Findings:**
 - The core of the business model is the transformation of complex data into something that allows a clinical decision, so it is highly data-driven.
 - Direct competitors are not yet visibly existent in the market, but there are players covering parts of the solution who are expected to move into a similar direction.
 - The main competitive advantage is based on the approach of taking the customers (doctors) perspective within the development of the tool, which then becomes visible in the way the user interface is designed, the information is delivered (in clinical language), and the implementation ability into existing IT infrastructures. The ability to perform this competitive advantage is based on the algorithms that are used to transform the existing data.
 - The more data is processed and the more information is generated, the less attractive it gets for other companies to compete because the cost to imitate are increasing.



Case #2

- **Date:** 14th October 2016
- **Form of interview:** *In person*
- **Company:** Founded in 2014, producing a smart pill dispenser that is connected to medical software and adjusted to the individual patient's needs. Currently working on the prototype, mainly in the U.S.
- **Expert:** Business Development Manager, responsible for the Europe Business
- **Key Findings:**
 - Despite the company is producing a tangible product, the business model can be called data-driven since it is delivering information to the doctor on the behavior of the patient within taking his medication, which then will be used by the doctor within clinical decisions. This is the source of the competitive advantage.
 - The data on the behavior of the patients is actively collected and analyzed.
 - A shift of the business model towards selling this information e.g. to pharmaceutical companies is expected as soon as enough data is collected.

Case #3

- **Date:** 26th October 2016
- **Form of interview:** *In person*
- **Company:** Founded in 2014, producing a portable and convenient vitro diagnostic device that allows for the detection of bacteria for the application in animals.
- **Expert:** Founder and CEO
- **Key Findings:**
 - The results of the tests are tracked and fed into existing management systems of the customers (farms). This data will then provide for another variable within these systems, thus no analytics is performed by the company itself.
 - The advantages over the competitors lie within product specifications and are protected by patents.
 - The data that is produced and its analysis might at a later stage be important for the improvement of the product itself.

Case #4

- **Date:** 26th October 2016
- **Form of interview:** *In person*
- **Company:** Software development studio that released in 2015 an app that allows patients to get an appointment with a doctor of their choice at a location of their choice (e.g. at home / in a hotel). It can be considered as an "Uber for doctors".
- **Expert:** Founder and CEO
- **Key Findings:**
 - The product is an online platform where patients and doctors meet, so it can be defined as highly data-driven.
 - There are direct competitors in the market. The competitive advantage lies within the ability to choose a doctor freely, the ease of use of the app and homepage, and the quality of the doctors.
 - With growing usage of the app, the increasing amount of data allows for analysis and further improvement of the usability of the app, in order to match doctors and patients better, for example based on the symptoms of the patients and the specialization of the doctors.

Case #5

- **Date:** 26th October 2016
- **Form of interview:** *In person*
- **Company:** Developing an augmented reality solution that processes videos produced during surgeries with guided cameras and supports the surgeon in real time e.g. with information on at which part within the human body he should cut. Sales estimated to start in 2018.
- **Expert:** Founder and CEO
- **Key Findings:**
 - The core of the business is computer vision, thus it is extracting meaningful information from images, which can be defined as data-driven.
 - At the moment there are no direct competitors.
 - The reason why the business model is hard to imitate is because of the complexity of the (analytics-)technology and the know-how with this and respective patents.

Case #6

- **Date:** 26th October 2016
- **Form of interview:** *Via skype*
- **Company:** Five year old company offering software-as-a-service for process management and information sharing within image based diagnostics.
- **Expert:** Founder and CEO
- **Key Findings:**
 - Main value for the customers (small to medium sized hospitals) lies within the increasing volume of data, so the business model can be defined as data-driven.
 - Within the customer data the company is able to create valuable information like demographic tendencies for the health of the population.
 - As soon as enough data will be present in order to be statistically accurate this will be used in order to change the business model since the information is valuable and it is hard to imitate this added value.

Case #7

- **Date:** 31st October 2016
- **Form of interview:** Via Skype
- **Company:** Founded in 2010, creating methods to detect microorganisms, mainly within the human stomach.
- **Expert:** Co-Founder
- **Key Findings:**
 - There are direct competitors in the market.
 - The competitive advantage is the velocity of the test results (3 hours vs. 14 days) which is given by a technologic advantage.
 - Data on the usage of the product is generated within clinical trials and analyzed in order to improve the technologic advantage and to provide potential customers with information on the advantage of the product.

2. Appendix B: Questionnaire (Leading Questions)

- In which industry is your business operating?
 - How long is your business existing?
 - What were the growth rates of sales / customers in the last time frames?
 - What respective growth rates do you expect in the future time frames?
-
- Who are your customers?
 - Which value do you offer to your customers?
 - Would you describe your business model as “data-driven”?
 - Bottom line, do you explore, visualize, discover, and/or communicate patterns or trends in data sets as a service to your customers?
 - Would you state that you conduct analytics of data as a key activity?
 - Which sources of information does your business use?
 - Which kind of analytics do you perform (descriptive / predictive / prescriptive)?
-
- Who are your competitors?
 - What are the internal sources of your advantage over them?
 - Do your competitors or potential new entrants have access to these sources?
 - Can those sources be substituted by another resource by your competitors or potential new entrants?
 - Can those sources be imitated by your competitors or potential new entrants?
 - Which knowledge, physical or legal barrier prevents your competitors or potential new entrants from imitating these sources?
 - Do you think that your analytics capabilities are the source of your advantage over the competition?
 - Do you think that your analytics capabilities prevent your competitors or potential new entrants from imitating your success?
-
- Do you think a similar business model like yours could be applied to another industry? Why?
 - What do you think are the factors that differentiate the health care industry from other industries when talking about data-driven business models?

3. Appendix C: Transcript Case #1 (13th October 2016)

MPI: Can you state briefly what your business model is? What value do you provide to your customers?

Case 1: We have developed a tool that allows medical doctors to make clinical decisions of any type based on the patients' genomic data in real time, so in the context of a medical appointment. Patients, or their insurance, will pay on their doctor's advice for what we call "genomic queries", which basically is a question that the doctor asks the patients genome, so to speak, and gets a report based on this specific genomes. This system can help the doctor in his decisions. So instead of having an image like an x-ray it produces a report based on that persons genomes, therefore it is based on complex personal data and the question the doctor enters, which may be a disease that the doctor suspects the patient might have, or a drug he may want to prescribe. The biggest value point is probably in therapy. Because we provide the capacity to be able to prescribe the right drugs or therapies. As you may know, many therapies and drugs work differently in different people. And that has a genetic basis many times. So in this case, what we provide is not a better diagnosis, but a more precise therapy which means avoiding trial and error situations or spending money on the wrong drug and sometimes even harming your patient.

MPI: How long is your business existing and can you state some key facts about its development?

Case 1: Its almost three years old, and the company was in development-mode for 2,5 years, so we developed the system from scratch, it was invented by the company itself, by me and other people. The company raised about 3.5m in funding, most of it equity. Now it is raising another round of capital. It has begun sales a month ago in Germany. So there are no relevant sales figures now. It is now developing a commercial deployment of the system in five different countries. So in the next years we forecast about a million queries per year. Then we estimate a high eight-figure income per year.

MPI: Would you describe your business model as "data-driven"?

Case 1: Yes, absolutely. Because the crux of our business is the capacity to give physicians something that is based on complex data. That is given to them in a form that they can decide upon. **So its core is the transformation of complex data into something that allows a clinical decision.**

MPI: By whom is the raw data that your business uses provided?

Case 1: So there is two sets of what I guess you could call raw data. One set is the genomic information of the patient. That is technically lent by the patient, we just need access to that data but we do not own it. That data is analyzed by the system to take conclusions specifically for that person. Then another set of data is a dataset of relationships between genes and health. So these many correlations tie to what is within the patient's genomes and allow us to conclude about the patient's health. That second meta-database is created by us based on existing public and private databases.

MPI: Okay, so in the end, all the data you use is external?

Case 1: Yes, the absolute raw data is external, we do not create raw data as such. But as you are saying, we have specific ways, algorithms etc., to match those two sets of data specifically for that patient and that question that the doctor asked. And the beauty is not in the matching of the data but in the transforming of the meanings of each part of the data into a clinic report in human language that can be the basis of a clinical decision. **So the value is about putting the data together in the right way and then digesting it and transforming it into something that allows a decision.** Because that data that I told you about, one is not comprehensible to anyone but a very specialized person, and it is comprehensible only in terms of chemistry, not in terms of health. And then the other data is comprehensible for anyone, but it is extremely complex, and it is worth nothing if not matched to the first piece. So what we do is to put it together in the right way and then give the doctor something he or she can use. Now, going back to the question whether we generate data or not: We do, in sort of layer that lays above all this. Each time a person uses the system, they have the option of uploading the patient's clinical history. **So there can be human and machine learning.** Because each person has a clinical history. So by this process of matching the two sets of data as I told before, we generate new data, new correlations. And that has a lot of value. After having a certain amount of patients we have a new set of very interesting data that is created. But you can say that this is not core of the business but happens almost "by accident".

MPI: Do you have any competitors at the moment?

Case 1: It depends on how direct of competitors you are referring to. **There are companies that perform different parts of this sort of value chain that I described.** There are companies that make drugs. There are companies that sequence genomes. There are companies that provide genetic tests. And then there are companies that develop e.g. hospital software. In all of these sectors, the most innovative and biggest players are moving in the direction of what we are doing. Pharma companies are looking more and more into digital systems that allow better prescription of their drugs. IT companies are more and more looking into software that is within the genomics field. Genomics sequencing companies are trying to expand their pipeline into the clinic. If you ask me: is anyone using our business model? To my knowledge: No. The main novelty of our company is actually the fact that the business model which is right at the crux of these different players. **And the big difference is that it starts from what the doctor needs. Not from a technological capacity.** We just had a model of putting the pieces together in order to make the doctors life easier and his job better done. So, short answer: We have a lot of competition coming along from different sides. **But I have not seen anyone doing the same approach.**

MPI: Why do you think that you are the only ones at the moment?

Case 1: First of all, **I do not think that it will last very long.** The main reason is that most of the companies in this field come from a research point of view. The asset they start from is a technical asset. For example a new drug, machine, software. **We did start from the other side: the doctor. What does he need?** We are doing something that is similar to what the others are doing if you look from the distance, but if you look closely, it is very different. Within that, I would say that a lot of people in this field have the notion that in healthcare real value is within new knowledge. If you look at drug companies, value is within knowing something that allows you to do something nobody else can do and you protect it with patents. And in this manner, a lot of companies within genomics are trying to advance

knowledge. This is very important by the way. Yet, our approach is different. Let's use that and just create the best way for doctors to use this information.

MPI: So the reason for your competitive advantage is that you were the first who started the business within this approach of looking differently at the industry. This does not sound like any other company could not go there and do the same thing.

Case 1: Yes true, they absolutely can. And like with many start-ups, of course we have one patent, but that's defensive. You are right, they can imitate us. There is a risk, it is a new model. The reason why someone would not do it is because the operational hurdle in this is within doctors and hospitals. They need to use it for the model to work. And that has been a traditional hurdle in the industry. Doctors are a conservative bunch. Our view was that the reason why a lot of new technologies in this area fail, is because they come from an engineering point. They put stuff in front of doctors that is complicated and takes time and diverts them from their main activity. What we are saying is: There is something where you can click a button, it can fit into your existing IT infrastructure. **The million dollar question for us is: Can we move fast enough so that when the big players decide to do it this way – they will buy you, instead of doing it themselves. So, can we evolve fast enough that when the bigger players decide to do it, they will buy us?**

MPI: So, you are saying your main difference over your indirect competition is that you look from the doctor's perspective. Isn't this advantage you generate over your competition then the result of your way of generating relevant and usable information for this specific group of people, thus the result of data analytics?

Case 1: Yes you can say that. **The reason why we are successful right now is that we did something with analytics that the customer likes, so the doctor.** And in more business terms, our advantage is given by the fact that it took a while to develop that analytical system. The decision a certain player has to make when deciding on getting into this field is: Do I want to make this investment myself, or do I hop on a train that is already moving? **But yes, it is this analytical system that is our advantage.**

MPI: And since you are talking about evolving, probably the longer these potential new entrants are waiting, the more expensive it will get to "hop on"? You stated that your system is advancing and learning..

Case 1: Exactly. **The longer they wait and the faster we move, the better the odds are that they use us, and not compete with us.**

MPI: Then it probably is not only about the technology, but everything that comes around this technology which the experience you gain?

Case 1: Yes sure, know-how plays an important role. And in addition, the fact that doctors are conservative now plays in our favor. **Because once a doctor is using our system, it is much harder to change to a potential competitor.** Especially because the system then generates its own habits, it becomes hard to change it.

MPI: Talking about the health care industry in general, what are the factors that differentiate this industry when speaking of data-driven business models?

Case 1: Well, first of all: this is very serious data. This is, and has to be, a **highly regulated industry**. Which is by the way why these products take long to be developed. We have to deal with ethics committees of hospitals, regulatory agencies of countries, data protection agencies etc. The other difference is the **personal dimension**. Genetic data is personalized. This generates an extra layer of complexity. Each one of us is a repository of data that is constantly changing. And part of the value of this data is the difference between people. So, in that sense it creates additional technical challenges. So as a consequence, the added value of data in health care has to be much higher than in other industries. Precisely because each new piece of data or way to transform it by definition has to have great value of a type that society tend to not disregard. So, for example when there is a crisis and people give up on buying new cars, the least they will give up is their children's health. So there is an intrinsic value to the data in health care.

4. Appendix D: Transcript Case #2 (14th October 2016)

MPI: Can you state what your role within the company is?

Case 2: I've been in the company since May 2015, and my role is "Business Development Manager". So at the moment we are in the U.S. and the European office which is this one here in Lisbon. Our founders are mainly in the U.S. due to investment reasons, so I am representing the company here in Europe.

MPI: Can you state some key facts about the company?

Case 2: The company was founded in 2014. We started within Startup Lisboa, we had a couple of partnerships with Bayer in Germany in the very early stage to support us with our technology pilot. **When we start our sales in Europe they will be very important for us.** After the cooperation with Bayer we decided that the U.S. will be our first market, for various reasons, and joined an incubator there in Boston who is specialized on engineering start-ups, which is great for us within the design and engineering of our pill dispenser. From thereon we also could establish more partnerships, for example with one of the major health insurance companies of the U.S., or one of the largest hospital chains. So currently, we are still in the prototype phase.

MPI: So concerning your product, sales hasn't started yet?

Case 2: No, as you can see on our website we only have a landing page without any products. You can download a small app for your mobile device but it is only for testing user experience for us. But this is not our main product. **The main product is a smart pill dispenser.**

MPI: Can you state what your business model is?

Case 2: Yes, we are a B-to-B-to-C company. So our product is designed for the final consumer, or patient. But we do not sell it directly to the patient. We sell it to companies, and the reason for this is that cost of care, mainly in the U.S., is rising quickly and companies have an incentive to reduce those cost. Because, if you do not take your pills as you should, you will have to come back to the hospital, your condition is not going to get better, etc., so this has huge cost. In the US alone this is estimated 290b\$ that could be saved every year if people were taking their medicine the way they should. Those who are suffering the most from this financial side are companies in the private and public sector, mainly hospitals and insurance companies, and this is why we are selling to them because what they spend on our solution is nothing in comparison to what they would spend on the problem. The other two values are that we increase patient satisfaction, and increase quality of care which means better results of a therapy. If patients use our product, they take their pills on time, so quality of care is better.

MPI: Okay so what is the value for the patient?

Case 2: There are various reasons for why patients do not take their meds, but 70% of the cases is because they simply forget. So we are helping them to remember to take their pills. And we also provide them with a simple solution for those who take multiple medication. And that's most of chronic patients who take many different pills every day. So we have those small pouches where the pharmacist puts all the medication for a certain intake of the day,

and so the pill dispenser provides the patient at 8 am, or whenever, with this pouch with the right medication in the right dosis inside. So the management of multi medication is very much easier for the patient.

MPI: How is the pill dispenser adjusted to the needs of the patient?

Case 2: We connect it to the medical software. So we know which prescription each patient is taking. The pharmacy has access to that and organize the medication in the pouches for the patient. This is a value added for the pharmacy as well because you gain customer loyalty. The patient knows that this pharmacist knows how he has to organize my pills, and the pharmacist can also charge a fee for that.

MPI: You are talking about the pill dispenser as your main product, but would you describe your business model as “data-driven”, and why?

Case 2: Yes. Data starts to become interesting when we have many many customers. **Because then we can generate information out of this data that nobody else can. Which is the behavior of the patient outside of the hospital and the pharmacy.** Because at the moment, nobody knows whether they take their pills or not. **So we generate a way to study the patient’s behavior regarding his treatment and this is very valuable.** We know when the patient has removed the pouch from the dispenser, or whether he forgot to do that. And we can also act in a preventive manner. Imagine someone is not taking his pills, we can send a notification to someone in the family or a nurse, or the pharmacy and they can react in a preventive manner. So the pharmaceutical industry will be very interested in that. **Also, it is very important for the doctor to include that information in the patient’s profile in order to give the doctor a basis for decision making for the further treatment.** And it is also important for the insurance companies to find out certain patterns, for example for individual insurance plans where you get a discount if you eat healthy, workout often, and for example take your drugs on time. So, at the moment our tangible product is what is most important to us. **But it is very likely that later on when we have generated enough data, there is a shift in our business model.**

MPI: Do you have any competitors that you are aware of?

Case 2: Yes, you can cluster them in three types. Almost all of them are B-to-C, so quite different from us. First there are companies selling smart pill boxes that the patient has to fill up by himself and they are connected to the smartphone. We do not see so much value in that, you do not avoid treatment mistakes because it is filled by the patient and the pills are exposed to the atmosphere which is dangerous for the effectiveness of the drug. Secondly, there are companies that build huge machines that provide the patient with the medications, but they are not adapted to the consumer, it is not portable, not adapted to people who live an active lifestyle, it is just not practible. And the third one is a competitor that also produced those pouches, but it is not connected, so you do not generate data and you cannot secure that the patient took his pills or not, no remote monitoring, etc.

MPI: So your advantage over your competitors is mainly that you create the possibility of real time monitoring on the basis of the data you generate?

Case 2: Yes, exactly.

MPI: Do you think that a competitor could imitate your product?

Case 2: The pill dispenser itself not, no. We have IP on that.

MPI: What makes the healthcare industry different than other industries in your opinion?

Case 2: There are very old established players, those are trillion dollar markets and you cannot go against those players. So we want to partner with all the stakeholders in the market because we bring value to all the players and want to include them. And then, obviously it is about health, which is almost the most private thing you can have. People do not talk about health that much. It is very sensitive. And regulations thus are very specific and you have to be compliant with that. For example rules on data protection and data privacy.

5. Appendix E: Transcript Case #3 (26th October 2016)

MPI: Can you state what your business model is?

Case 3: Our product is a in vitro diagnostics device, we are **still in the prototype phase**. The concept is to have a portable, convenient and easy to use device that will detect bacteria in any biological substract and starting with application in animals, specifically within cows.

MPI: What is role within the company and what are your responsibilities?

Case 3: As the CEO of the company my responsibilities are the day-to-day management of the company, managing operations, strategy definition, investor relations, fundraising and looking for partners.

MPI: Would you state that your business model is at this point or a later point is “data-driven”?

Case 3: This might apply at a later stage, yes. It depends on the model that we pursue in the future, currently we have a portable device and you need the tracking of that device and the information in order to systemize some sort of management system, in this case of a farm. So, we will feed data into this kind of management system. But at the moment we are not too concerned with this. So at the moment the data that provides for the answer of whatever the device is asked, like “infected / not infected” at the moment is self-sufficient. And based on this information a treatment protocol is activated. But since we are talking about cows on a farm, **it will become important to track this data and associate each disease with each animal**, for example, in order to know the history of the animal etc., we are not looking at this at the moment actively. However, we are developing our prototype in a way that it can interface with every database so that this is possible in the future.

MPI: Do you have any direct competitors that you are aware of?

Case 3: Yes we have quite a few of them. At the moment, we have the advantage that we know that they exist, but they probably do not know about us yet. We are investing into three key factors in order to differentiate from them. The first is the convenience and the ease of use of our product. Second is the ability to have multiple analysis within one single test. And the final is the ability to operate at the farm level within a sensitivity that is at lab-level, but nonetheless at speed.

MPI: Do you think that the data you are producing and the analysis of this will be critical within the evolving and improving of your product?

Case 3: It is likely, but in the long-term. We live in a data-driven world. The goal here is that with our product we can feed another variable into existing data bases of our customers.

MPI: What are the differences of the veterinarian health care market compared to other markets?

Case 3: So first, compared to human health, it has lower barriers to entry in terms of regulatory obligations etc., it has more open distribution channels, it is a relatively small market. This leads to less capital needs, faster go-to-market etc. This is one part of the reason that we do not want to enter into human health market.

6. Appendix F: Transcript Case #4 (26th October 2016)

MPI: Can you state what your product is and who your customers are?

Case 4: We do software development for the healthcare market, but we also develop our own products within the healthcare sector. Right now we are mostly focused on three different applications. One is [Product1] which we founded and **it can be considered as an “Uber for doctors”**. You can basically get a doctors appointment wherever you are and a doctor will come to your house. Then we are developing another product at the moment which is [Product2] which is a treatment for fear of flight with virtual reality, currently here we are starting clinical trials in the Netherlands. And the third I cannot really talk about at the moment, it deals with education and the way of citing scientific journals. So we are not focused on a single product, but we are a software development studio.

MPI: Okay, so the first two projects are within healthcare, have you launched them already?

Case 4: [Product1] is already released since last year, yes. [Product2] is still in clinical trial mode, so it is a prototype. So let me show you [Product1] on my phone. This is the app, you can see the doctors that are around you, you can see the price, the doctor’s rating and their interest and academic background. You can filter by different kinds of category. With this we are aiming at three different kinds of customers. One is young parents with children that do not want to go to the hospital because they have to watch their children. Second, people who are elderly and cannot leave the house. And third is tourists and people that stay within hotels.

MPI: Concerning [Product1], do you think you have any competitors?

Case 4: Yes, we have companies that do similar things mainly in the UK and the U.S., for example “heal” and “pager”. It is starting to be an exploding market. Most of all, each one of them has their own business model and approach. For example, heal charges a monthly subscription and it is more directed at companies like insurance companies. Then, for example in most of the competitors you cannot chose the doctor that comes to see you, you just call one and a random doctor will come. **Within [Product1] we want you to choose a doctor, and be able to keep that connection to the doctor. Which is important because the doctor has to know the medical history of a patient and you can rely on the same doctor if he did a good job.**

MPI: What would you say what your advantage over the other competitors is?

Case 4: So first, as I just said, the ability to choose the doctor. Another one is the ease of use, we have a iOS app and a mobile version because we saw that 80% are from the mobile homepage. Because if people are sick, they will not download a new app, they will just go to the web and get an appointment. The third one is the quality of the doctors. Most of the competitors do not talk to the doctors beforehand, they just try to get as many as possible into the platform. Our process is different, we have an initial interview with the doctors with our medical partners and CEO where they are tested for their medical abilities. At the moment we have a pipeline of 190 doctors waiting because we do not have the resources to interview them all at the moment. But it is a way for us to guarantee quality.

MPI: Can you then say that your advantage over the other players is built on the way that you generate or process data?

Case 4: That will be an important factor. I was before talking about the patient-doctor proximity. So once we get that data, and we know the symptoms of the patient we can **automatically suggest an appointment with a doctor whose specialization is just that field and location.** This will allow us to get ahead of our competitors in terms of choosing the right doctors. **Because, in a nutshell, the more experience we get, the more the system gets, the better the quality for the patient gets.**

MPI: Do you think this is something your competitors can also do?

Case 4: Yes, but it depends, because it is linked to the business model. So for example, within most competitors, the doctor is chosen by their own standards and prospects of monetization, so basically the cheapest one and closest to the patient will be allocated. So we are kind of ahead of this.

MPI: Concerning the healthcare industry, when entering this sector with a data-driven business model, what distinguishes this industry from other sectors?

Case 4: It is mainly different because of adoption. Most people will use Facebook etc., but either you do not have any health issues, then you do not care about apps within healthcare. Right now it starts to become a trend, but mostly the people who are in the age of being highly keen to technology, they are not so much interested in healthcare apps because they just do not have to. Another one is legal issues because it is hard to define for example which data is sensitive or not. And also the variety of regulatory institutions between countries especially in Europe makes it hard to scale and enter various markets. Then, especially in the public market it takes a long time to enter, if you are dealing with sensitive data. And the private sector, is dominated by three or four huge companies which makes it difficult to integrate new business models.

7. Appendix G: Transcript Case #5 (26th October 2016)

MPI: What do you think distinguishes the healthcare market from other markets in terms of digital business models?

Case 5: Doctors, and in our case surgeons, tend to be skeptical, and then there are regulatory issues. Innovation takes longer to reach its target in this market. So when a start-up enters this market, it needs to be prepared or have enough capital, to survive for the fact that it is not in the consumer market. So revenues tend to come later when you are in the healthcare market. This is important for startups in the healthcare market in order not to run out of money. So companies need to have technology and be able to financially survive the long time to get traction and get revenues. And there are two kinds of companies entering the markets. The first are new companies, start-ups, and they struggle with what I just said. And then, there are big companies, and most of them are, let's say, not exactly technological saviors.

MPI: So what distinguishes your company from the other companies?

Case 5: Maybe you have heard about augmented reality. And what we are offering is this within the healthcare market. So not the helmets, there are other players who are good at this, but within the software. We are offering this for surgeries to guide the surgeon using cameras and sensor information. So what distinguishes us? First, we are quite innovative for the sector. The challenge is that we are creating our own market. So the challenge is that people think we are kind of cool, but no one can imagine how this can be accepted in the market. Our strategy is B-to-B, we want to engage big companies with simple things first, like image enhancement. So we manipulate medical images for visualization purposes like improving contrast in real time etc. And we managed to be successful. And now we are entering the market with those partners whose trust we gained.

MPI: Okay, can you explain how your product is functioning then?

Case 5: We are experts in computer vision. In **extracting meaningful information from an image**. And, our starting segment are surgeries where the surgeon conducts surgeries with a guided camera. So we are processing the video that already exists to do either image manipulation or to put guidance to the procedure. We are showing the surgeon for example in real time where he should open a tunnel, open a whole etc. to succeed the procedure. It is like a navigation system.

MPI: Do you think another company could copy this?

Case 5: Well, it is a complex pipeline to get where we are. **We are using a protection strategy, we have patents, but we also have a lot of know how.** And we just provide our customers with binary codes, so it only becomes useful in combination with a license, just like Microsoft Office. The thing is: nothing is possible to be copied. But it is very hard. You would have to infringe patents, and come up with a very good team to reverse engineer what we are doing. All this added – the best they can do is just to work with us because everything is already in place. And companies that typically do such things are big players. For them, it is easier to just buy you than to start doing patent infringements etc. **But this is because it is a very complex specialized technology.**

MPI: Are you already selling or are you still in prototype stage?

Case 5: Okay, so at the moment we are having a big player as one of our biggest clients whom we did the prototyping with, customized for one specific application. And now we are doing final deployment and negotiating all those parts. And the sort of deal we are facing is licensing fees. And this is the long-term plan, the product should come out in 2018. We lock the binary codes to the hardware we use. And we never felt the tendency of copying us. Because it is complex technology and you are dealing with big companies, and if they are interested they will just buy you.

MPI: Where will you be entering the market?

Case 5: Within the U.S. and Germany, because there are the biggest companies we want to partner with. Japan is always a difficult market to do business with because of the culture. But in the U.S., the corporations tend to be open to newcomers. In Europe, if you establish links with those companies, you will do business for life. But as a first entry point, it is very hard because of the culture of not taking risk. So we started to make business in the U.S.

8. Appendix H: Transcript Case #6 (26th October 2016)

MPI: Can you state what your business model is?

Case 6: We are experts in image based diagnostic processes. We started this company five years ago. Initially, we had planned to build a number of products that would manage the full cycle of image based diagnostics and everything attached to it. **And we came up with slightly different business model, which is software-as-a-service.** Because we are much more focused on the private sector than on the public sector. So, we are focused on imaging centers, small to medium sized hospitals. Our business model implies that we want to control everything that the customer produces. **We believe that we create value for our customers because especially in healthcare the volume of data is very, very big.** So we try to be the full provider for both infrastructure and solution for a customer that has a lot of imaging-based data and clinical data.

MPI: Would you state that within your business you are turning raw data into usable information?

Case 6: Well, that is something that we have embedded in our solution but we have to be very careful about its usage. First, we are not exactly “big data” in the sense that we have a lot of individual information. What we have is heavy information in terms of the size of each file, but not the quantity. Since we are dealing with a couple of million records, we have since the start had the possibility to analyze anonymously on our customers information. So this can become very interesting. **We can extract very interesting information like average age or most common sex for one very common disease, for example. So we can create demographic tendencies for the health of your population.** But we have to be very careful with the usage of this information because of the legislation on this clinical information.

MPI: So what are you doing with those analysis that you are doing at the moment?

Case 6: For now, nothing.

MPI: So at the moment, performing analytics is not the core of your business?

Case 6: Not for now. As I said, we have a couple of million records at the moment but our business is growing exponentially. So we want to grow at least 50% more before we think we have enough data so that it can be called accurate statistics. **But once we have it, we are planning on using it as a business.** Selling the information to pharmaceuticals or giving it to our customers. But we need to collect more data for this to be accurate.

MPI: Do you know any direct competitors for your customers?

Case 6: There are a couple of companies selling similar solutions to the same customers. But at the moment here in Europe we do not really have direct competitors for selling image based diagnostic solutions, with software-as-a-service business models.

MPI: Why do you think that is the case?

Case 6: The healthcare market itself is very technological. But the healthcare IT itself is a very slow mover. Both for regulatory issues, but also for the terms of market distribution. If you look at the imaging healthcare market, it is a several billion dollar market, but worldwide it is in the hand of four or five companies. This accounts for 80% of the market, so it is not

very competitive. Ours specifically, there are many companies working on it. But again, for regulatory and mindset reasons, it is an extremely slow mover. The lifecycle for healthcare IT is five or six years, and for IT this is incredibly long, normally it is one to two years. Strangely, there are companies selling the same products for almost 15 years. And this exact fact, helped us to try and come up with something different. Software-as-a-service itself as a business model, I think we are the only ones because people see the proprietary of information and the way people connect with clinical information. So everyone is comfortable to have his financial information where he does not know where it is, but when it comes to clinical information, people tend to see things differently and they get concerned with the fact that they do not know where their data is stored. But this is starting to change, and people start accepting that if they have someone with way more experience managing clinical information, it may pay out.

MPI: Would you say that your capability of collecting and analyzing data will strengthen your market position?

Case 6: Yes, of course everything is about scale, it depends on how much data you have in order to come to the right conclusions. Let's imagine if we are in the Portuguese market and we get 2-3 million records of patients, the information I can extract can be unbelievably valuable. And this is something not a lot of companies can do. **A different player who does not have this data, even if he is bigger than me, it would be hard for him to compete with the value that we have.**

9. Appendix I: Transcript Case #7 (31st October 2016)

MPI: Can you explain what your business model is?

Case 7: Yes, we are a start-up and we started within **creating methods to detect microorganisms**. We started with a product that was able to detect helicobacter pylori which is a bacterium that may harm the human stomach and is associated with several gastric diseases. The product detects this bacteria within gastric biopsy, but also detects whether the bacteria present is resistant or not to clarithromycin which is one of the most common antibiotics within this field. At the time we are designing a business plan for this product. We already could raise 300k€ initial investment which we mostly used in order to validate the product as a medical device in the U.S., so we had to get the FDA approval. At this time we thought that we were not so different to a comparable product that was already in the market. But within the conversations with the FDA we noticed that actually we were quite different and there was no comparable product approved by the FDA already. But we would have had to commission another company with the clinical trial of our product in order to get the FDA approval and they wanted to charge 1m\$ for this. So we had to reshape the strategy of the company and started to go into the food safety market first, before entering the healthcare market, which was significantly simpler than dealing with the FDA. We received the admission for the European market for this last month. So at the moment we do not have any sales.

MPI: Okay, and who are your customers for the product in the healthcare area?

Case 7: Those are hospitals and laboratories. They are already performing similar tests.

MPI: Do you now have any competitors?

Case 7: Yes there are some companies doing similar things but they also do not have FDA approval. But the methods they use are very old and slow. **They have the result after 14 days and we perform it within 3 hours, which is our main advantage, this is given by our technologic advantage.** We perform the tests on PNA which is similar to DNA, it has the same structure. So we do not need the bacteria to grow like within the cultural methods of the other companies, we directly analyze within the structure of the PNA.

MPI: Could your competitors copy this technology?

Case 7: No, we have patents on this.

MPI: Do you expect that you will create or collect any data in the future when you start selling your product?

Case 7: So we have not started sales now, currently we do not have any data. But, we are scientists and no sales people, so currently we are trying to show the labs our product and perform some validation studies within central hospitals for example. **And then, we are planning a back feed of this data and create information out of this in order to improve the product itself and the process of using it.** And we will use this in the next step in order to better enter the market. For example, being able to exactly point out how much money a hospital can save if they work with our product compared with the traditional methods. Because at the moment, the doctor will give the patient a medical treatment even before the results of the tests arrive, because they take so long, and they could save the money for this.

At the moment we do not have this information in order to sell out product. But we hope for the future that we will also create some information on for example the emergence of certain bacteria related to certain demographic factors of the patients etc.

MPI: When entering the healthcare market as a start-up, what would you say are the differences over other industries?

Case 7: Well at the moment we are not yet in the market. But we see that the well-established methods implemented in the laboratories at the moment are difficult to replace because the technicians working with them are hard to convince of a new methodology. So it is very difficult to convince the clients. Another reason I suppose is, since we are saving the patient's money because they do not have to go to the doctor twice, this is actually not so good for the doctors because they cannot charge twice for an appointment.