HAIKARA

JOIN-E7005 - IDBM INDUSTRY PROJECT

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PBL EAST AFRICA

SUPPORTED BY OFFICIAL
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HAIKARA HEALTH

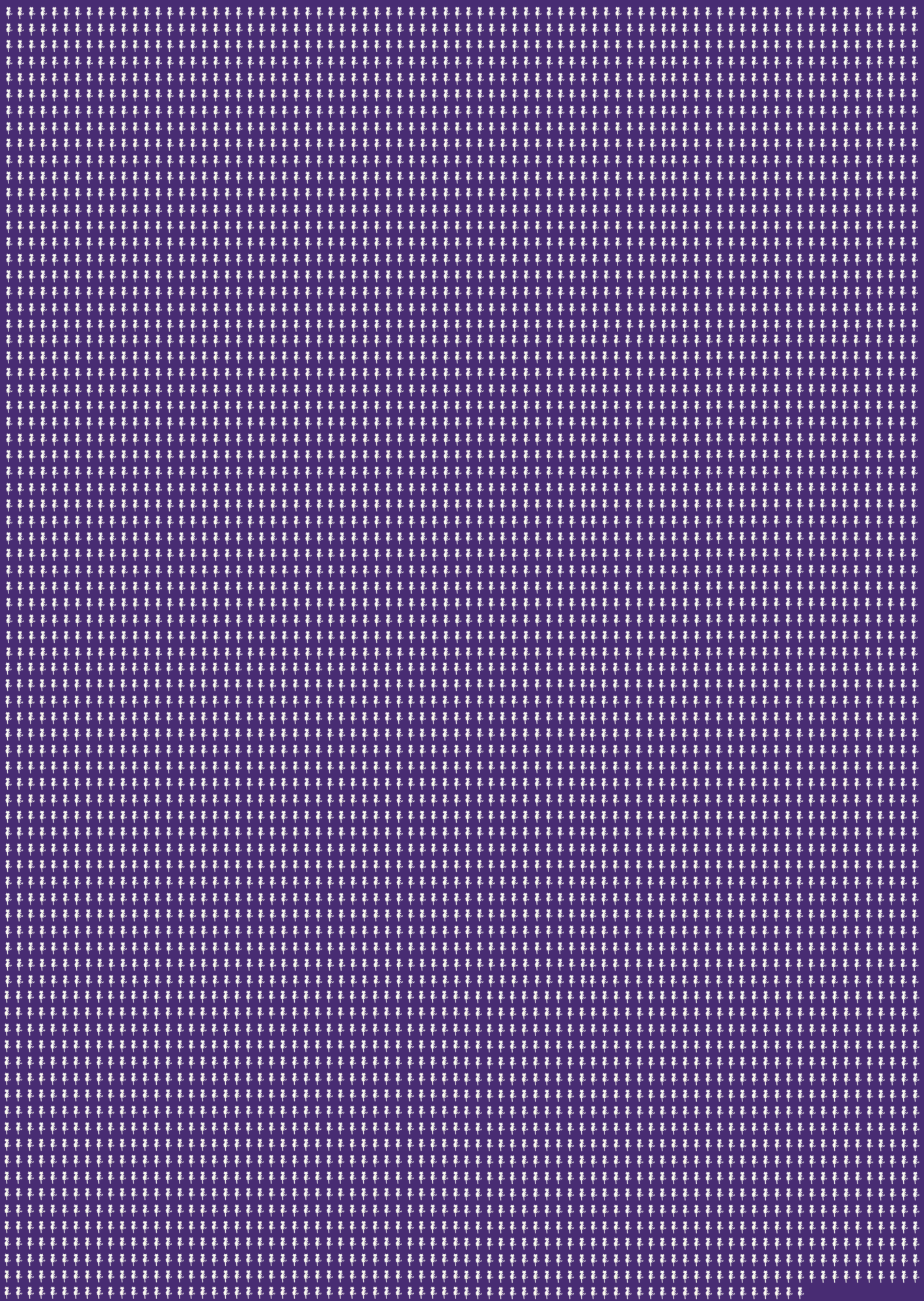
Our final concept is Haikara Health, a digital platform for the onboarding and referral of pregnant women between medical facilities. With Haikara Health, our goal is to create a more reliable and efficient maternal healthcare process in developing regions for all key stakeholders.

THE INSPIRATION

In Kenya, 6300 women die every year due to complications arising out of pregnancy and birth. There are many contributing factors for this, one of them being an inefficient and difficult referral process. When an expectant mother is referred to another healthcare clinic, several challenges arise. Often, mothers visit the referral clinic only to meet long queues or sometimes even be turned away. Then, there is the case that when a mother does see a referral clinic, she cannot remember or provide her medical history. This results in longer patient appointments and delayed treatment. Another challenge is that medical records are currently all paper-based, making it difficult for clinics to store, maintain, and share a mother's medical history with a referral clinic. Paper-based records also leave greater room for inaccuracies and are hard to verify, thereby compromising the overall integrity of the healthcare system.

We wanted to create a centralised solution that will improve the overall efficiency of the referral process, enhance the accuracy and reliability of mothers' healthcare records and ensure peace of mind for mothers and medical professionals.

Haikara is a streamlined platform, which enables healthcare facilities to verify and communicate patient information swiftly and confidentially between one another, creating a more efficient and reliable referral process. The platform is also easily accessible by patients, thereby increasing transparency and control over their personal information.



6300 WOMEN

KEY FEATURES OF HAIKARA HEALTH

MANAGING PATIENT FLOW Haikara Health is designed to digitize the patient onboarding and referral process. The system enables healthcare providers to share patient information, facilitating higher quality patient care across the healthcare delivery system. Haikara Health also relieves medical professionals from administrative efforts during the onboarding of new patients, empowering them to focus their capacities on the mother.

SHARING INFORMATION AT EASE Haikara Health puts a strong emphasis on patient privacy and information confidentiality. For a healthcare provider to refer a pregnant woman and her information to another facility, she must provide consent. In addition, Haikara Health features an SMS system that is used for pregnant women to communicate with medical professionals and to provide them with all the information they need for a wholesome journey through pregnancy and keeping them notified about who accesses and modifies her records.

HEALTHCARE INSIGHTS As Haikara Health collects aggregate data, it means that healthcare facilities as well as systemic organisations such as ministries, insurance providers, VCs and NGOs can stay on top of the current healthcare system.

WHAT HAIKARA HEALTH OFFERS

FOR MOTHERS

Peace of mind, knowing that she will be expected, accepted and promptly seen.

FOR HEALTHCARE FACILITIES

An efficient and transparent patient flow with verified and reliable information.

FOR SYSTEMIC ORGANISATIONS

Live information on what is happening in maternal healthcare.

To arrive at the Haikara concept, the team has gone through five months' worth of design research, in-field research in Kenya and co-creation - all done in collaboration with the University of Nairobi, local partners, medical professionals and of course, expectant mothers themselves. A myriad of solution ideas emerged from these phases. Through a series of prototyping and validating these concepts, Haikara, a solution which empowers both healthcare facilities and expectant mothers, was born.

This report dives deeper into the process we took to developing Haikara Health, including the research, concept development, prototyping of the service design, business design and technology, testing and even developing a basic minimum viable product.

We invite you to view our introduction video and learn more about Haikara Health by visiting our website **www.haikarahealth.com**

PBL EAST AFRICA

C4DLab Innovation Lab

MAKER SPACE

METHODOLOGY

PROJECT GOALS

Our project centered around social impact design, and was introduced to us by the Problem Based Learning team from Aalto University. Our primary goal was to create a concept that addressed a real need or problem in the Kenyan maternal healthcare system. We aspired to create a solution that would improve lives by making increasing efficiencies on a systemic level and that would be scalable across the region and perhaps even across wider Africa, or beyond. As a team, we decided to commit to strictly follow the design process, thus approaching the project with a highly open scope. In this sense, we did not want to prematurely commit to any preconceived ideas for solutions or problems to be focused on. We decided from the outset that decisions would be based on evidence gathered from need-finding, testing and validating as opposed to assumptions and historical data. Finally, because our project focused on social impact, our guiding goal was to ultimately ensure that whatever we create, should first and foremost serve the people and society encountered and only to a secondary degree the interests of any institution or organization.

PROJECT SCOPE

As per our project goals, we discussed and decided from the outset with the project partners involved that our project would have an open scope, in which a final solution would be derived based on findings from our field research in Kenya. The only restriction was that the solution would address Kenyan healthcare, be specific to pregnant women and that it would enhance the overall availability of medical support. Our counterparts in Nairobi had a more specific brief in which they were asked to redesign the fetoscope. In comparison, we had greater flexibility to take a true design approach and identify the key issues in the area and then create a solution to address one of these areas.

PROJECT STEPS

1. **PLANNING:** this phase encompassed the first steps of the organization of the team and the project. More specifically, it included the practicalities to be covered before the field trip to Kenya.

2. **RESEARCH & DATA ANALYSIS:** this stage consisted of designing the research materials and organizing the activities needed to collect all the essential data that could help the team to understand the context of the problem. This phase also included preparatory desk research which was conducted in Helsinki, Finland, prior to visiting Kenya. After, we also had two weeks of field research in Kenya, where our main insights were obtained, which made way for our design direction and final solution.

3. **CONCEPT DEVELOPMENT:** during this phase the team analysed the insights from field research and then developed design directions to come up with a viable solution. We then selected one design direction and came up with several possible solutions, finally settling on the solution we wanted to prototype.

4. **PROTOTYPING AND TESTING:** over the last few weeks we developed, tested and validated our concept solution, whilst reiterating the solution based on feedback.

5. **PRESENTATION:** finally, the concept idea was presented at Aalto's IDBM Impact Gala, along with other projects. In addition, a more thorough and detailed presentation and a final report covering the project development will be done for the partnering institutions.

RESEARCH APPROACH

Our first step was to build foundation level knowledge of the Kenyan healthcare system as well as challenges facing maternal health. We then visited Kenya where we obtained on-ground first-hand insights and information. The research phase of this project was lengthy, but crucial to identifying a real problem that requires solving, based on in-depth desk and ethnographic research.

Below we discuss in detail our research approach, journey and key findings.

PREPARATORY DESK RESEARCH

TTo build fundamental knowledge of the Kenyan healthcare system in general and maternal healthcare in particular as well as various cultural and social aspects of the country, the team first deep dived in preparatory desk research. This desk research took place prior to our trip to Kenya where we conducted field research.

Our desk research comprised of four key research streams:

1. Medical: The goal was to understand pregnancy and the fetoscope as well as to benchmark other medical devices used in different countries to replace the fetoscope.
2. System: The goal was to understand the healthcare system in Kenya, and identify the structure, stakeholders, challenges and pain points for users.
3. Design: The goal was to understand what companies are working on social impact design projects and what types of projects have been successfully completed in Kenya.
4. Culture: The goal was to understand the cultural context and general views and beliefs held by Kenyan people.

Here is a brief summary of the key findings and relevant information from each stream. Detailed findings for each stream can be found in Appendix 2.

MEDICAL

We analyzed the basic medical background of the issue at hand, trying to understand both harmless and harmful phenomena that can arise during the time of pregnancy. Additionally, we tried to get an idea of the activities of medical professionals and the way they integrate technical devices into their work, including the fetoscope and alternatives.

As Kenya is a developing country, the quality of maternal healthcare is much lower than in a developed country like Finland and as such, maternal deaths are more frequent. The fetoscope is mainly used in developing regions, and serves as a simple and affordable tool to determine the fetal heart rate. Based on the low reliability of the instrument and also the fact that there are more reliable and sophisticated tools available, the Pinard fetoscope is no longer used in the Western world. Instead, highly sophisticated electric ultrasound devices based on doppler phenomenon are used widely for monitoring the pregnancy and labor.

It was also discovered that antenatal care in Kenya suffers from scarce and unequally distributed resources as well as educational standards. This was verified when we conducted our field research in Kenya.

Based on this, we understood that some of the limitations to providing top maternal healthcare in the region related to limited resources and equipment and overall lack of education on maternal healthcare.

SYSTEM

If we were to create a solution relating to maternal healthcare, then it was essential to have a proper understanding of the healthcare system and policy regulations in Kenya.

Kenya's healthcare system follows a devolved government approach, under which 47 county governments are in charge of most operational responsibilities. Healthcare facilities are organized in a six-step service delivery model, with complex medical cases being referred to higher levels. While only parts of the population profit from insurance, there is a national reimbursement policy aimed at covering pregnancy related medical bills.

SIX STEP REFERRAL SYSTEM

Kenya's health care delivery model relies on a referral system with six levels. The principal idea is that complicated medical cases are referred to higher institutions with better treatment capacities.

In order to make this possible, communities are supported by voluntary health workers (Non-Governmental Organization) that serve as first-level support upon the encounter of medical issues. In contrast to the institutions of higher levels these workers are no medical professionals and only receive rudimentary training. Most facilities with trained medical staff in reach of rural communities would be dispensaries and health centers that are equipped to process medical checkups and non-complex procedures such as deliveries, whereas severe complications would be treated in hospitals (level 4 and higher), which typically are located in cities. Most facilities are governed by the county, with the exception of national referral facilities, which deal with the most complicated cases.
(Ministry of Health, 2014)

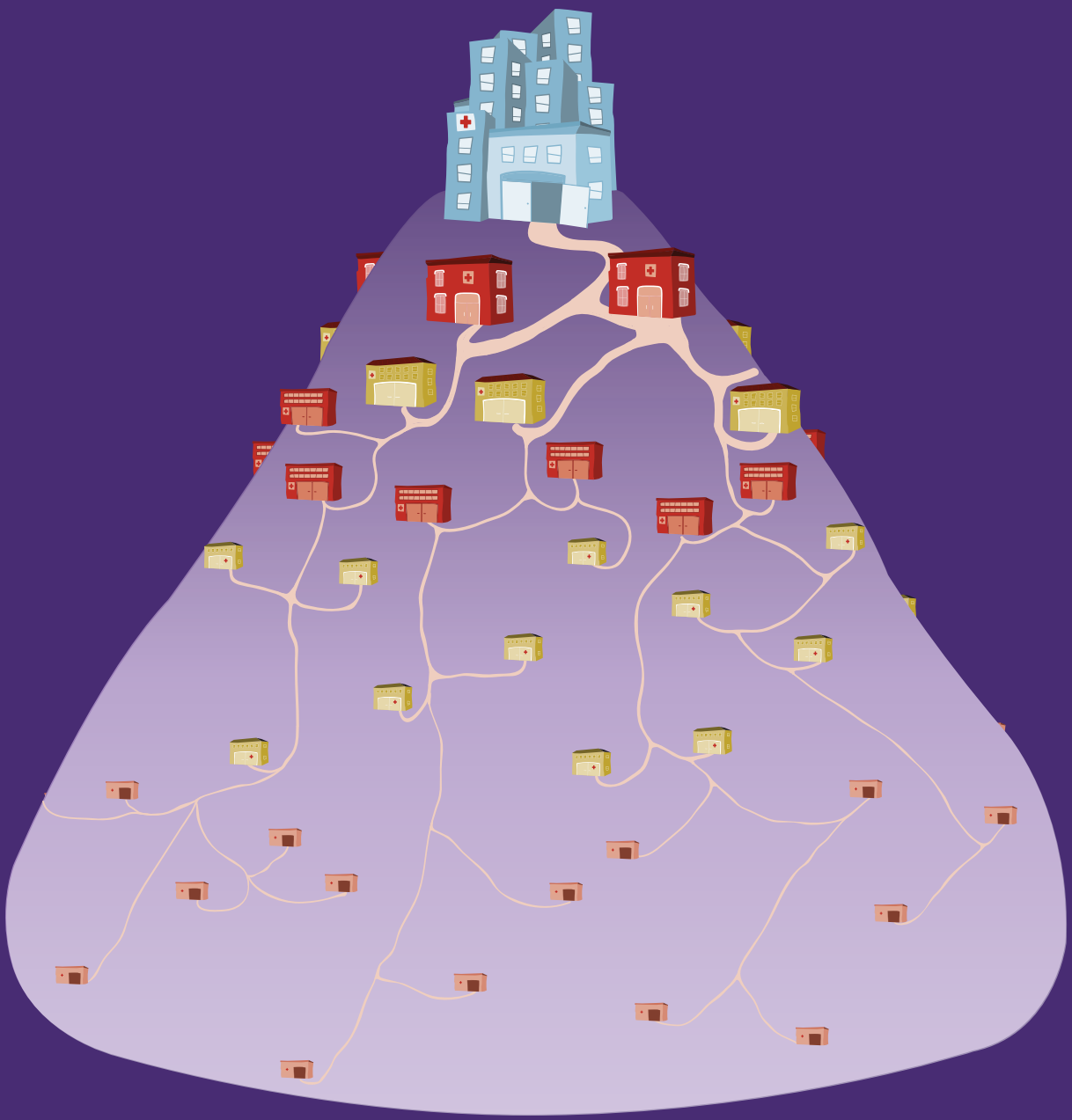
Here is a breakdown of the 6 levels and what clinics and each level offer:

Level 6 - National Referral Services
Highly specialized healthcare institutions as well as training and research services on issues of cross-county importance.

Level 4-5 - County Referral Services
Comprehensive in-patient diagnostic, medical, surgical and rehabilitative care, including reproductive health services. Facilitate, and manage referrals from lower levels.

Level 2-3 - Primary Care Services
Provide disease prevention and health promotion services. Offer basic outpatient diagnostic, medical surgical and rehabilitative services as well as ambulatory services. Take care of observations and normal delivery services;

Level 1 - Community Level
Facilitate individuals, households and communities to embrace appropriate healthy behaviors and recognize signs and symptoms of conditions requiring referral.



LINDA MAMA

There is also some financial support available to mothers through an initiative called Linda Mama. Linda Mama is a national policy aimed at covering pregnancy related medical expenses for all women in Kenya. It was introduced in 2013, and was first maintained by the Ministry of Health, before being transitioned to the National Health Insurance Fund (NHIF). Linda Mama serves as a blueprint for the country's wider ambitions to introduce universal healthcare for all its citizens.

Linda Mama covers the cost of delivery for pregnant mothers, but not for possible complications. The policy also provides an antenatal care package to its beneficiaries, including an antenatal profile and preventive services. It also includes services for the prevention of mother to child transmission (PMTCT). After delivery, Linda Mama covers a post natal care package. It comprises of at least four focused personalized visits or assessments after birth to at least 6 months post-natal. (NHIF, 2019)

DESIGN

To better understand and benchmark the current solutions, products and innovations other social impact design organizations have created, prototyped, tested and launched in the maternal healthcare sector, we analyzed the work of design agencies working in East Africa.

Our research found four main streams or areas for which design agencies are pursuing solutions to tackle maternal health and infant mortality. These are in the areas of Connectivity & Data, Self Care, Community & Awareness and Education & Management. Design agency solutions include self-birthing kits, education apps and technological solutions to assist patient record keeping. In order to develop these solutions, core enablers such as data & connectivity, government support, and sufficient infrastructure in the healthcare facilities must be present.

For more details on the 'benchmark' projects, please refer to Appendix 2.

CULTURE

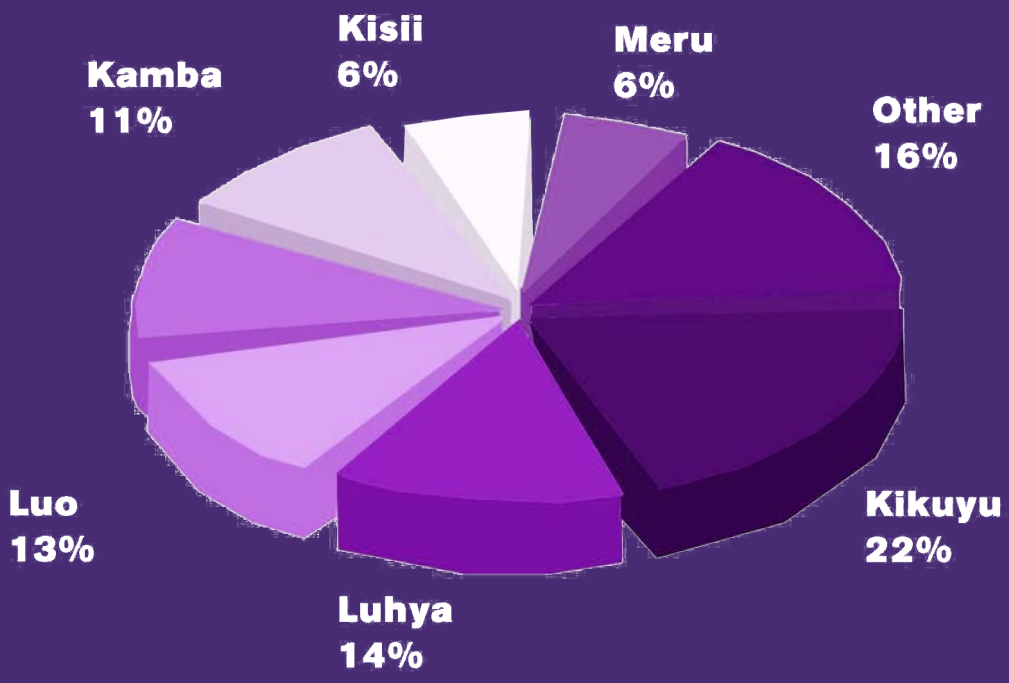
Understanding the cultural and societal norms of a country is critical to designing the best possible solution. Any solution must take into consideration local taboos, social etiquette and cultural habits, to ensure that a solution will be well received and more importantly adopted and supported by the local community.

As Kenya is a country which is very religious, generally society hold more conservative beliefs regarding pregnancy out of marriage, teenage pregnancy and abortion. Whilst the Kenyan constitution proclaims a right to quality healthcare, it does not include abortion unless in emergency circumstances. As a consequence, many teenage pregnancies are met with little to no family planning and support.

In addition to the religious beliefs, Kenya also has tribal beliefs - that is depending on the tribe you are from, you may hold other superstitions, cultural norms and beliefs. Kenya is a multiethnic society, in which 42 major tribes coexist, most of the time peacefully. An individual's tribe plays an important part in their life, and defines their customs as well as their social and cultural environment.

Ethnicity also draws the line between different political faction, which has lead to issues of ethnic-based violence during elections. The most prominent recent example for a violence outbreak are the general elections of 2007, which lead to the killing of several hundred Kenyans, and to the displacement of up to 600,000 (Wikipedia, 2019).

The figure below depicts the major tribes in Kenya along with the percentage of population belonging to those tribes.



FIELD RESEARCH

We spent two weeks in Kenya, to gain better understanding of the cultural context as well as to obtain first-hand insights from mothers and those involved in the maternal healthcare system in Kenya. During this time we worked together with our global partners from University of Nairobi and together we formed one of the PBL East Africa teams.

Over the course of the trip, we worked together to address the following topics in particular:

1. Identify the main problems healthcare personnel face regarding the use of the fetoscope; and

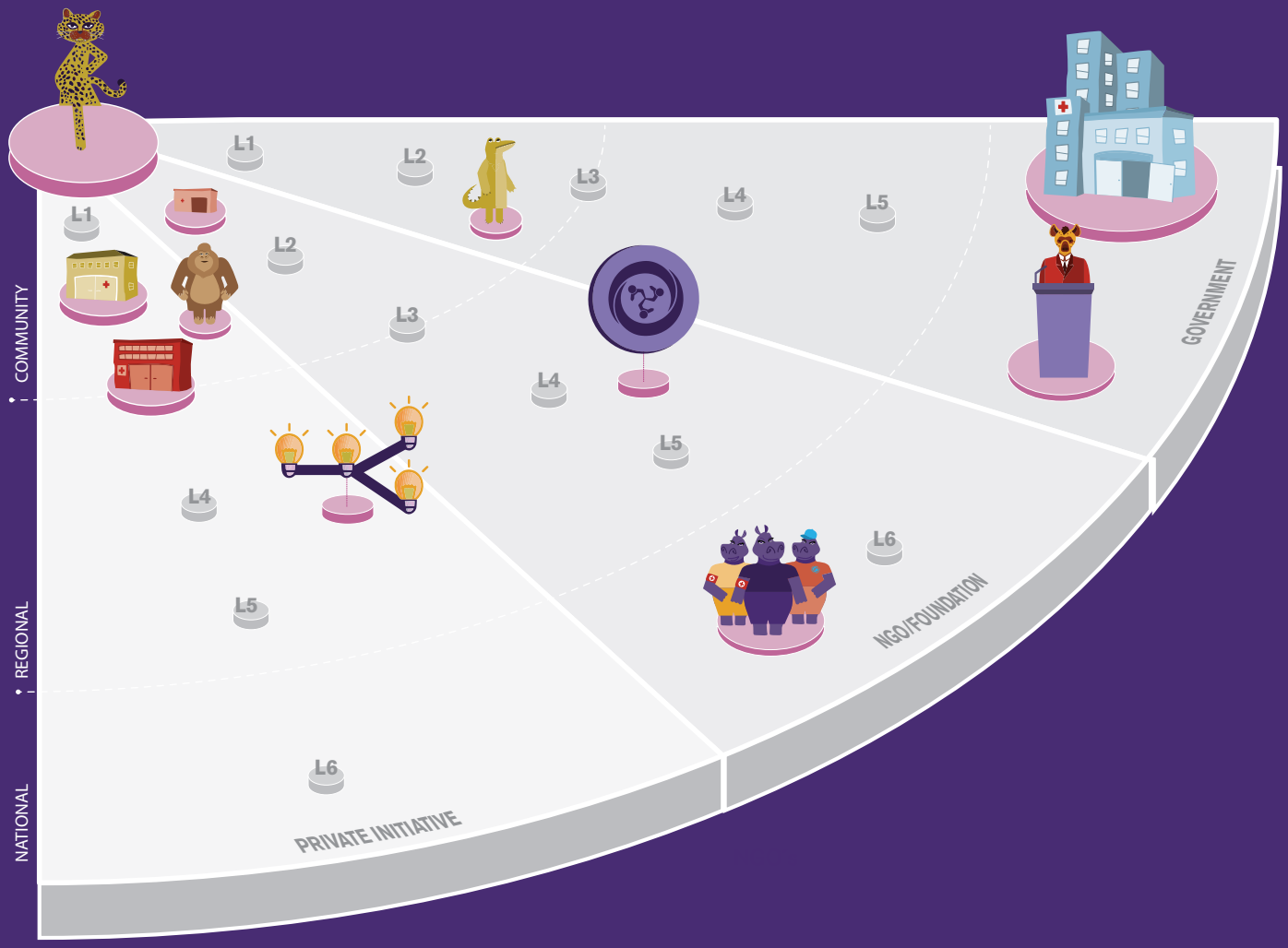
2. Identify the main challenges relating to maternal healthcare in Kenya in general'

In this endeavor, we (Aalto University) focused on the second area, with a wider approach to understand the problems and their context, whilst the Kenyan students worked on the former one as per their client's (Makerspace) request.

Based on our findings from interviews, observations and co-creation workshops, we identified that there were two key challenges relating to maternal healthcare in Kenya that people wanted to be solved:

A better way for mothers patient information to be stored and communicated between referral clinics; and
A safer way for mothers to be transported from rural areas to health facilities during labour.

Through our co-creation workshop and other interviews, it became clear that the first challenge regarding mother's healthcare information was at the forefront of people's minds and so it became the inspiration and problem we set out to solve.



COMMUNITY LEVEL

- Pregnant Mother
- Traditional Birth Attendant
- Imani Medical Services
- Venoma Medical Clinic
- Community Leader

REGIONAL LEVEL

- Startup Ecosystem
- Carolina for Kibera (Tabitha Medical Clinic)
- Maker Space

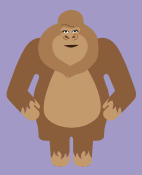
NATIONAL LEVEL

- Kenyatta National Hospital
- United Nations
- Government Official

INTERVIEWS

Questionnaires were designed to perform in-depth interviews to get insight into the areas of interest. These interactions lasted approximately one hour, being audio recorded (when possible) and reported through note-taking by capturing general impressions, personal quotes and relevant data.

Short interviews with patients and users took place when visiting clinics. They were reported through note-taking. The table below provides a brief overview of the key takeaways from each of our interviews.

INTERVIEWEE	KEY TAKEAWAYS
MOTHERS 	Transportation to the hospital is hard to find at night; patients use Tuk-Tuk (motorcycle) if they can afford it, or deliver at home. Private hospitals offer better services than public ones, or TBAs, all in one place. Referral system: In emergency, a patient will simply try to reach the closest facility, usually by Tuk-Tuk.
TRADITIONAL BIRTH ATTENDANTS 	TBAs believe they acquire their knowledge about maternal healthcare and birth from god. They are decreasing in popularity, even in rural areas, as health education spreads. If complications arise, TBAs take mothers to the nearest health facility and remain as their companions during birth.
CAROLINA FOR KIBERA (NGO) 	Carolina for Kibera is an NGO initiated by individuals from both Nairobi and the University of South Carolina aiming to improve the healthcare level and to drive behavior change with regards to education and health in Kenya's biggest Slum, Kibera. The primary difficulty is ensuring teenage mothers return to the centre for education on maternal health. It's important to ensure you have community champions and community buy-in for these types of initiatives to be taken seriously and make an impact. Education, good communication of the benefits and providing incentives to people also increases the likelihood of successful intitiatives.

COMMUNITY CHIEFS

The community chiefs encourage women to deliver in hospitals as opposed to relying on TBAs.

A big concern is how to transport women safely to hospitals, especially in the night time.

For men, providing the cost of transport is also burdensome.

IMANI PRIVATE CLINIC

Imani clinic has implemented a local server-based web solution to record their patients' data. Yet, traditional forms (paper-based) have to be filled in with the same information in order to forward it to the Ministry of Health.

There are many inefficient bureaucratic processes relating to maintaining maternal health records as they are all paper based, which means numerous records in different ledgers.

During referral, staff must take mothers to the new clinic, which puts a strain on medical staffing resources.

VENOMA PRIVATE CLINIC

Venoma Medical and RHS Centre is a private clinic in Malindi. When they wanted to register a clinic, they had to ask for permission from the sub-county, which overall took two years.

The main complaint was how difficult it is for mothers to move through the whole referral process.

They will be moving to an online patient information system in June 2019.

COUNTY OFFICIALS

A digital system for patients would be appreciated, but the county does not have the capacity to implement one. There would need to be separate funding.

Poverty is the biggest barrier to proper healthcare. This has changed as previously it was culture and stigma that was the biggest barrier.

KENYATTA NATIONAL HOSPITAL

Kenyatta National hospital (KNH) is the highest level hospital in Kenya. We visited KNH two times and had the chance to inspect the labor ward as well as other departments, such as the procurement and maintenance of medical devices.

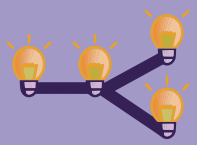
As they are the highest level hospital, they do not refer patients to other facilities.

Verifying health records is difficult. A patient might lie about their own medical history, e.g. they may fail to report past pregnancies after a change of partner.

Patients have limited awareness of their health. They also lack the education and empowerment to understand why knowing their health history is important for future treatment.

Lack of referral information when a new patient arrives is a big reason for delayed treatment and processing.

iHUB STARTUP HUB



The iHub supports its startup members mostly with facilitating contacts to influential stakeholders, such as high ranking individuals from politics and business, and with providing infrastructure and trainings.

A digital system or patient information would be a big step forward, because it would create accountability for doctors.

Obtaining funding is one of the biggest hurdles faced by startups in Kenya.

UNITED NATIONS (UNFPA)

Quality of care and access to healthcare services remains an issue in marginalized communities, such as the northern regions, which leads to many deliveries at home. Despite clear standards being provided, it is difficult to monitor if they are adhered to in practice.

A digital system for patient information would be within the framework of the referral strategy and the healthcare sector strategic plan.

Access to healthcare and quality of care remains an issue in marginalized communities.

The common patterns through the interviews related to:

- The lack of patient information reliability and availability between health facilities;
- The transport of women to health facilities (particularly at night) to ensure safe birth and safety of mothers;
- Overall access to healthcare by women from all socioeconomic backgrounds; and
- Maternal healthcare education and understanding why knowing your own health history is important.

For further details on the interview, please see Appendix 1.

OBSERVATIONS

Clinics allocated at different levels of the healthcare system and community facilities in Kenya were visited.

Access to operational facilities as well as to medical equipment and records was possible in some cases, in which photography and note-taking were the main sources to report findings.

We visited Traditional Birth Attendant (TBA) 'clinics.' As TBAs operate mainly in rural areas, the facilities were incredibly minimal and humble. There was often nothing more than a wooden bench in a small mud hut, which was used as a makeshift delivery bed for pregnant women. We observed that at the tier 2 and 3 facilities infrastructure was limited, even in private facilities (Venoma and Imani clinics), albeit far more developed than the TBA facilities. Often there were only one or two computers maximum for the whole clinic, where staff would input patient information after it was first put into a written paper ledger. As we moved up to higher level clinics (private), we observed that there was more infrastructure in terms of technology available to staff. It was clear that public health facilities at all levels lacked in resources in all capacities - staff, technology and medical equipment.

More information about the interviews conducted at Venoma, Imani, Carolina for Kibera and Kenyatta Hospital is set out in Appendix 1.

CO-CREATION WORKSHOP

As a final method to understand users' perspective and conclude the face-to-face collaboration between both universities, a series of exercises were designed to bring together users and interested parties in a hands-on experience to generate solutions.

To guide the discussion towards our topic and to conduct some initial ideation, the following problem statement was used as a trigger:

"How might we communicate patient data between health facilities during the referral process and encourage patients to take responsibility for communicating their medical history?"

Through a series of facilitated activities, participants were encouraged to foster critical thinking and creativity to come up with ideas to address and give an answer to this question.

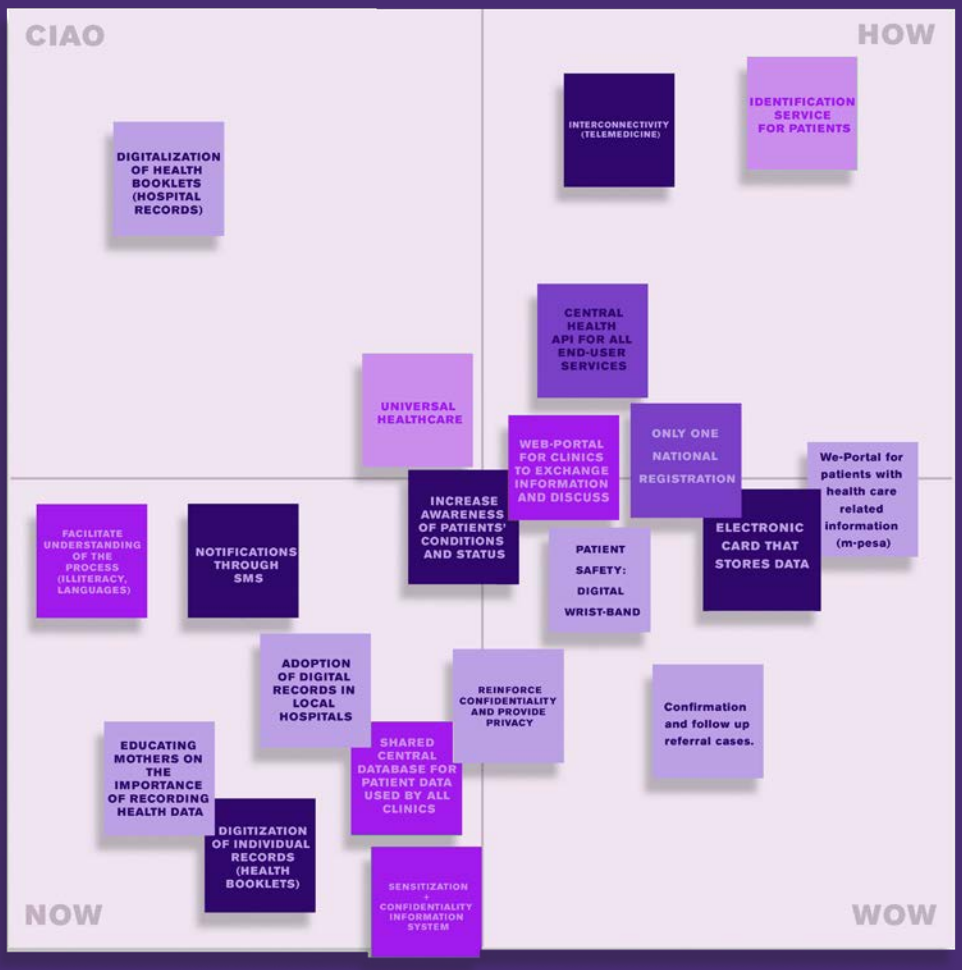
The goal of this practical activity was to create useful, usable and desirable solutions to improve maternal healthcare processes and discuss about their possible implications by implementing a research-based method to get instant feedback from the experts in different fields.

The ideas generated when varying stakeholders collaborate are much more rich and pertinent to the needs of real users. Our participants included academic professors, midwives and nurses, heads of medical devices for Kenyatta Hospital and the Kenyan team's client, Makerspace.

All participants agreed that the current issues regarding patient data and its transfer is a key challenge to be overcome. Some of the ideas included:

- Wristband, which patients present to the hospital and which stores their medical history, blood type, HIV status and other crucial information;
- Establishing a centralized system or database which all clinics could use to access patient history;
- An electronic healthcare card that stores patient data;
- Simple solutions like introducing digital records to hospitals;
- A quick carbon copy referral pad, which the referral hospital uses when referring patients;
- Education programs for expectant mothers, so they understand the importance of their medical data and their future child's;
- Sensitization programs on confidentiality and information services.

Each of these ideas was then mapped using the 'How, Now, Ciao, Wow' framework, through which we could better categorise ideas based on their uniqueness, how easily implementable it could be and the resources required.



MAIN INSIGHTS FROM KENYA

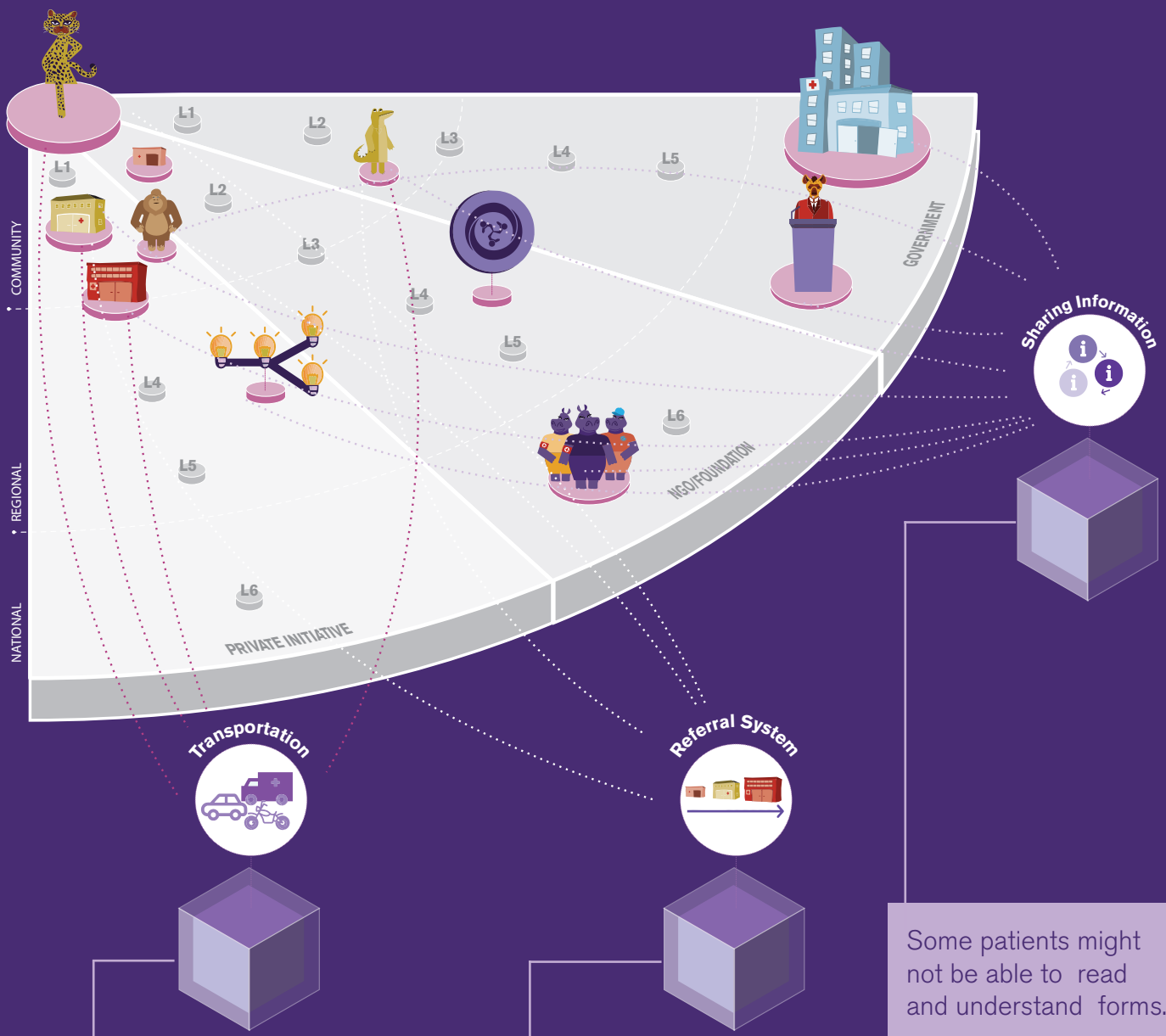
These were the main insights from our trip to Kenya:

Referral Process: One of the main challenges present at all levels of healthcare and across all stakeholder groups is the referral process, which is not always working efficiently. Patients visit clinics/hospital based on proximity and availability, crowding units that either are not capable to provide the required services or that are overqualified for it. Medical professionals complain about not being able to track and follow the advancement of a patient throughout the system based on protocols and proper diagnoses.

Sharing patient information: Storing and sharing patients' information was a consistent issue witnessed by different stakeholders. Traditional paper-based reports are predominant to keep records, although they have proved to be ineffective to communicate data to patients, other clinics and the Ministry of Health. This situation has lead private institutions to adopt their own digital solutions. However, the lack of a centralized system doesn't allow transferring reliable and accurate data concerning patient clinical history. In this regard, patients are not able to communicate their own information properly to medical professionals.

Transportation: Transportation was a problem found at community and sub-county level. Patients struggle with finding means to travel from their villages to the closest clinic or hospital. These in turn do not have enough available means of transportation to refer patients to the next level of healthcare. Therefore, they make use of local transportation such as Tuk-Tuks and Boda-Bodas (motorbikes), even though these present a risk for the patient's safety. Motorbikes can access communities more easily and are more available during nights. However, fees are sometimes not affordable for patients, which leads to involuntary home deliveries.

Flawed Incentives: Linda Mama's reimbursement policy sets flawed incentives for clinics to hold on to patients until delivery and then refer them to higher facilities once complications ensue.



Transportation is hard to find and afford at night.

Pregnant women use the tuk-tuk to travel.

Use of private car or outsourced ambulance.

Most patients deliver during nightime, when getting the transportation is most difficult.

Lack of patient information results in slower treatment.

In emergency, patient will reach closest facility.

Medical professional will escort the patient to next level.

Many patients do not adhere to system, but go directly where they want.

Some patients might not be able to read and understand forms.

Use of basic cell phones (Nokia) to communicate.

Centralized digital system for patients would be appreciated.

Digital patient information system would be a big step forward.

Digital system is within framework of the referral strategy.

TBA has to provide information about the patient.

DECIDING THE DESIGN DIRECTION

As outlined above, in our research on maternal healthcare in Kenya we identified systemic issues in the areas of, firstly, policy designs setting flawed incentives in patient care, secondly, unsafe and unaffordable means of transportation that cause involuntary home deliveries, and, lastly, patient information.

Currently, medical data in clinics and hospitals is generally recorded and stored in traditional paper-based reports, which are the main sources of patients' clinical histories. This information must be handed over to government authorities by medical facilities, requiring them to use scarce personnel to fill in the reports forms. Private clinics that are adopting digital solutions have to maintain manual copies to keep track of the required case files.

It was this process and the way in which patient information is handled across the system, that we identified as the biggest and most pressing issue in need of fixing. This was also a challenge acknowledged by all interviewees and participants in the co-creation workshop and there was overall support and consensus that this is an issue worth tackling and trying to solve.

THREE DESIGN DIRECTIONS

We first determined three possible design directions relating to problems around the sharing and transfer of patient information. These are set out in the figure next page.

	User: Patient (Clinics)	User: Clinic	User: Mother
Problem	How might we incentivise patients to provide quality data and maintain its availability throughout the referral process.	How might we provide information to clinics on what happens to a patient in previous/following facilities.	How might we educate mothers about the need to provide accurate health information to health facilities.
Supporting findings	• Mothers provide inaccurate data. • Security/confidential concerns were mentioned repeatedly. • Data is not shared efficiently throughout the referral process. • Cost and quality of healthcare is suffering from this.	• Medical staff have an unfulfilled need for information on their patients. • Higher institutions have capacity issues and need to know when a patient arrives or will arrive. • Data is not shared efficiently throughout the referral process. • Cost and quality of healthcare is suffering from this. • Referral process docs do not work efficiently (simple cases.	• People give false information to the health facility. Reasons for this include lack of trust, don't want to be judged, they don't want to face reality). • People don't understand the importance of providing accurate health data.
Success Indicators	• Cost & quality of healthcare • Time spent on admin stuff decreases • Number of patient security alerts decreases • No of data correction decreases • Access to relevant data increases	• Number of relocations decreases • Availability of accurate and up to date data information on patients status increases • Number of users and adoption increases.	• Decrease in number of false health facts by patients. • Increase in disclosure of health information by patients.
Benefits	• Transparency on who receives information • Psychological reassurance to share information • Smooth onboarding process • Faster access to quality care • Health awareness	• Patient receives accurate health care • Prevents clinics from overloading on patients • Provides anonymous data on patient 'streams' • Provides clinics with work flow management capabilities.	• More reliable data diagnosis • Better health for mothers
Incentives	• Fast track care	• More efficient patient care	• Fast track healthcare.

SELECTED DESIGN DIRECTION

Our initial design direction was to focus on pregnant women and empower them to take charge of their own medical information. As we progressed, however, we realised that the main beneficiaries of our solution should be the healthcare facilities and ensuring that information can be shared swiftly and securely.

From this perspective our design direction evolved to create a solution that:

- Ensures that clinics profit from a more efficient and transparent patient check-in and referral process, allowing them to invest more of their scarce resources into patient care.
- Still assists mothers in more simple terms by providing pregnant mothers with an information service which makes it more transparent and manageable to know who their data is being shared with, in order to build trust, alleviate fears, and provide them with a clearer understanding of the medical process they are going through.

These were the criteria that Haikara Health had to address first and foremost.


1
2
3

CREATING HAIKARA HEALTH

To bring our Haikara Health concept to life and to ensure a holistic, comprehensive result, three components were created:

- Service design and blueprint: Defining how the solution should work in practice and how it needs to be presented according to the needs and constraints of its users.
- Business model design: Defining how stakeholders can be incentivized and approached to support a sustainable implementation of the solution.
- Technological development: Establishing how the solution can be technologically implemented and maintained in a scalable way.

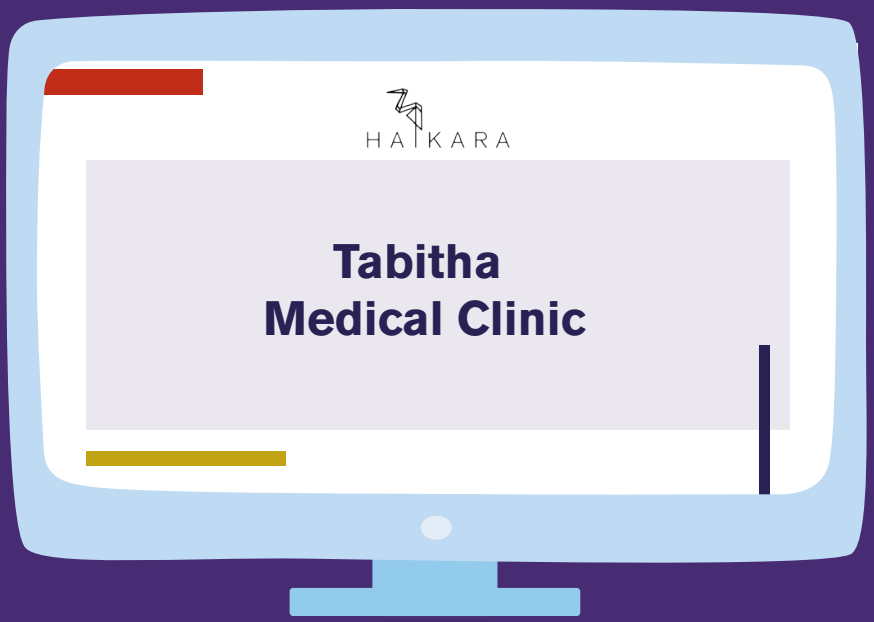
The creation, development, testing and iteration of each of these elements is set out in further detail below.

SERVICE DESIGN

Haikara Health comprises a service design which provides a streamlined solution for the onboarding and referral process between clinics. Its development started with a brainstorming session in which, based on the information gathered during field research and identified needs, a series of ideas (that in parts relied on hypotheses at that stage) were generated. As a result, basic elements to include in the system were defined:

- SMS as the main communication channel to exchange information between the Haikara Health system and pregnant women due to its availability and affordability. As it was observed during visits to clinics and communities, not all people possess a smartphone, and the service must be reachable for most potential users.
- Digital platform to register and storage pregnant women's data. By targeting private clinics, we ensure they have the required infrastructure (computers and internet access) to make the implementation of the system feasible.
- Confidentiality and privacy of pregnant women's data. Since Haikara Health must manage sensitive information concerning medical history, it must protect and restrict the access, providing a safe and trustworthy system.

To develop the initial idea further to a more defined and concrete concept, the team carried out two iterations by prototyping and testing these hypotheses with different stakeholders in order to assess their viability. As a preliminary step, a benchmarking investigation was undertaken to set the current state of the art in the market.



SIMILAR SERVICES

During the research, the team identified different solutions aiming to tackle the problem of registering and keeping records of patients for medical purposes, as well as referring them to the most suitable healthcare provider in order to get treatment. Some of the most relevant examples are briefly explained in this section as a reference of existing offerings.

VULA MEDICAL REFERRAL
https://www.vulamobile.com/

Vula Mobile gives healthcare providers access to medical and surgical specialists through its instant messaging system, which enables them to get advise in a more convenient and faster way. Moreover, it allows capturing clinical information and photos available to share with other subscribed specialists through a secure system, reducing time spent in this task. Vula Mobile is an app for smartphones that integrates a network of healthcare providers from different specializations such as ophthalmology, cardiology, orthopaedics, etc.

MEDICALREFERRALS.COM
https://medicalreferrals.com/

An online platform which simplifies sending and receiving referrals between clinics. It uses a database of registered specialists to provide the most suitable medical service according to patients' needs. In addition, it keeps updating the information in real time, making the process more efficient and reliable for all healthcare providers affiliated. This digital solution enables its users to exchange messages and patient files, improving accessibility and visibility, therefore is possible to track who is referring the information and how this is being managed.

LUMEON
https://www.lumeon.com/

Lumeon's Care Pathway Management (CPM) is a platform which automates processes in order to increase the efficiency of clinical and administrative processes that happen within an institution and across healthcare facilities. It digitizes and standardizes routines and repetitive activities by designing and deploying care pathways which improve the service for everyone. Lumeon offers real-time 'care traffic control', enabling medical organizations to correct on the way as a strategy to offer a more effective and efficient care by maximizing resource utilization.

EPOCRATES

https://www.epocrates.com/

Digital app that helps healthcare providers to access a wide network of knowledge. It enables medical professionals to contact specialists and to get up-to-date information in order to improve the accuracy of a patient's diagnosis. It provides orientation about potentially harmful interactions between drugs, guidelines for evidence-based treatment and in-depth information on diseases. In addition, it offers the possibility of creating private chats, groups with care teams, and virtual conversations to facilitate the exchange of useful and crucial information between specialists.

EHEALTH

https://www.idrc.ca

REACH Ethiopia SZHD in collaboration with the Liverpool School of Tropical Medicine, has developed an eHealth platform to make the delivery of medical service and reporting faster and more accurate. Such service is targeted to Health extension workers (HEW), who are at the frontline of healthcare, as a strategy to improve the access to essential services by recruiting, training and deploying health workers in their communities. eHealth technology relies in the use of mobile phones to improve data collection, communication and, therefore, decision making.

CONCLUSION

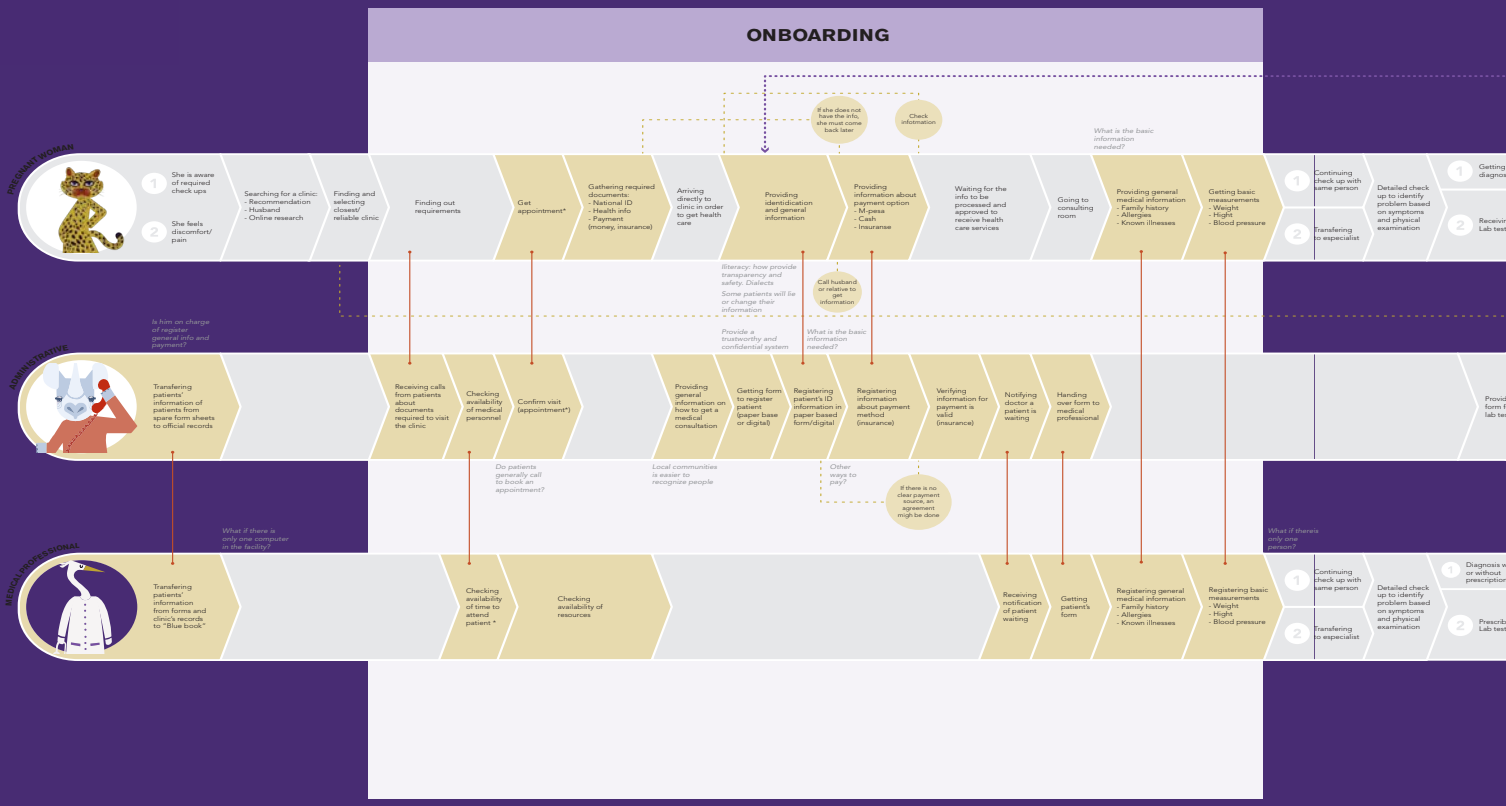
Not all products presented were developed either in Kenya or in a developing country, but they help to map out the current context in which our proposal could enter as potential competition. From the digital services analysed, most of the solutions integrate a developed infrastructure based on smartphones to provide their services and to communicate within and across institutions. A common characteristic is that they position and empower healthcare professionals as the frontline to provide medical assistance to patients, by facilitating tools and information they might need to provide a better and more accurate service. However, concerning the entire referral process a patient has to undergo in order to get accurate treatment, these products focus in one phase or type of interaction: medical professional to medical professional in same institution, medical professional from one institution to medical professional from a different one or medical professional to patient. They do not deal with administrative procedures, focusing on the quality of diagnosis, treatment and prescriptions they must provide to their clients.

CURRENT SITUATION: CUSTOMER JOURNEY

In order to start developing the service intended, it was necessary to first recreate the current customer journey for the different stakeholders identified. To do so, all activities that integrate the process were mapped out based on interviews, observations and comparison with similar systems.

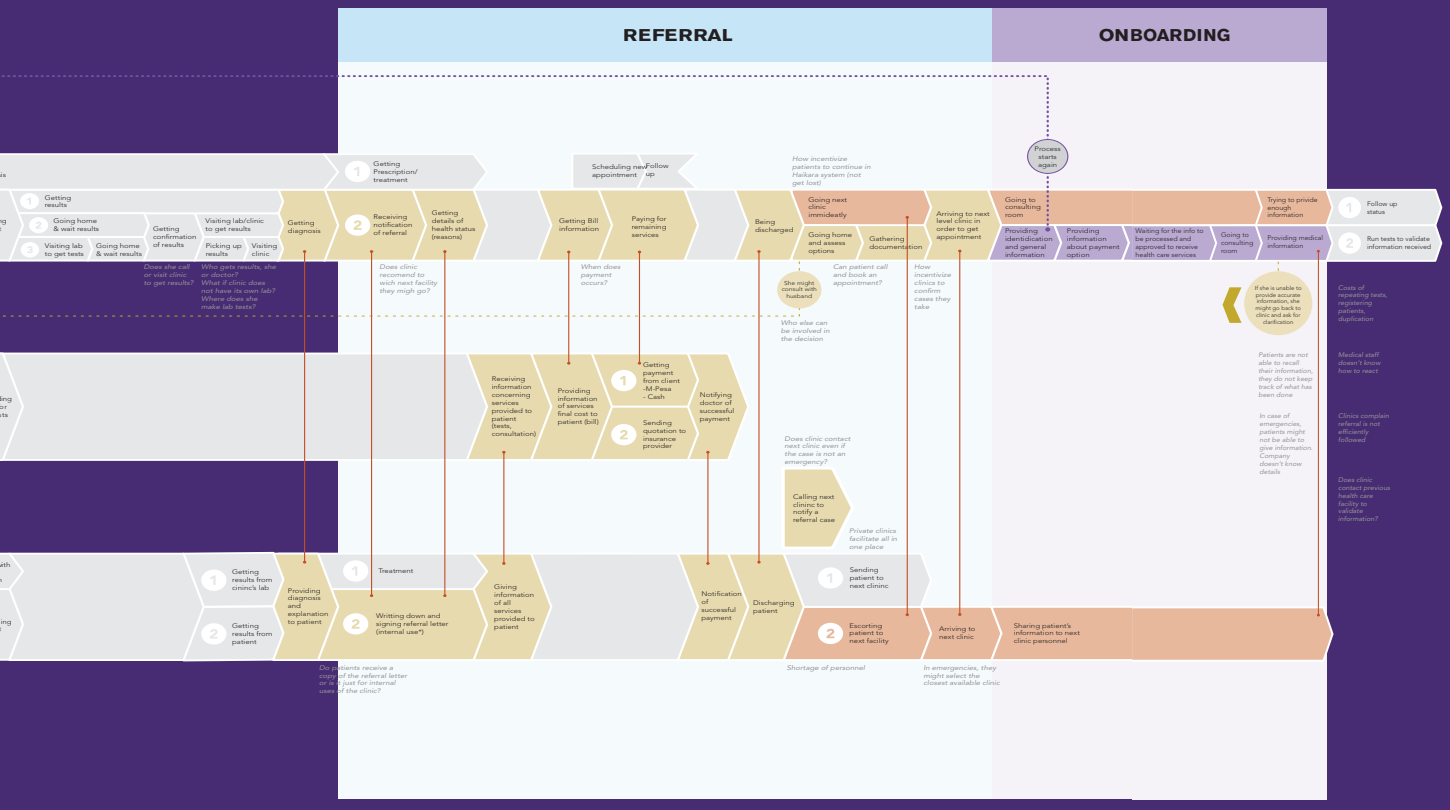
One of the users that was considered during this process, and that was out of the picture in the initial considerations of problem, was administrative personnel. Not only pregnant women and medical professionals are the ones who are directly impacted and affected by the efficiency (or inefficiency) of the overall process, but also receptionists, secretaries or counters who take part in tasks concerning the referral and onboarding operations. In all clinics visited, at least one person was in charge of this role. They deal mostly with personal information (non medical) of any patient and client visiting healthcare facilities, as well as payment methods, insurance, reports, etc. It was important to spot this stakeholder during the field trip, because it helped to better define all agents involved during the development of this chain of events to envision a more comprehensive solution.

At the same time, by aligning and comparing the different activities that the three users (pregnant woman, healthcare provider and administrative) perform, was possible to pinpoint what are the main touching points and where the journeys of each user coincide. Moreover, the specific activities they carry out as part of their responsibilities or as a client were determined, which enable the visualization of how they are developed throughout all system and what is the logic and pattern behind it. From these interactions, the most pivotal and crucial ones are the following:



- When a pregnant woman arrives to a clinic and has to register. This is a process that is happens each time they visit a new clinic, demanding time from both, administrative personnel and pregnant women.
- When a medical professional has to provide treatment. To make this job easier and faster, as much accurate information as possibly available regarding the medical history if a patient is required.
- When a pregnant woman is referred. Sometimes they do not know where to go (following the 6 level structure) nor how to communicate their diagnosis or medical condition.

After analyzing the current circumstances and considering that a referral can occur either on a normal basis or in emergency situations, it was determined that, based on evidence from the research, the proposal should prioritize critical scenarios. In this context, the system should be able to provide the most efficient service and be designed error proof, in order to cope with demanding conditions and life threatening cases. Once all these aspects where specified and delineated, the team continued with the development of the service design.



DEVELOPMENT AND PROTOTYPING

Since the proposed solution for the problem is a service, the Service Experience Blueprint (SEB) was used as a main tool and method to give shape to this idea. SEB enables designing multi-interface service experiences, by first analysing the customer experience to understand better the requirements and demands in order to find solutions and alternatives to satisfy them. Its goal is to improve a system integrated by a constellation of activities that are interconnected and linked to leverage the value created by the different interactions happening. Moreover, it seeks to provide a desired experience by allocating activities and interfaces suited for them in a specialized form. As a result, users are guided through the process, enhancing the overall customer experience.

To design the SEB, all stakeholders involved during the onboarding and referral process, as well as their tasks, are included, categorized in three different users according to the role they play:

- Pregnant woman: individual who receives services from healthcare providers and who will be navigating through all process if a referral is required based on the severity of any clinical diagnoses.
- Medical professional: any healthcare provider whose activities include examination of a patient, registration of medical information and diagnoses. This person must be certified and have a valid medical license.
- Administrative: person responsible for managing a patient's personal information (non medical), payment and insurance related matters, basic administrative procedures and, sometimes, keeping patients' records.

Moreover, the type of interface enabling the interactions between them are visualized. It includes the physical means for communication, the specific feature or design which provides the information and allows actions to happen, and the backstage activities carried out by either the user or the platform system itself. In addition, supporting activities which are not part of the service, but can enhance and add value to the entire structure are incorporated.

To test the service design, it was necessary to prototype it and assess it with real user. In this regard, one of the biggest challenges for the project's development phase was that the developing team was in a different geographical location than the end users. In addition, communication with the diverse stakeholders the team interviewed during its visit to Nairobi and Malindi weakened after a couple of weeks, making it harder to get a rapid response from their side. However, a different approach was used in order to test the ideas and get feedback which could help to improve the solution:

- Video: This visualization tool was selected due to its capability to depict and tell the story of the new scenario Haikara Health is intended to create. Using animation and narrative, it allows an easier and clearer way to communicate ideas among people in different locations.
- Survey: To facilitate feedback, a video was accompanied by a set of designed questions to trigger reflexion in users. The questions were both broad, to understand the general impression concerning the service, and specific, to focus attention on the most relevant

aspects the team wanted to evaluate.

- Stakeholders in Kenya: medical professionals and users interviewed during field research were reached out to in order to get feedback. Since they were aware of the project and its goal, their opinion was crucial for the improvement of the proposal.
- Stakeholders in Finland: medical professional and faculty members were also included as evaluator for the concept. For the design department, Markus Ahola, project manager in Aalto's Experience collaborated with his deep understanding of human experiences. From the business department, Ville Eloranta, postdoctoral researcher of management studies contributed with his insights into business design and platforms.
- Facebook groups: to expand the number of interactions and feedback, video and survey were shared through social media, on groups integrated either by Kenyan mothers or medical professionals. Due to lack of trust, the response of mothers was not as desired. However, health care providers showed more interest in the topic.

PROGRAM

Iterating the concept using the described resources for one month and a half.

Fieldtrip

First Iteration
Initial idea defined and all material required to prototype and test (illustrations, video editing, setting up survey) created from scratch.

Second Iteration
Service design modified based on first round of feedback. Second video and survey set up.

Final proposal
Final concept solution detailed and final animated video for presentation finished.

FIRST ITERATION

In the first version of the service design three crucial stages where outlined:
1. Onboarding process for the first time. A pregnant woman arrives to a clinic, most likely a community level facility, in order to register in Haikara Health to become a user. This stage comprises registration of personal data, insurance and basic medical information.
2. Referral process. A healthcare provider indicates that a pregnant woman must be referred to the next level clinic according to the severity of her case. This stage comprises registration of referral reasons, selection of preferred clinic and transference of pregnant woman's information.
3.Onboarding process consecutive times. A pregnant woman arrives to a new clinic, a level (or several) above the one visited before. This stage comprises identification of the patient and fast processing to get medical care.

A core feature of the service is an SMS based system through which the exchange of information between clinic and pregnant woman takes places. A mobile phone becomes the key identification for the patient and she uses it to grant access to her personal file to any medical facility she visits. Therefore, in order to build trust, a pregnant woman receives messages that indicate when she has been successfully registered and when her data has been manipulated. Furthermore, it empowers her with the control of who can access this data.

Clinics communicate through the centralized system of the platform. It enables them to

1st Time Visit

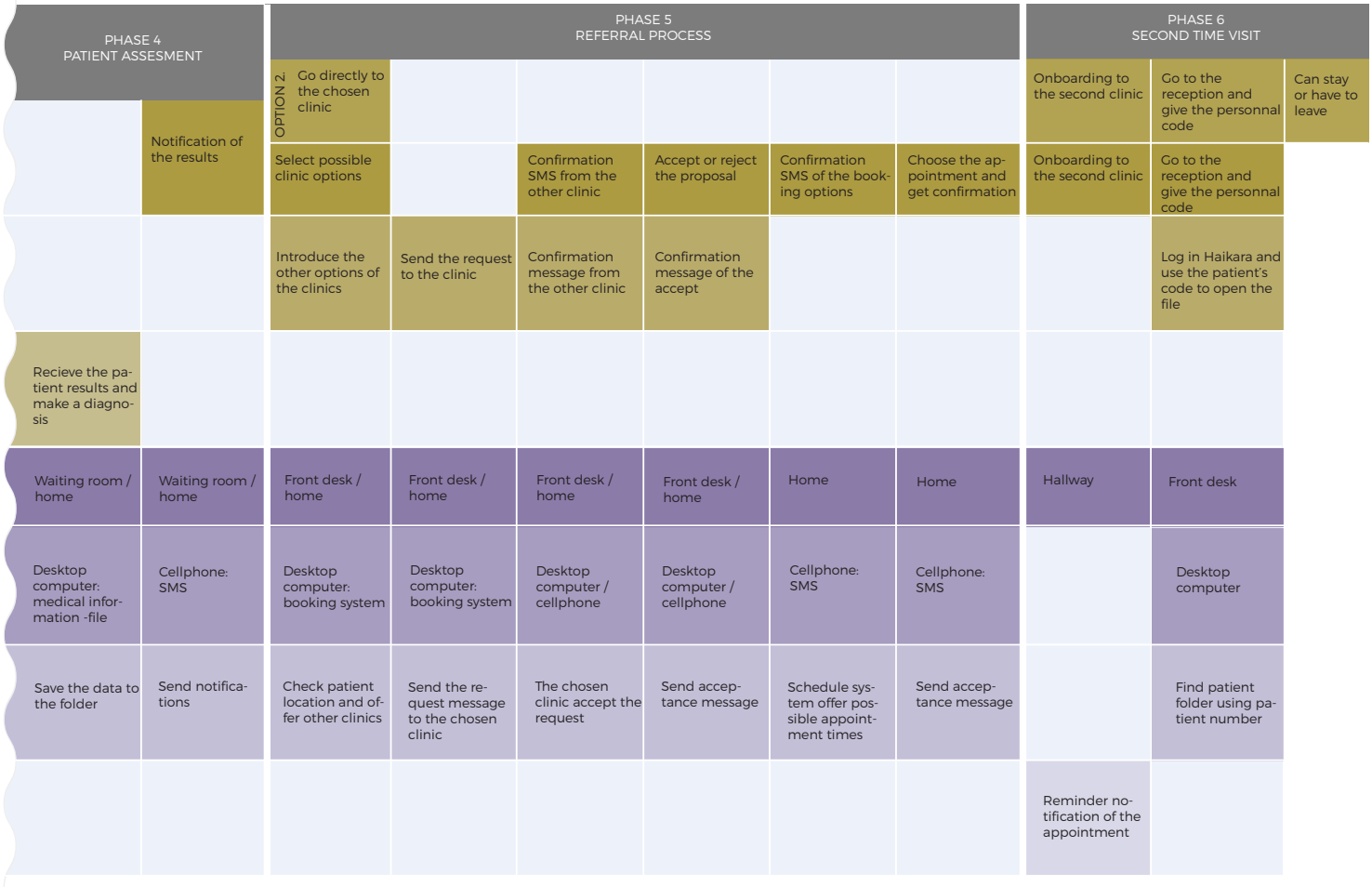
		PHASE 1 ARRIVAL		PHASE 2 REGISTRATION						PHASE 3 PAYMENT
				IDENTIFICATION AND INSURANCE		MEDICAL INFORMATION				
USER ACTIONS	Patient	Onboarding to the clinic	Go to the reception	Give general information and show ID or birth attendance	Confirm and accept information	Wait in the waiting room	Meet the medical professional	Answer for given questions	Comfirm and accept information	Confirmation SMS and personal code	Pay the costs of the visit and needed tests
	Counter		Log in Haikara	Create a new patient profile and record patient information	Ensure that information is correct						
	Medical professional					Call the patient by name	Log in Haikara and find the created patient profile	Ask questions and record them to Haikara	Ensure that information is correct		
Place of action		Hallway	Front desk	Front desk	Front desk	Waiting room	Exam room	Exam room	Exam room	Waiting room	Check-out room
Physical evidence			Desktop computer	Desktop computer: general information -file	Desktop computer: general information -file		Desktop computer	Desktop computer: medical information -file	Desktop computer: medical information -file	Cellphone: SMS	Cellphone / Payment methods: m-pesa, insurance, cash
Backstage of database				Create a new patient folder	Save the data to the folder		Find the right patient folder with name		Save the data to the folder	Send confirmation about registration and give a personal code	
Support processes									Printed form to patient	Information how to take care of the health during pregnancy	m-pesa

TESTS IN CLINIC

standardize the registration process and have the most basic and important information required to provide a better and more accurate service in an accessible and handy space. Haikara Health provides a more efficient way to store and manage patient information, with special focus on the referral process, including the different activities and data needed to make it reliable and easy to follow.

As mentioned before, three different stakeholders directly involved in the process were identified. Therefore, three different types of profiles are available in the system:
Pregnant woman. She can access the platform to adjust her privacy settings, but she cannot modify data concerning her medical history. If she must make any change, she has to visit the closest clinic registered in Haikara Health, so its personnel can help with this matter.
Medical professional. They have complete access to medical related forms in the platform, and to ensure data confidentiality, each doctor, nurse, etc. who might consult or modify the information must be identified with an official license.
Administrative personnel. They have restricted access to Haikara Health system, only possessing rights to manage identification and insurance or payment information.

This distinction is fundamental for the proposal, due to the sensitive nature of the information storage in the platform. By creating different profiles with different access rights it ensures privacy and confidentiality, granting access only where it is needed for the appropriate user.



WHAT TO TEST

For the first interaction, it was necessary to determine how the service concept will be received by real users in Kenya. Therefore, the main question around the creation of this prototype dealt with how stakeholders will perceive Haikara Health as a possible integral solution with the aim to streamline different activities to facilitate the onboarding and referral procedures within and across healthcare facilities.

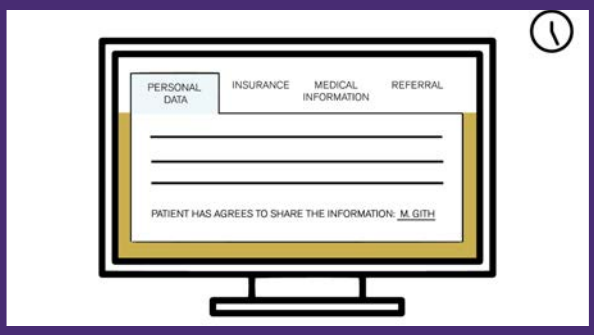
Furthermore, it provides information regarding the features and aspects included in the platform as core activities to facilitate the registration, management and transfer of information to validate its suitability for the social context in which the problem is present.

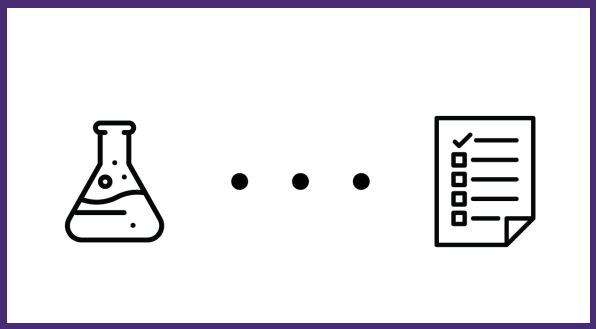
Finally, our third goal was to identify any gap in the proposed journey that must be incorporated, based on the experience of experts.

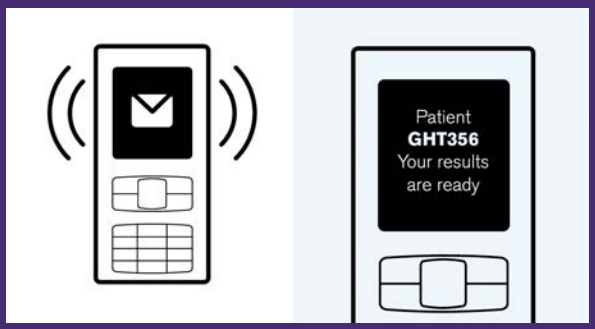
PROTOTYPE DESIGN

To test and validate the idea, a video was created based on the service design activities and characteristics. A storyline was developed to better visualize and communicate the value and benefits that the new model could bring to the users experience when integrating it to the current system, enhancing their interactions.

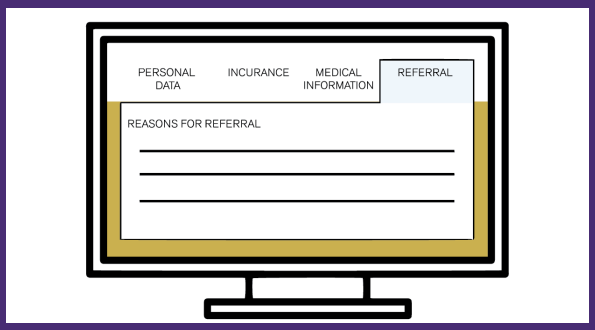
In addition, a survey accompanied the video with the purpose of prompting reflection and critical analysis from the participants' side to get more comprehensive feedback that could be used to improve the current proposal. The full questionnaire and answers are included as an appendix at the end of this document.

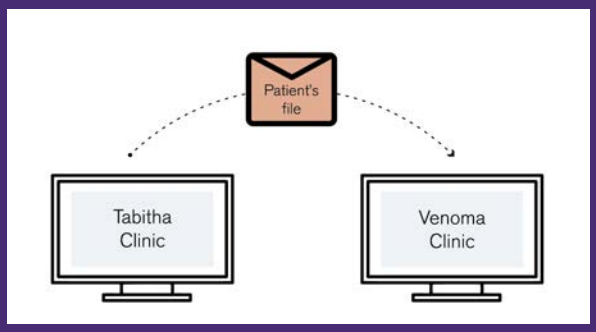




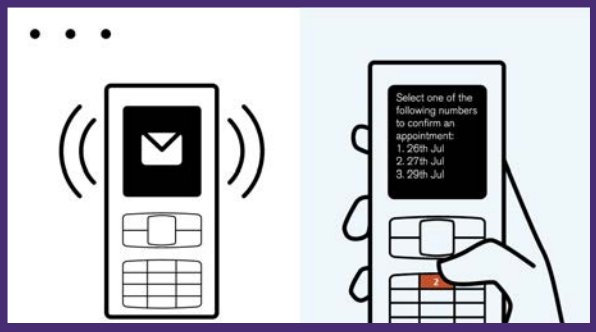

Patient
GHT356
Your results
are ready

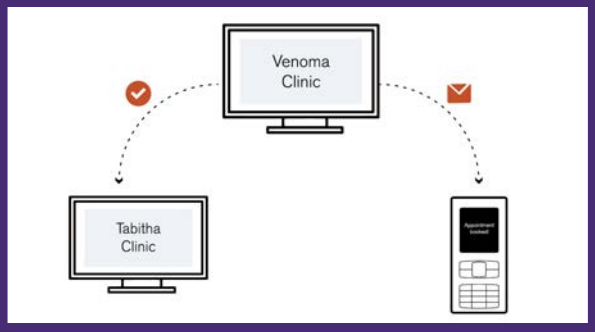

Consulting Room

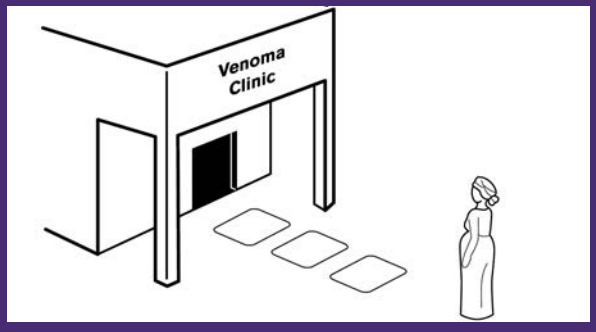

PERSONAL DATA
INCURANCE
MEDICAL INFORMATION
REFERRAL
REASONS FOR REFERRAL

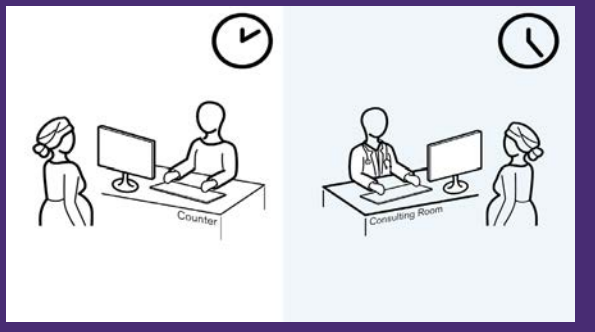

Patient's file
Tabitha Clinic
Venoma Clinic


Patient: GHT356
PERSONAL DATA
INCURANCE
Your case is being processed


Select one of the following numbers to confirm an appointment:
1. 26th Jul
2. 27th Jul
3. 29th Jul


Venoma Clinic
Tabitha Clinic

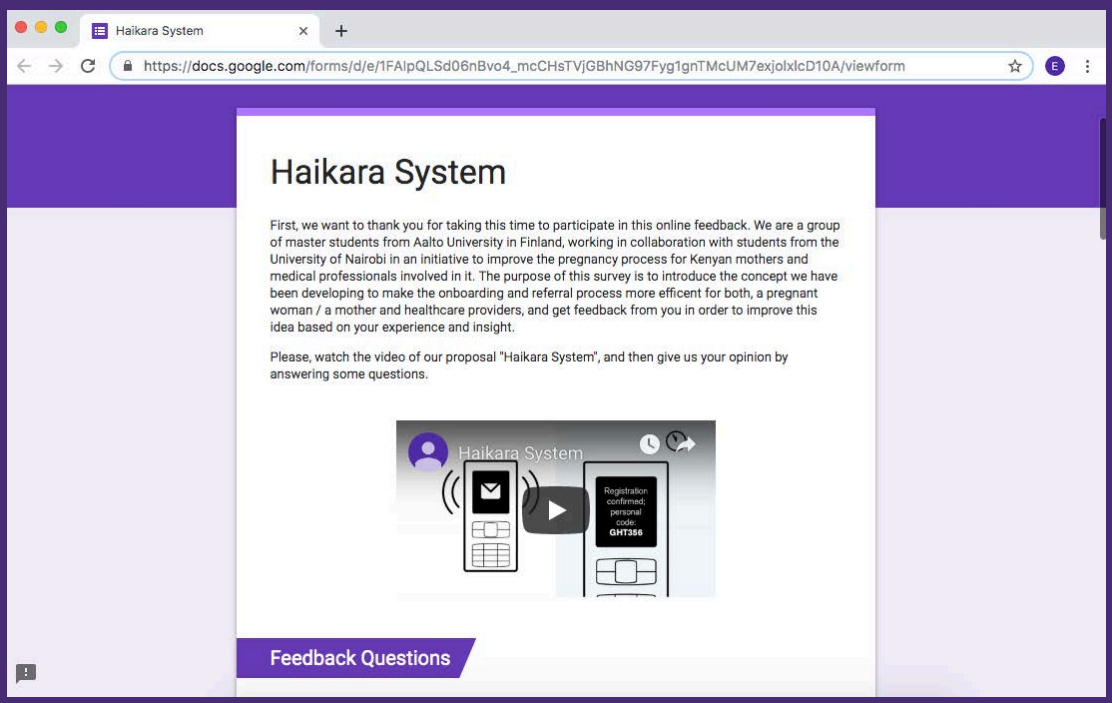

Venoma Clinic


Counter
Consulting Room

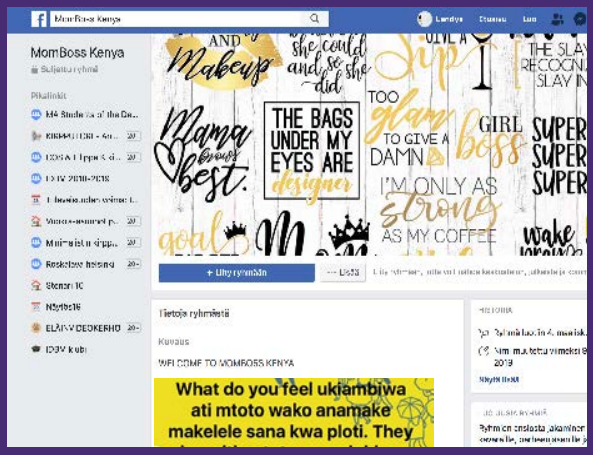
FEEDBACK RESULTS

A total of 11 people, comprising medical professionals, mothers and volunteers, gave their feedback, 9 of them using the survey format and 2 using an informal channel (WhatsApp). After analyzing all responses, the most relevant points are listed below (full questions and answers can be found in Appendix 3):

- A general positive opinion regarding the information database and streamlined process was shared among the participants, upholding our concept and the need for a solution to a current inefficient referral process. They consider Haikara Health improves the overall procedures by avoiding delays through a reliable flow of information, guaranteeing patients privacy and reducing the workload for healthcare facilities staff by automating routine tasks. " It's an excellent idea in terms of sharing data among health clinics." Healthcare provider, Kenya, 2019."Sharing of data by only authorized medical personnel, increases privacy and reduces waiting time for clients."
- The SMS system was well received, since it is the main means of communication (as was identified during field research). Most of the beneficiaries, according to one of the respondents, have "feature phones generally with no internet connection". Thus, by providing notifications and relevant information through this wideused service it it possible to reach more patients. However, it was stated as a concern related to the number of instant messages that a pregnant woman will receive, because they can become annoying, producing an undesired effect. "Reduce the number of SMS or texts used since may be too much to the pregnant mothers, they may ignore so make it a whole system with smaller or less components" Healthcare provider, Kenya, 2019.



This format facilitated sharing the concept solution with stakeholders allocated in Kenya via email and Whatsapp, as well as diverse facebook groups that included Kenyan mothers and medical professionals.



- To keep a reliable registration, it was suggested that pregnant women should not be able to edit their identification information, thus avoiding duplication or having more than one profile for one patient. In this regard, it was also mentioned that the proposal should facilitate scanning of authenticity of documents in order to reduce time and resources invested.
- Participants highlighted the relevance of integrating current platforms and services used for the personnel and patients into the system, as M-pesa (payment method) and Telemedicine (digital portal to assess clinical cases and prescribe medication). Furthermore, including traditional methods of communications as phone calls to communicate urgent matters.
- Some additional comments where: integrating transportation scheme as part of Haikara Health, including GPS so pregnant women can allocate nearest clinic and reminders about appointments or medical advice

CONCLUSIONS

TThe most significant inputs and takeaways from the survey were taken into consideration to redesign the next iteration of the service design. These were the following:

- One of the main benefits is found during the registration procedures. By avoiding the repetition of this task in each clinic, Haikara Health provides a smoother communication and transference of information, keeping its reliability and confidentiality in a safe system.
- Emergency situations should remain as the focus of the proposal, being the most critical and demanding context. In addition, Haikara Health should provide options for pregnant women that cannot share their medical history or decide to go to a clinic which is not part of the system.
- As many of the processes carried out in within healthcare facilities currently rely on traditional tools and methods, it is hard to suppress them completely from the picture. Therefore, including SMS and other services, as phone calls, can make it easier to implement.
- Keeping tasks and messaging exchange to the minimum is one of the main concerns among pregnant women and medical professionals. The system must consider the workload of healthcare users, as well as the comfort of patients.
- All processes of selection (as preferred referring clinics) should take place in advance in order to avoid any inconvenience or stressing situation when a referral has to be done. It will grant time for the patient to decide and make future interactions smoother.

SECOND ITERATION

We modified the second blueprint based on the feedback that we got from testing the first prototype. One of the biggest issue that came up, was related to privacy and security. We decided to keep three different accounts for those who are using Haikara Health platform.

- One account is for the pregnant woman who can check her own information through the Haikara website and modify basic settings, such as contact information, by herself.
- The second account is for the administrative personnel in clinics who register the basic information of the pregnant women into Haikara. Administrative personnel also takes care of the referral process and is responsible for the communication with other clinics.
- The third account belongs to medical professionals who register basic patient's medical information in Haikara Health. Only medical professionals have access to the clinical records whilst the patient gets a notification via SMS when someone modifies her file.

During the discussion the possibility of automatically integrating insurance information was considered. The basic idea was that a pregnant woman will provide just her name and the name of the insurance company, upon which the administrative person could find her information through the system, avoiding a situation in which pregnant women can't remember or do not have the required documentation at hand. However, the idea was turned down because it would require an API or similar data source to be integrated with Haikara Health, which currently does not exist.

		PHASE 1 ARRIVAL			PHASE 2 REGISTRATION						
					IDENTIFICATION AND INSURANCE						
USER ACTIONS	Patient	Onboarding to the clinic	Goes to the counter		Shows ID or birth attendance and give general information	Give the insurance information OR	Gets the insurance or choose other payment option	Chooses three possible clinics for referral process	Gives the access for patient file to the chosen referral clinics	Confirms and accepts information	Goes to the waiting room
	Counter		Explains what the Haikara to the patient	Login Haikara's administrative account	Creates a new patient profile and record general patient information	Finds the insurance information from Haikara or Register the insurance information OR	Introduces the cooperation insurance company for patient	Introduces the other clinics for referral process	Register the permission of the access to the patient file	Ensures that information is correct	Convey information of a new patient to the medical professional online or with printed form
	Medical professional										
Place of action		Hallway	Counter	Counter	Counter	Counter	Counter	Counter	Counter	Counter	Counter
Physical evidence			Desktop computer: Haikara info package	Desktop computer: Administrative account	Desktop computer: General information -file	Desktop computer: Insurance information -file	Desktop computer: Insurance information -file	Desktop computer: Referral system	Desktop computer: Referral system	Desktop computer	Desktop computer: general information -file
Backstage of database	Medical professionals										
	Administrative		Info package of the Haikara	Open the side of the administrative -account	Create a new patient folder	Find the insurance information	Offer the insurance	Check patient location and offer other clinics			Save the data to the patient folder
Support processes			Booklet about Haikara for patient		Patient has an opportunity to change default settings by herself: address etc						Printed form for patient
Insurance company						Insurance information could be already in Haikara	The first choise insurance what to offer for patient				

We considered to integrate some insurance companies to Haikara. The idea was that the pregnant woman can tell her insurance information for administrative person when she is arriving the first time Haikara clinic. Administrative person could find the insurance information through the system which helps the referral progress later on. However, the problem would be that the insurance companies should also create the online system which would be integrated to Haikara and that would need more effort to insurance companies as well.

We also considered that in referral progress, the administrative person could check which clinics are available using the Haikara's Traffic light -system. The idea behind the traffic light -system was that there would be three different realtime color codes to identify the patient's flow in each clinic. The red color could tell that the clinic is full and cannot access more patients. Yellow could represent that the clinic starts to be full and the green color could tell that the clinic is available for the new patients. In this point, the Traffic light -system would need more complicated platform and the clinics would need to do more effort for that so that's why we decided to leave that out from our service.

Another idea was to implement a traffic light-system in Haikara Health in order to check real-time availability of clinics a patient could be referred to, i.e. a visual indicator of three different colors. A red color could tell that a clinic is full and cannot accept more patients.

PHASE 2 REGISTRATION								PHASE 3 PAYMENT
MEDICAL INFORMATION								
Waits in the waiting room	Goes to the exam room and meet the medical professional		Gives the contact information and access to patient file in emergency case	Answers for given questions	Comfirms and accepts information		Gets confirmation message and personal code via SMS	Pays or uses the insurance for the costs of the needed tests
Checks validity of the insurance if needed								Makes a bill
Calls the patient by surname (or anonymous?)	Explains that only Haikara's certify personnels have access to patient's data	Login Haikara's medical professional account and find the created patient profile	Register the contact information and asked the access to the patient file for emergency case	Asks questions and record them to Haikara	Ensures that information is correct	Gives the printed patient file if needed		
Waiting room	Exam room	Exam room	Exam room	Exam room	Exam room	Exam room	Waiting room	Counter
	Desktop computer: Haikara info package 2	Desktop computer	Desktop computer: Medical information -file	Desktop computer: Medical information -file	Desktop computer: Medical information -file		Cellphone: SMS	Payment methods: insurance, m-pesa, cash
	Info package of the Haikara	Open the side of the medical professional -account			Save the data to the folder		Send 1. message: notification	Find the insurance information
	Booklet about Haikara for patient				Patient will get notification via SMS everytime when someone modified her file	Information how to take care of the health during pregnancy	In SMS message there will be a link for the Haikara webpage where patient can change default settings	m-pesa

POSSIBLE TESTS AND / OR TREATMENTS IN CLINIC

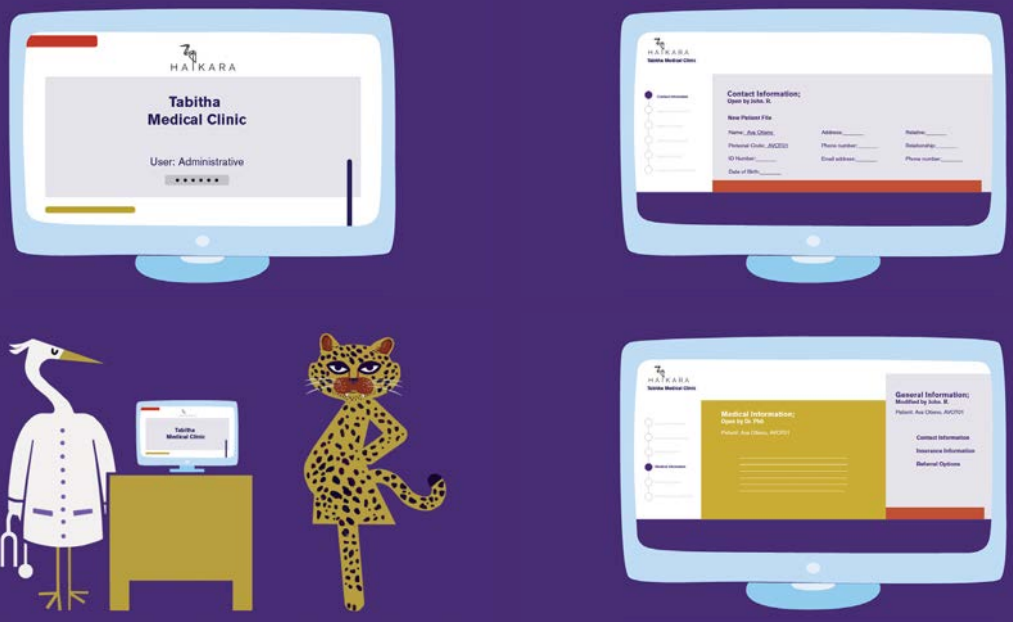
Yellow could represent that a clinic can take in some cases and a green color could indicate a clinic is completely available for new patients to come. But, such a system would add complexity to the proposal and would increase the effort required from healthcare providers or administrative personnel.

PHASE 4 PATIENT ASSESMENT					PHASE 5 PAYMENT CHECK-OUT		PHASE 6 REFERRAL PROCESS		
							OPTION 2.		
	OPTIONAL= Gets SMS notification	(Visits the clinic again and) see the doctor	Gets diagnosis	Gets notification of the referral letter	Payes or uses the insurance for the costs of the needed tests		OPTION 1.	Gives the access to the patient file, if didn't give it before	Waits while counter calls to the chosen clinic
					Makes a payment check out	Confirmation of payment	Checks the live update situation of the chosen clinics	Registerer the access to the patient file	Calls to the chosen clinic and confirm patient coming
Recieves the patient results	*OPTIONAL= Send notification to the patient*		Gives diagnosis	Writes summary (and reasons for referral letter)					
Waiting room / home	Waiting room / home	Exam room	Exam room	Exam room	Counter	Counter	Counter	Counter	Counter
Desktop computer: medical information -file	*OPTIONAL= Cellphone: SMS*		Desktop computer: Medical information -file	Desktop computer: Medical information -file	Desktop computer	Desktop computer	Desktop computer: Referral system	Desktop computer: Referral system	Desktop computer / cellphone
Save the data to the folder	*OPTIONAL = Send notification*			Send 2. message: notification	Find the insurance information		Live data of the patient flow based on the onboarding		
				Printed summary and referral letter			Traffic light system: Red = Full Yellow = Almoust full Green = Available		

	PHASE 6 REFERRAL PROCESS		PHASE 7 ARRIVAL TO THE SECOND CLINIC			
OPTION 2.			Goes directly to the wanted clinic	Goes to counter (and show ID)	Sends the SMS to the clinic to give the access to the patient file	Stays or leaves if have to another clinic
OPTION 1.	Chooses the appointment time	SMS notification of the appoinment time	Onboarding to the chosen clinic	Goes to counter (and show ID)		
	Gives appointment options which other clinic offers				Login Haikara and open the patient file	
	Counter	Counter	Hallway	Counter	Counter	
	Cellphone	Cellphone: SMS			Desktop computer: General information -file	
		Send 3. message: confirmation			Find patient folder using ID / acceptance SMS	
		Reminder notification of the appointment				

THE IMPROVEMENTS OF THE FIRST SERVICE PROPOSAL ON THE WAY TO THE SECOND WERE:

- We reduced the amount of SMS messages which the pregnant woman has to send and receive, mainly during the referral progress to confirm the transfer to the next clinic and confirmation of the doctor appointment. The improvement streamlines the pregnant woman's role in the referral process, especially during an emergency situation.
- We exchanged the SMS message communication to a phone call between the clinics. That way, the clinic will get the information of availability for referral process and ensure that the patient will be received more easily without waiting for the answers of SMS.
- We changed the place of selecting the next clinic in referral process. When the pregnant woman arrives to the clinic for the first time, she can choose an order of clinics where she could be referred to if needed. In emergency situations, the counter can immediately call to the selected clinic without having to confirm the choice with the pregnant woman.
- To build trust and make the system more transparent, we decided that the pregnant woman can access her patient file through the website. The system will leave a mark if someone opens or modifies the patient file which can be tracked afterwards. If the pregnant woman noticed that someone has opened her file without her permission, she can report the misuse to a clinic or Haikara Health directly.

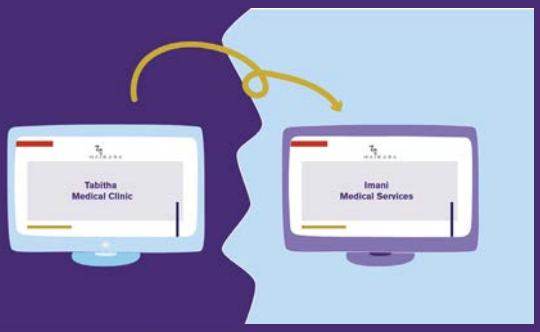



HAIKARA
Tabitha Medical Clinic
Consent Form
Open by Dr. Phil


HAIKARA
Tabitha Medical Clinic
Patient registered successfully!
Welcome to Haikara Health!
Patient: Ava Otieno
Code: AVOT01
http://haikarahealth.com


Lab test results:
READY
You can come to the clinic to get your results and diagnosis


Tabitha Medical Clinic


HAIKARA
Tabitha Medical Clinic
HAIKARA
Imani Medical Services


HAIKARA
Imani Medical Services
Access to the Patient File:
Open by Dr. Phil

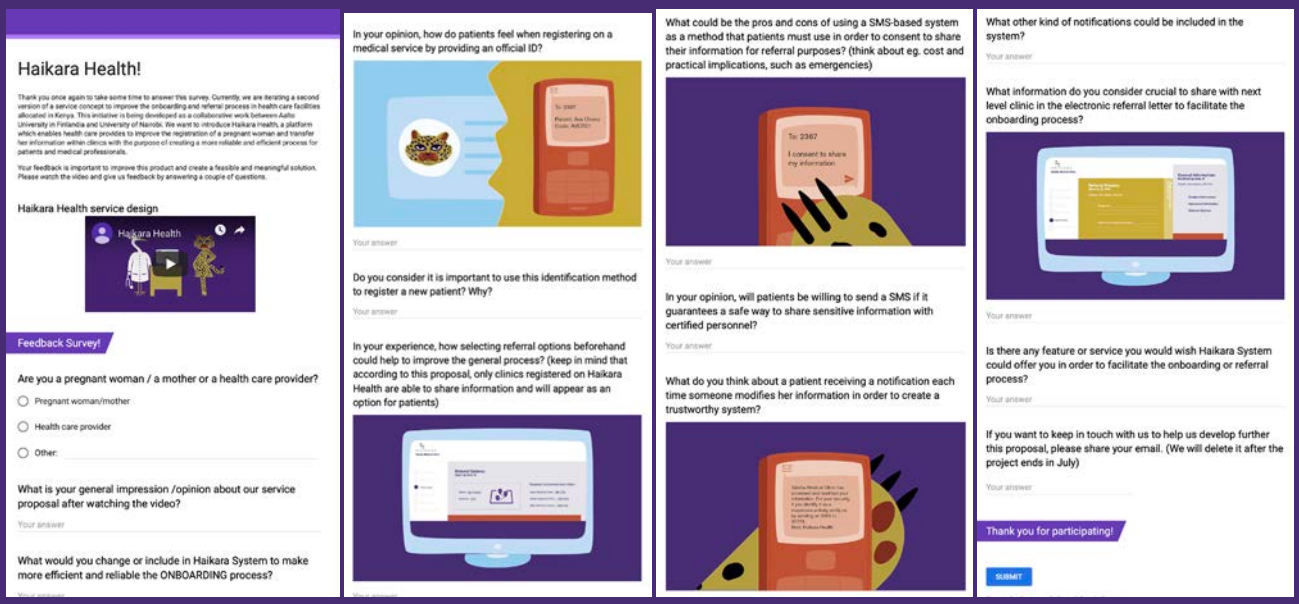

Your appointment has been confirmed.
Date: 26th July
Place: Imani Medical Services
Contact: xxxxxxx
Address: Sugar Street No. 23


Venoma Clinic

PROTOTYPE DESIGN

We iterated our second version of the service concept aimed to improve the onboarding and referral process in health facilities allocated in Kenya. To do so, we made a second video to present the modification and new storyline of the service design. Together with the video, a questionnaire was sent to get feedback regarding the general impression of the concept and more specific open-ended questions related to the onboarding and referral system and the information recorded and exchanged through Haikara Health.

We invited pregnant women and healthcare providers to watch the video of the service idea and answer the questions. We reached out to them via different Facebook groups of Kenyan mothers and medical professionals. Also, we asked for collaboration from our partners from the University of Nairobi as well as different stakeholders who took part in the interviews, observations and workshops during the field research.



FEEDBACK RESULTS

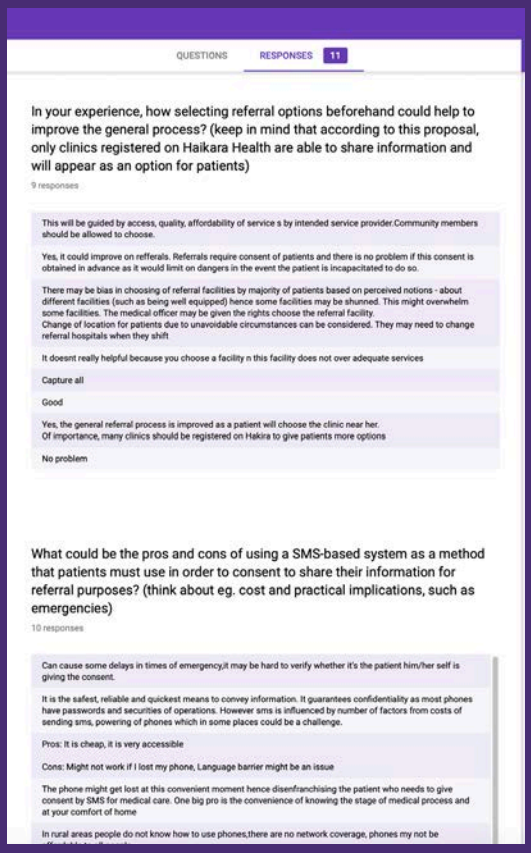
We got 9 answers through the online survey, mostly from health care providers and from public health specialist and fellows of Nairobi Innovation Fellowship 2019. Generally, the respondents approved of our second concept proposal, as they commented that our proposal could solve the problem of misinformation during referrals.

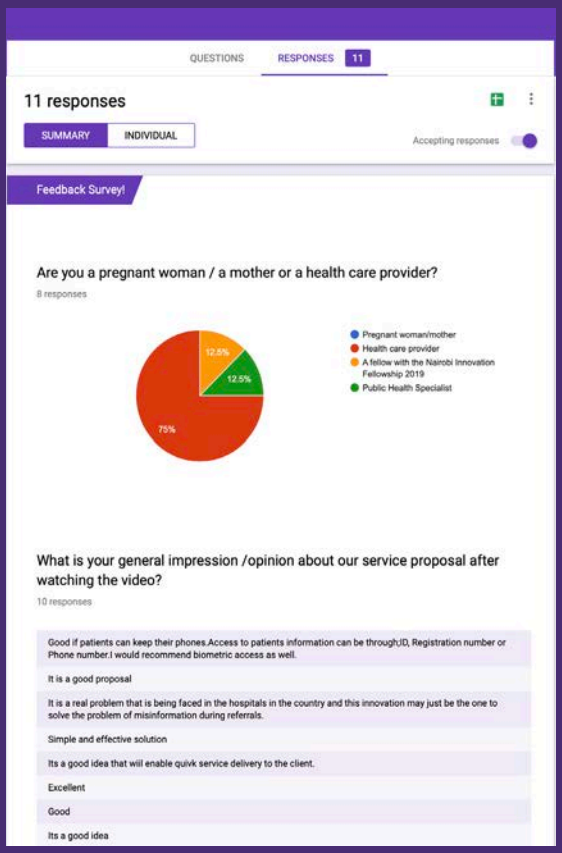
“Sharing of data by only authorized medical personnel, increases privacy and reduces waiting time for clients.” Healthcare provider, Kenya, 2019

- Some concerns were about cellphones and how the battery can run out or the phone can get lost. We decided to include the ID card as an option to identify the pregnant woman during the referral process.
- We got suggestions to integrate the Huduma Namba to identify the pregnant woman. Huduma Namba is a digital and biometric way to identify a person in Kenya without the need to show an ID card, driving licence etc. Huduma Namba and other ways to

- identify the pregnant woman could be taken into account during a potential further development.
- For the event of an emergency situation, to smoothen the referral process, the pregnant woman could provide consent to generally grant healthcare providers access to her information if needed during emergency.

From the feedback, we got a lot of good advice to improve our service proposal and we used it to develop our service proposal forward. The full questions and answers can be found in Appendix 3.





CONCLUSIONS:

The most significant inputs and takeaways from the survey were taken into consideration to redesign the next iteration of the service design. These were the following:

- We decided to focus on private clinics where we can pilot our platform and after that it could be possible to scale to the public sector as well. Private clinics also have more resources, for example desktop computer and access to internet, which are needed to use Haikara Health.
- The challenge in our proposal would be that the lower level hospitals would have to do the first registration of the patient, so some kind of incentives for them would be considered because they are giving the biggest effort to running the Haikara system.
- To support the pregnant woman more during pregnancy, Haikara Health could send notifications about relevant information such as knowledge about pregnancy and notifications about appointments, etc.

FINAL CONCEPT

The previous blueprints were drafts and tools for us to understand the bigger picture around the service. We modified the blueprint step by step every time when we created some new parts or derived new thoughts on our service proposal. We separated the user's journey into three paths so that the final blueprint would be more readable.

- When developing the final concept we focused more on the perspective of the medical professionals and administrative personnel. Haikara Health is a tool for clinics to ensure a smooth patient flow and that's why the access to information should be easy to find and use.
- We integrated traditional systems such as printing, phone calls and SMS to support and communicate between clinics and pregnant woman.
- An attachment features was added, so that healthcare providers can upload test results, fetoscope examination data, photos, etc.
- One of the forms that healthcare personnel must fill in is the info concerning the blue book, so in the future it could be used for the information needs of the Ministry of Health.

KEY FEATURES

One of the key features of our final concept is a smooth patient flow during the onboarding and referral progress. All the registered patient information will be found in a cloud system where the administrative and medical professionals have access to get the needed information by logging into the system. To keep the system transparent and improve the trust between pregnant women and the clinics, the pregnant woman has the possibility to login to Haikara Health and check who has opened and modified her file. If she notices some inaccurate information, she can send a notification to her clinic that they can change the wrong information. If there is some improper use of the patient information, the pregnant woman can report that straight to Haikara Health.

We wanted our concept to reach as many pregnant women in Kenya as possible and that's why the communication channel between pregnant woman and clinics or Haikara is SMS-based, as not everyone has a smartphone or access to internet. All supporting notifications such as information about pregnancy and notification about someone has been modified the patient file, will be sent via SMS to the pregnant woman.

Easy access to the patient folder helps to get the right diagnosis and the needed treatment for pregnant woman faster. That will save money and time from both user groups; clinics and pregnant women.

HAIKARA HEALTH DEMO

The third and final video was an animation of the service path from the pregnant woman's point of view. The storyline of the video is that the pregnant woman, whose character presented as a cheetah, is trying to go to different clinics but faces some of the widespread problems: the clinics are full because it's hard to control the patient flow, there is hassle because of manually filling all the patient information and trying to find it afterwards, and, lastly, the lack of patient information needed when wanting to do any kind of tests or examinations. The fourth clinic in the video is a Haikara Health clinic that welcomes her and registers her into Haikara Health. All the needed basic and medical information are recorded and when she needs referral, the next Haikara clinic can easily access her patient information with her permission.

BLUEPRINT

SUPPORT PROCESS	BACKSTAGE ACTIVITIES	FRONTSTAGE	PHYSICAL EVIDENCE	PREGNANT WOMAN
Posters / flyers (QR-code) in clinic wall				Arrives to the clinic
				Arrives to the clinic
			ID's etc. documents	Gives info and shows ID etc.
Patient can be called by code or surname for exam room in the future			The counter's screen	Checks that information is correct
	Settings can be changed remotely at home		The counter's screen	Chooses referral clinics
			The counter's screen	Checks that all the registered info is correct
	Send to Clinic's system	SMS message	Cellphone	Grants for consent
Link to Haikara Health website		SMS message	Cellphone	Receives notification (patient code)

MEDICAL PROFES-SIONAL	ADMINIS-TRATIVE PERSON	PHYSICAL EVIDENCE	FRONTSTAGE	BACKSTAGE ACTIVITIES	SUPPORT PROCESS
	Welcomes the patient.	Desktop computer	Website; Landing page of Haikara Health		
	Logs in	Desktop computer	Log in Administrative account		
	Explains what Haikara is.	Desktop computer	Website; Explains		
	Creates a new patient file	Desktop computer	Website; New patient file		
	Asks for patient info				
	Registers patient info + insurance info	Desktop computer	Haikara online patient form	Patient's code is generated	
	Introduces and register chosen re-ferral clinics	Desktop computer		Filtering clinics based on location	
	Checks the patient info	Desktop computer			
	Asks for consent		Online message	Digital signature	
	Explains what Haikara is.			Send the notification to pregnant woman	Printed version of registeration for pregnant woman

SUPPORT PROCESS	BACKSTAGE ACTIVITIES	FRONTSTAGE	PHYSICAL EVIDENCE	
				Waits in a waiting room
				Waiting in a waiting room
				Goes to consulting room
				Meets the doctor
Can check who access her files logging in website				
				Tells the basic medical information
		SMS message	Cellphone	Receives a notification
			The counter's screen	Agrees the information
She receives info through the link	Notification if someone modifies the file			
				Returns to counter

	PHYSICAL EVIDENCE	FRONTSTAGE	BACKSTAGE ACTIVITIES	SUPPORT PROCESS
Verifies insurance information	Cellphone/ Desktop computer	Browser		
Confirms the insurance info				
Receives the info of a new patient		Talking		Print / online
Notifies of a new patient				
Sends patient to consulting room				
Meets the pregnant woman				
Logs in	Desktop computer	Log in Medical Professional - account	Leave a mark / Identify who access	
Opens a new patient file	Desktop computer			
Register medical information	Desktop computer	Online form		
			Send a notification	
Verifies information	Desktop computer			Print
				Send notifi-cation about pregnancy

SUPPORT PROCESS	BACKSTAGE ACTIVITIES	FRONTSTAGE	PHYSICAL EVIDENCE	
				
				Pays
				OPTIONAL: Goes to lab test

LAB TEST ARE READY

	Receives info through SMS			
				Goes to consulting room
				Gets diagnosis
		Form of summary	Printed form	
				Pays the check-out payment

	PHYSICAL EVIDENCE	FRONTSTAGE	BACKSTAGE ACTIVITIES	SUPPORT PROCESS
Receives the payment	Desktop computer			
Register info	Desktop computer			
		Sheet form		

LAB TEST ARE READY

		PHYSICAL EVIDENCE	FRONTSTAGE	BACKSTAGE ACTIVITIES	SUPPORT PROCESS
Receives pregnant woman		Printed form	Form		Notification of results
Gives diagnosis					
Writes summary (and reasons for referral)		Desktop computer			
Fills info to a blue book form		Desktop computer	Online form	Send a noticifation to administrative	Printing the form
		Desktop computer	Website		Printing the form to the blue book
	Confirms the payment	Desktop computer			
	Checks selected referral clinics	Desktop computer	Website		
	Call to referral clinic to confirm	Cellphone	Number of clinic		

SUPPORT PROCESS	BACKSTAGE ACTIVITIES	FRONTSTAGE	PHYSICAL EVIDENCE	
		SMS message	Cellphone	Receives the notification
				Arrives to the new clinic
		SMS message	Cellphone/ ID card	Sends code or shows ID
				Goes to consulting room

	PHYSICAL EVIDENCE	FRONTSTAGE	BACKSTAGE ACTIVITIES	SUPPORT PROCESS
Calls / Answers the call	Cellphone			
Asks for appoint-ment / Opens the patient file	Cellphone			
Checks availability	Cellphone			
Confirms the patient's coming	Cellphone/ Desktop computer	Website confirm	Send info of a new clinic to pregnant woman	
Welcomes pregnant woman				
Identifies the pregnant woman	Desktop computer	Website	Receive the SMS and open file	
Notifies the doctor of a new patient		Talking		Print / online
Sends the patient to the doctor				

GRAPHICS STORYTELLING

Graphic design is the process of visual communication. Visual storytelling is a mega trend in brands trying to tell their story to their customers. We discovered in our field research that when searching information about pregnancy online, Kenyan mothers find it mostly from Facebook and Facebook groups, since it is free to use. Facebook, as well as Instagram, Pinterest and Snapchat are based on visuals.
Story told by visuals can be understood easier for everyone without reading the actual text. That's why it's a good way to deliver the message for people speaking different languages or being illiterate. Text or fact based info only can easily be boring and fail to get the attention it deserves.

CHARACTERS

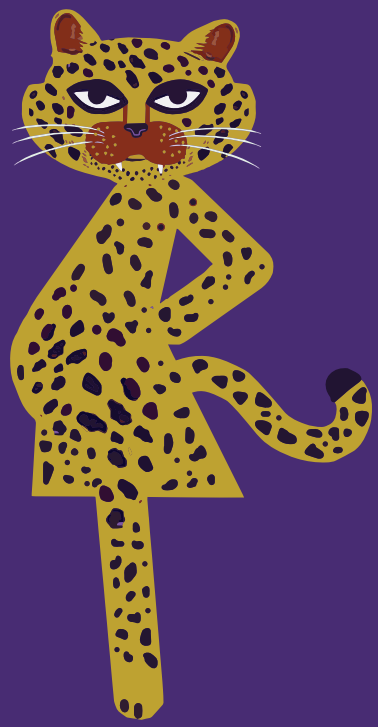
We decided not to use photographs or faces of interviewees from the field trip for reasons of privacy and respect. Pregnant mothers are often in a very vulnerable position in Kenya. Customers would not be interested in our story if it isn't relevant to a "conflict" or problem they are struggling with. It is easier to relate to someone if we are familiar with what they do or who they are, so we decided to show the mother and healthcare professionals having the same problems they are currently dealing with. Only after this we present our own solution.

DR. HAIKARA

Haikara means "stork" in Finnish. The white stork is a large bird that connects Finland and Kenya. It breeds in Europe (north to Finland), northwestern Africa, southwestern Asia and southern Africa.

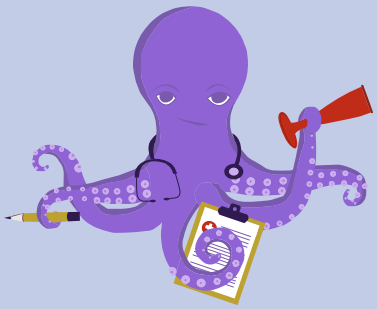
According to European folklore, the stork is responsible for bringing babies to new parents, so Haikara would be a reliable doctor.

Haikara is near to the word "haraka" in Swahili which means fast. We are aiming for a faster and more reliable referral system so the name Haikara is a perfect name for us.



CHEETAH MOTHER

The character for the pregnant woman is a cheetah. Mothers in Kenya need to often fight their way through the system and be brave for their children. The cheetah is a large cat that occurs in North, Southern and East Africa. It is the fastest land animal on earth and we needed the character to run fast in the video as well

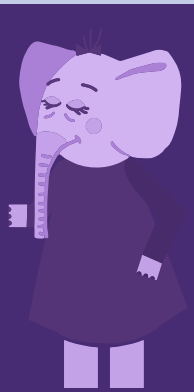


Dr. Octopus who is too busy with paperwork.

Dr. Crocodile who can not take care of patient without previous diagnosis..

Dr. Giraffe who can take care of the mother after being refferred inside Haikara system.

Rhino counter from Haikara clinic one.



Elephant counter from Haikara clinic two.

Government Hyena

Incurance Lion

NGO Hippos

PLATFORM DESIGN

To ensure that potential users could find out about our service, we started to create the first draft of our platform. The goal was to make a website where visitors can find the information of Haikara easily and join the platform. To test and demonstrate our concept, we made a first mockup of the landing page with the aim to present key information for pregnant women, medical professionals, and systemic organizations. The idea was to explain how our concept would works for different users, introduce the key features, and present the different options to join HaikaraHealth. The landing page should easily present all the necessary information and get people interested about our concept. The first draft of the landing page was made by using drawing program just to define the needed space and information we wanted to explain on the website.

After iterating the draft of the landing page, we started to code a technology based landing page. This was necessary to make information easy to be read and found. The visual elements we wanted to integrate were the logo on the top bar to represent our brand, the animation of our service concept which tells the reasons and solution behind Haikara Health and the visual elements such as animal characters which are familiar from the animated video to give a stronger brand identity for our website.

IMPLEMENTATION IN KENYA

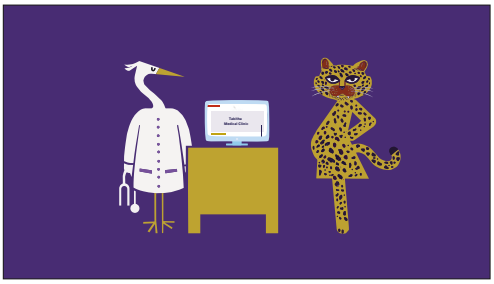
One of the biggest challenge in the service design workstream was that the future users are located in Kenya while we were working on the solution in Finland. To test the prototypes with users was challenging because of the long distance, and difficulties in reaching the potential users and winning their trust as an external agent. However, we got a good amount of participants for our survey, although for the further development of the concept and a possible implementation we would have to collaborate more closely with stakeholders or companies in Kenya.

HAIKARA HEALTH

For Mothers | For Health Care Providers | Contact

"Supporting mothers through pregnancy process"

Haikara Health is a platform which enables health care provides to improve the registration of a pregnant woman and transfer her information between clinics with the purpose of creating a more reliable and efficient process for patients and medical professionals.



HAIKARA OFFERS

CLOUD STORAGE

Haikara is a platform for patient's general, insurance and medical information.

NETWORK

Haikara builds a network between clinics to share the patient's information.

SECURITY

Only medical professionals have acces to the patient's file with the patient's permission.

CHOOSE THE PACKAGE FOR YOUR NEED

Break down of offerings - features & benefits

	Healthcare Providers	
PACKAGE	BASIC	PREMIUM
Pricing	Free	Monthly or annual subscription
Referral System	Y	Y
Email support	Y	Y
Phone support	N	Y
Customer analytics	N	Y
Care packages	N	Y
Market insights & reports	N	Y with additional fee

	Insurers, Ministries and Government
PACKAGE	INSIGHTS Obtain aggregate data and insights into maternal healthcare and the hospital performance in Kenya. Use these insights to gain competitive advantage and deliver on your healthcare initiatives.
Pricing	Pay per report Talk to us (full package)
Market insights & reports	Y

Marketing Account Types

	Value Proposition & Resonating focus	Account Types
Patients	Access and control your healthcare data more easily. Enjoy faster healthcare service.	Patient (not advertised, FREE)
Healthcare Provider	We provide a seamless tool to onboard and refer patients to and from your facility	Basic - FREE Premium - Subscription
Large Organization	Gain specific market insights on healthcare to help you respond, adapt and tailor your services to gain competitive advantage	Insight - Subscription / Individual agreement

BUSINESS MODEL DESIGN

BUSINESS MODEL CANVAS VALIDATION

From the outset we decided that it would not be appropriate for patients to pay for the service, as such we needed to design a business model that could be funded otherwise. We realised quickly that the Business Model Canvas (BMC) has some shortcomings when designing a business model for an online platform. It was difficult to identify only one key target customer as benefits flowed to multiple stakeholders, not just one. It was also difficult to determine what revenue model would be the right fit as again, different revenue models were applicable depending on who the stakeholder interacting with the platform would be. Then there was the question of funding the platform - who would contribute the requisite capital investment to ensure Haikara could operate? We knew that it would not be feasible for mothers to pay to obtain their own medical history and from a point of principles, our team did not believe this was ever an option. We then thought that perhaps the health facilities themselves could fund Haikara and pay a fee for the benefit of using the system. The problem there was the fact that health facilities are already under resourced, it would be unrealistic for them to in addition spend money on the Haikara platform - even if it would streamline the collection and distribution of a mother's healthcare information

We sought advice and feedback from Ville Eloranta, a professor at Aalto University. He guided us to think more broadly and identify the stakeholders that "benefit from the platform, without ever actually using the platform". He also taught us about the platform business model, which is multifaceted and more appropriate to creating new business models for the online world.

PLATFORM MODEL AS A NEW FRAMEWORK TO CREATE A BUSINESS MODEL

We took our new found knowledge and went on to create a business model that is appropriate for a platform. The first step was to identify all the core stakeholders and see who benefits and who gives at the different stages in the service. The diagram below demonstrates the key stakeholders and what they may gain from Haikara:

↱	Haikara	HC Facility	Insurance Agency	HC Staff	Patients	Externals (ministries, government etc)
Haikara		Infrastructure Training to use system Customer support Access to Market / customer insights (premium)	Market insights	Training and support	Streamlined healthcare service. Easy to access health information.	Market insights and reports. Indirect reputation booster for Kenyan healthcare system.
HC Facility	Health information. Indirectly help to build Haikara network. Money for premium package.		N/A		More swift referral Streamlined healthcare Better service Access to health info	N/A
Insurance Agency	$$ Money paid for market insights.			N/A	N/A	N/A
HC Staff	Data and health care info input into Haikara system.	Operate Haikara and work in HC Facility	N/A		Direct service and access to Haikara	N/A
Patients	Healthcare info	Payment for hospital visit	N/A			
Externals (ministries, politicians	Payment for market insights and reports.	Rewards to hospitals doing well based on Haikara reports	N/A	N/A	N/A	

What we identified from the above is that there was the possibility for external stakeholders such as insurance companies, ministries (both local and national) to benefit from the insights and information collected through the Haikara system. As both of these stakeholders tend to have funds as well, we identified an opportunity in which Haikara would provide market insights (at an aggregate level, anonymized and not individual personal data) to insurance companies and ministries in return for payment.

Building on this, we also decided that Haikara would initially target private hospitals and health facilities only. The rationale for this is the fact that we observed in Kenya that most private hospitals already had the existing infrastructure for Haikara to be implemented and the profitable private hospitals may also be willing to pay a small fee for access to insights and information about their clinic which will be obtained from the Haikara system. Access to aggregate data could help the health facility to identify trends in patients and enhance business operations.

REVENUE AND PRICING MODEL

Now that we had identified which stakeholders could possible fund the Haikara platform, we turned our minds to the revenue and pricing models.

It was decided to follow revenue models such as Netflix and make Haikara a subscription based service. Haikara will always be free for the mothers and for now, free to health care facilities taking the basic feature package (see figure below). Health facilities can upgrade their subscription to a premium package where they would pay a monthly or annual subscription fee to received added benefits such as market insights, information about their patients and health facility.

External systemic organizations such as insurance providers, ministries and government and NGO's, can subscribe for monthly reports and insights specific to a healthcare facility, region or even national level. There is also the possibility to pay per report, however, Haikara would try to influence these external systemic organizations to subscribe to ensure regular recurring revenue.

In terms of pricing model, we have decided on a classic tiered model used widespread online for platforms such as Slack and Spotify in which the price paid for users is dependent on the package they take - basic, premium or insights. The premium package is tailored to private health facilities and the insights package is targeted at the external organizations seeking aggregate data. For mothers, Haikara is always free.

The figure below shows our designed revenue and pricing models:

	Price	**Medium**	**Task**	**Benefit Received**
Mothers	FREE	Receive info via text + login details	Confirm info online and consent to collection of healthcare info	Streamlined healthcare, better service.
HC Facility	FREE	Computer or web device	Input patient info and run the daily field operations for Haikara	Streamlined healthcare Ability to predict and prepare for incoming patients.
	PREMIUM	Computer or web device	Input patient info and run the daily field operations for Haikara	As above + monthly insight reports and premium desktop features like analytics.
Insurance Externals	PAID SUBSCRIPTION (Monthly, annual or per report)	Web device	Pay for insights	Detailed market and segment analysis on overall healthcare system, and region based. Use this info for competitive advantage..

VALIDATING THE BUSINESS MODEL

After iterating, we wanted to obtain feedback and a form of validation on our business model. Admittedly, we were unsuccessful at receiving feedback from Kenyan stakeholders, however, we did receive great insights from insurance companies and design experts here in Finland. We had short telephone conversations with representatives from Lähitapiola, IF and Pacific Prime insurance. They each confirmed that insurance companies would generally be interested in maternal data relating to the following:

- Age
- Pre and Post-natal treatments & examinations
- Medically prescribed Caesarian
- Normal delivery
- Delivery with complications
- Delivery following fertility treatment
- Hospital or Home delivery costs
- Birth defect rate
- Care of newborn children

We have assumed that in the Kenyan context there may also be interest in statistics relating to hiv diagnosis. By obtaining this information, insurance companies can better assess their offerings, premiums and pricing.

For other externals such as ministries, there is interest in more regional and national level data, particularly if the statistics can support current initiatives and motivations.

SPONSORSHIP OPPORTUNITIES

Haikara Health is an initiative that will help mothers, healthcare facilities and the Kenyan national healthcare system at large. It can be truly revolutionary for developing nations and their healthcare data and processes. There will likely be several organisations (private and public) who are interested to sponsor such initiatives. This is one clear way we have identified to raise initial capital and support at a country level for the initiative. Whilst this solution is created specifically for maternal health, there is of course opportunity for the system to be expanded to cater for all patients over time.

INCENTIVIZING HEALTHCARE FACILITIES TO USE HAIKARA

We suspect that the fact that the basic package for Haikara is free, will prove to be sufficient incentive for private health clinics to first trial the service, particularly as they will not need to invest in new infrastructure. Haikara will send representatives to implement Haikara to their network and also go through basic trainings on how to use the system. We will offer an initial pilot period where the healthcare facility can trial Haikara.

We have also concepted the possibility of garnering a range of private clinics to conduct a pilot case together, so they can see how seamless, efficient and easy the referral process and storing of patient healthcare information can be.

There is of course also a need for wider support and encouragement to trial Haikara, which will be needed by government, policy makers and NGO's to promote the use of the system amongst healthcare facilities. This will enhance the trust factor associated to Haikara.

PRIVACY AND DATA PROTECTION

We acknowledged from the outset that the Haikara system will collect and share highly sensitive and personal information about mothers. As such, it is integral that the Haikara system complies with local privacy, data and confidentiality requirements at a minimum. As at January 2019, Kenya does not have any data protection laws in place, which means that Haikara could technically operate as is (State of Privacy, 2019), without contravening any laws. The Kenyan constitution does afford every Kenyan the right to personal privacy, which includes the right to privacy of information relating to their family or private affairs, however, this may or may not capture health information (State of Privacy, 2019). With the lack of privacy and data regulations in Kenya, we propose that for best practice Haikara will be compliant with the European Union General Data Privacy Regulation (GDPR), which is recognized as the world's most thorough data regulation requirements for consumers. Some of the basic requirements under the GDPR include:

1) Lawful, fair and transparent processing
This means Haikara would process information that has a legitimate purpose and in a responsible manner only for a legitimate purpose. Transparency relates to the fact that all mothers will be told and need to consent to the collection and sharing of their health information.

2) Limitation of purpose, data and storage
Haikara will limit the processing of mothers information and collect only that data which is necessary, and not keep personal data once the processing purpose is completed.

3) Data subject rights
This means that all mothers will have the right to request for information stored about them and can also request to be deleted from the system.
In our view, we believe that Haikara would not be an ethical or desirable solution unless it takes account the best interest of mothers and patients in the system and this includes the safe handling, storing and sharing of confidential health information. We would also propose that information be encrypted when stored (please see further discussion in Technology below).

CURRENT SHORTCOMINGS

The ability to provide thorough insights and aggregate information requires numbers, it means that Haikara needs to be operating across several healthcare facilities in order to give regional and national level insights. This is why sponsorship and 'on-ground' champions of the solution is so vital. In terms of scalability, Haikara should easily scale across private health clinics as they have the existing and needed infrastructure, however, it will be more difficult to overcome resourcing and infrastructure requirements for public sector health facilities. It is likely that government level funding and sponsorship will be needed to roll this out nationwide across all facilities.

TECH DEVELOPMENT

The third workstream in the team's concept development efforts was the tech development workstream. The goal was to produce a simple but functional prototype to showcase at Impact Gala and to test the concept with end users in a simulation. The latter was decided to tackle after the end of the official project as it was not feasible within the given time.

TECHNOLOGY BASIS

After deciding on a design direction, the first fundamental question to consider was on which technology basis the solution should rely. Essentially, two alternatives were evaluated; for both of these a basic description of the requirements, a possible MVP scope, and an exemplary user journey were derived to communicate the options with the other work streams, upon which pros and cons were assessed.

Option 1
An RFID chip-based solution running on an Arduino or Raspberry Pi device with an attached RFID writer/reader, paired with a card or wristband for patients

MVP: Basic patient data (Name, DOB, diagnosis, risk info) stored on RFID chip wristband readable/writable by Android device. No database.

Devices & software needed for MVP: Wristband with RFID chips, RFID reader/writer devices, computing platform (Arduino, Raspberry Pi, or PC) with user interface and keyboard input

User journey for MVP: Pregnant woman is referred to Kenyatta hospital at a local health clinic due to high blood pressure. After visiting the doctor the receptionist gives the woman a wristband and stores basic info to the chip (name, DOB, diagnosis: susp. pre-eclampsia). Instructions where to go next and when are given orally/in writing. The receptionist calls Kenyatta and informs about referral. The woman enters Kenyatta where reception staff read the chip and get confirmation about the woman's identity. And the check-in process begins.

Scaling up the concept: Patient identification number stored on RFID chip wristband that helps to identify the patient in clinics (passive, no location tracking). More detailed data is retrieved by a medical professional from a database by reading the chip.

Pros
- MVP doesn't require any database to retrieve data from. The basic info is entered locally to the chip. The chip is read locally.
- The MVP doesn't need internet access.
- The MVP doesn't require structured information as it is not transmitted to any database

Cons
- The solution requires non-existing hardware (chips, readers), might be expensive to distribute widely
- The possibility of direct communication with patients is very limited
- The maintenance of writers/readers could prove troublesome while the concept relies on working readers at every facility
- If not widely distributed, medical professionals might not use it (difficult to make into a routine, if not happening regularly)
- Difficult to find the motive for smaller clinics (referees) to do extra work (store data into chip as it is not easily transmitted from a compatible database)
- Possible resistance to wristbands (could be replaced with a chip card)
- Reliability: what happens when patients swap wristband. Can it be really trusted?
- Data security: Encryption difficult. Best would be not to store much confidential data on the wristband.
- Alters normal routines of medical professionals, possible resistance at understaffed clinics.
- Requires a lot of guidance and medical professionals training

Option 2
A web-based system for healthcare providers, paired with an SMS-based solution for communication with and authentication of patients

MVP: Patient identification data (Name, DOB) combined with phone number to enable patient self check-in via SMS at clinic. Database required.

Devices & software needed for MVP: Web App with user interface, database, and backend, SMS-communication API and mobile phones

User journey for MVP: The referring clinic has submitted the pregnant woman's phone number to the database thus combining patient's identity with the phone number. The woman is instructed to go to Kenyatta where she finds instructions to dial in SMS "Check in Kenyatta" (by sending the SMS the woman gives permission to use her personal data). The woman receives confirmation SMS with guidance where to wait for admittance. The hospital reception gets to know the woman has checked in.

Scaling up: Patient identification data (Name, DOB) combined with more detailed data to enable patient guidance via SMS. Database required. Patient could for instance subscribe to a weekly pregnancy-related newsletter-SMS giving tips on health and nutrition / The service could be scaled up to offer an SMS chat with medical professionals.

Pros
- Patients are familiar with mobile phones, no need for additional guidance
- Much wider possibility to communicate directly with patients
- No need for extra hardware (given both the patient and clinic have devices needed)
- Reasonably inexpensive solution
- Widely distributed easily
- MVP easily scaled up

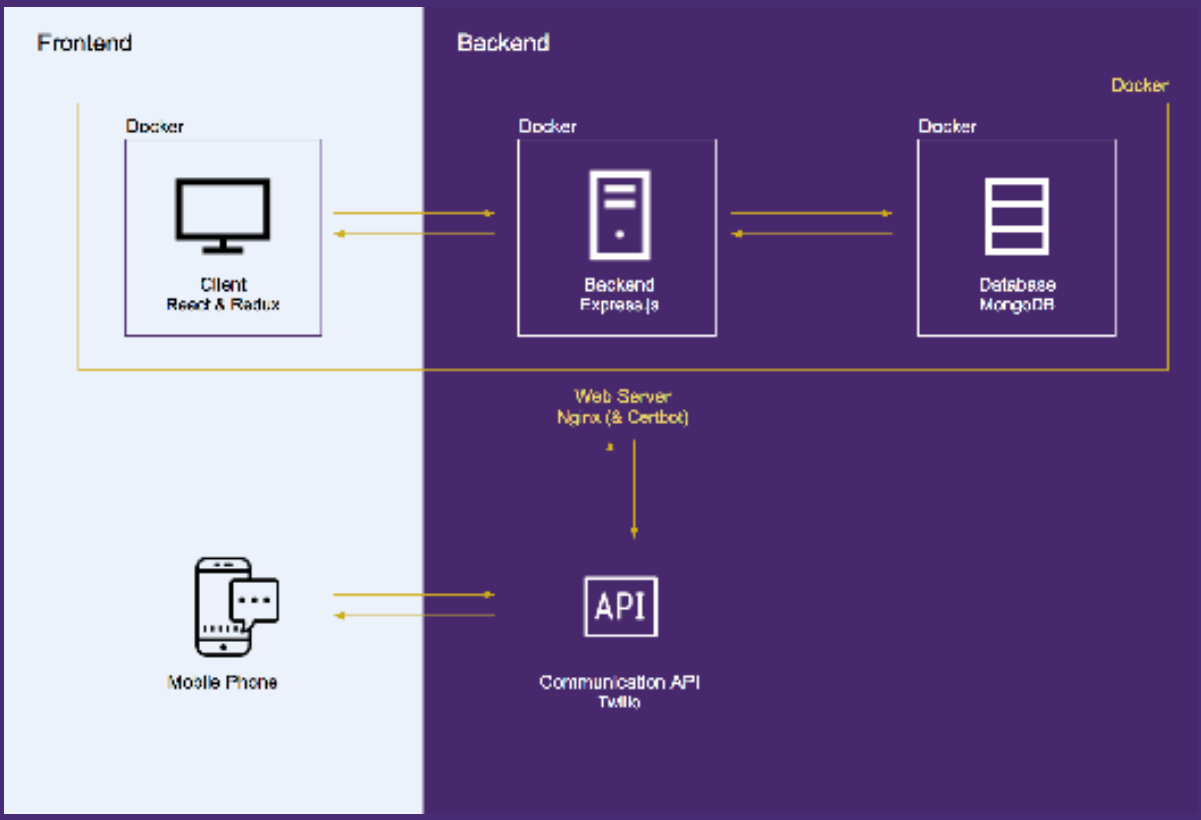
Cons
- Database required
- Internet access required
- All participating institutions need to use the web-based application to access the database

DECIDING ON THE TECHNOLOGY BASIS

As it was established during the co-creation workshop in Kenya that any future solution should ideally rely on infrastructure already in place (which was true for the SMS-based option and not true for the RFID-based one) and it was clear from the service design workstream that the possibility for direct communication with the patient would be required, the team decided to move ahead with Option 2.

TECHNOLOGY ARCHITECTURE

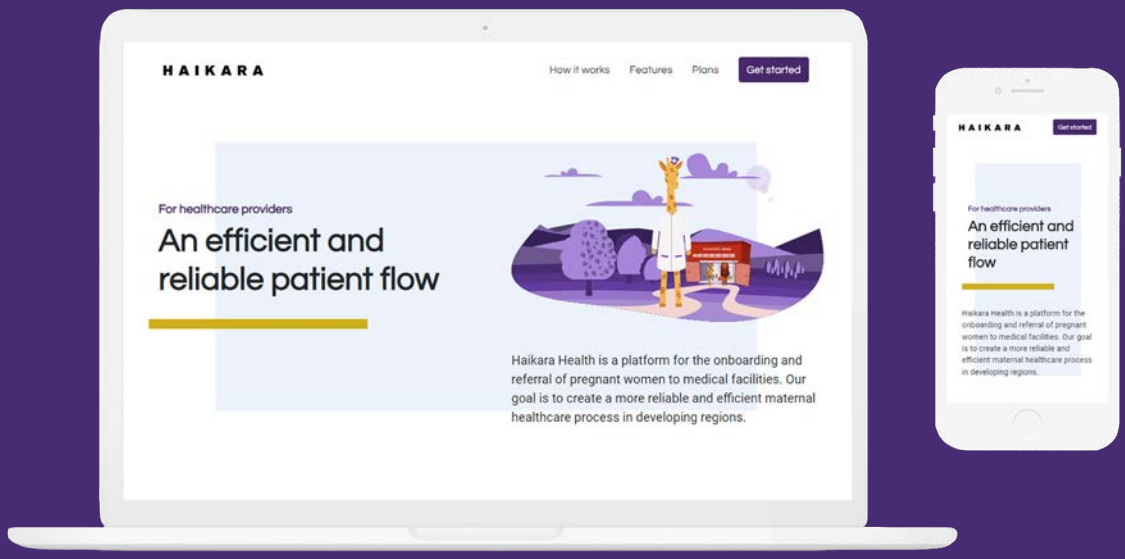
After making a choice regarding the technology basis, the next step in the tech development workstream was to make decisions on the specific technologies and frameworks to be used during the development of the functional prototype. After some research on viable implementation options, the decision fell to the favor of the following technological architecture:

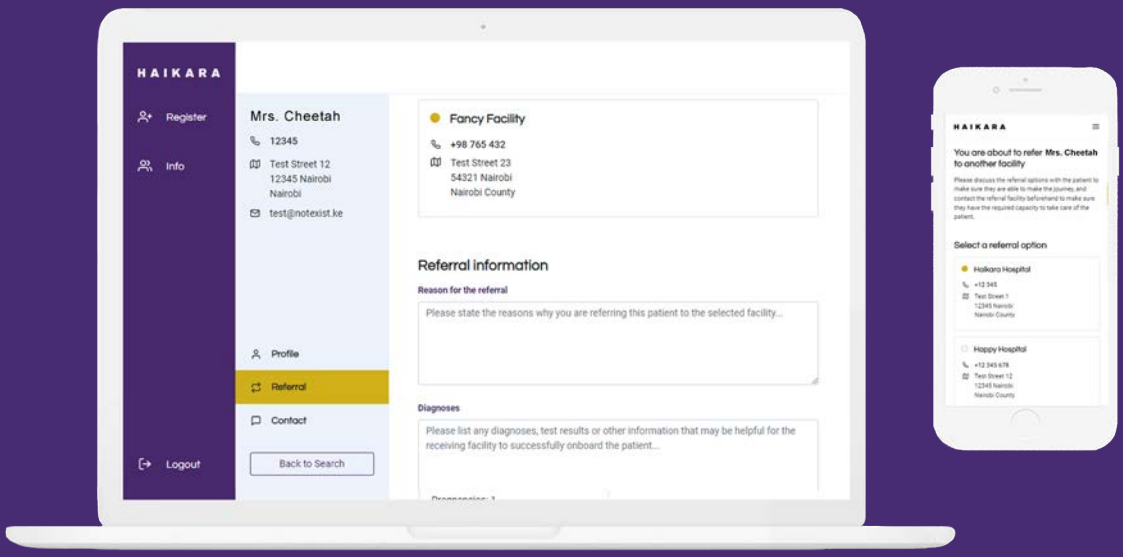


The whole application was hosted on an Amazon EC2 and was made accessible through the domain HaikaraHealth.com. By the end of the industry project, the web platform (everything contained by the web server) was functional, but not yet connected to the communication API, meaning the application could not yet communicate with patients using SMS.

FUNCTIONAL PROTOTYPE

Here a series of impressions demonstrating the functionality of the developed prototype are shown.





FROM PROTOTYPE TO MVP

While the prototype developed as part of the industry project is functional and can be used for viability tests with potential end users, there would be a variety of changes required to advance it into the direction of a full-fledged Minimum Viable Product (MVP). Since these changes would be numerous, we will only outline the main areas only that would need to be tackled in the case of further improving on the current technological design.

Information Security:
Naturally, information security and confidentiality are some of the most crucial factors for the Haikara Health platform to be successful and worthy of the trust of its users, patients and healthcare providers alike. The functional prototype provides a series of features that ensure the safety of processed information. Specifically, it is served through HTTPS so that the website traffic is encrypted, and the service is built modularized using docker networks and served through an Nginx server, protecting the backend and database from unwanted access requests. To gain access to the prototype, a 'clinic' furthermore needs to register an account with the platform that is protected through a JWT-Token login scheme; passwords stored in the database are encrypted using the Bcrypt algorithm. Access rights to patient profiles need to be obtained as per the service's design so that no unauthorized party is able to read or manipulate a patient's information. To make the current setup MVP-ready, it would be advised to encrypt the patient information itself, so that the data is protected against database leaks. Access rights to patient profiles would need to distinguish between administrative and medical professionals; which they do not yet under the current design. Additionally, the whole technological design would need to be adjusted to comply with GDPR regulations.

Technology Architecture:
Currently, the platform utilizes a simple MongoDB database. The choice was made since non-relational databases are less restrictive and can thus be more suitable for prototyping needs. To provide an actual product, however, a relational database would be a more suitable option to account for the various relations between patients, healthcare providers, and their attached information. Moreover, the backend is currently built with Express.js, a framework based on Node.js. While the communication with the client and the communication API to be integrated (Twilio) could continue to be handled with Express, additional services to focus on data analysis aspects of the platform should be developed in Python as it's more suitable for these tasks. The backend could thus be comprised of a series of microservices, as is standard for modern applications. On top of these things, the development and deployment should rely on a full DevOps scheme. While the current approach with modularized services running on Docker services is compatible with this, more advanced build and testing tools such as Jenkins should be integrated into the workflow.

IDBM IMPACT GALA

We presented Haikara Health at the IDBM Impact Gala. After five months of research, concepting, prototyping and testing we are proud to have created a holistic concept that creates a swifter, more reliable and more transparent referral process for mothers, healthcare facilities and the Kenyan health sector as a whole. We also went a step further and created a functional prototype of the Haikara Health platform.

HAIKARA

You can visit www.haikarahealth.com to discover the service, view our introduction video and simulate the onboarding and registration process within the Haikara Health platform.

By designing a solution targeted at the referral of a mother's medical information, we have created a solution that could very easily be used to tackle referral processes of all medical conditions. This is the beauty of the design process. Sometimes, by focusing on a specific user and developing a solution to address one of their challenges, you can inadvertently design a solution applicable to a broader range of people.

BOOTH

The impact gala was the first public event where we presented our proposal. We wanted to create a comprehensive impression of our concept so we designed the booth for Impact Gala to be compatible with our visual identity.

Because our concept is not a physical product, we wanted to present our proposal more powerfully using physical elements of our graphical identity in the Impact Gala.


PBL EAST AFRICA
CENTRALIZED DIGITAL SYSTEM
SMS-BASED CURRUCIFICATION
RESTRICTED ACCESS RIGHTS
MANAGING THE PATIENT FLOW
IMPACT

THE TEAM

ANNA-SOFIA JUNTUNEN

Academic Background
M.A. in Collaborative and Industrial Design from Aalto University in Helsinki, Finland
B.A. in Industrial and Product Design from Turku University of Applied Sciences in Turku, Finland

Work Experience
The last four years I have been working as a Designer and Project Coordinator / Project Manager in different international projects. My main experiences are in co-design, usability testing, user research and 3D modeling.

Project Motivation
"I believe that with this project we can solve the real-life challenges by using our expertise in design, business and technology."

EVA GALLEGOS

Academic Background
M.A. in International Design Business Management, Aalto University in Helsinki
B.A. in Industrial Design, Universidad Nacional Autonoma de Mexico (UNAM)

Work Experience
Five years of experience in product design and user research. Two years as project leader coordinating the development of medical devices for the startup Trade-Min in collaboration with Cryopharma pharmaceuticals.

Project Motivation
"Design is more than simply helping companies to be more competitive in a market. I consider this process and way of thinking a powerful tool which has the capacity to transform lives and create a positive social impact."

LANDYS ROIMOLA

Academic Background
M.A. in International Design Business Management (IDBM), Aalto University in Helsinki, Finland
B.A. in Art, University of Applied Sciences in Lappeenranta, Finland

Work Experience
Five years of experience in entrepreneurship as an artist. Three years experience in leadership and AD in music festival Provinssi. Collaborations with World Vision Finland, Interpedia, Fox TV, Danske Bank and various other organisations.

Project Motivation
"I am lucky to be part of a team with multidisciplinary background. Together we can solve complex and wide problems and finally make a real impact in the world."

LEONARDO LUTZ

Academic Background
M.Sc. in International Design Business Management (IDBM) from Aalto University in Helsinki, Finland
B.A. in Philosophy & Economics from Goethe-University in Frankfurt, Germany

Work Experience
Experiences in fields ranging from automotive (Mercedes-Benz Financial), to banking (Deutsche Bank), and consulting (Accenture Strategy).Various consulting projects in industries such as investment management, gaming, and augmented reality.

Project Motivation
"I was very much looking forward to working on this project, because it seems like a great chance to create a meaningful impact in an interesting and dynamic environment."

MEERA SIVA NATHAN

Academic Background
Msc Economics (International Design Business Management), Aalto University in Helsinki, Finland
Bachelor of Laws, Bachelor of Commerce, Bond University, Australia

Work Experience
6 years working as a lawyer and management consultant : relevantly, working in the public prosecutors office representing women and children. Later working in consulting and at the intersection of design and law, helping to create legal information that is easy to understand and use for everyday people.

Project Motivation
"The design approach has the capacity to create real and viable solutions to solve larger challenges faced by both people and the environment. This project provides the opportunity to do just that and create positive impact within a society."

MARLEEN WIERENGA (TEAM SUPERVISOR)

Academic Background
DSc. with specialization in Management from Aalto University in Helsinki, Finland
M.A. in Management, majoring in Creative Sustainability, from Aalto University in Helsinki, Finland

Work Experience
Currently working as a researcher and Doctoral Candidate. Previously worked for public organizations (EU institution, Finnish embassy), in consulting (Accenture) and as an entrepreneur (market research).

Project Motivation
"I am excited to work with and learn from a motivated group of students with diverse background. The project also facilitates learning and collaborating across geographies, and I hope the experience is something everyone participating treasures for the rest of their lives."

INSTITUTIONS FINLAND

PBL EAST AFRICA

This project is part of a larger collaboration project between Aalto University and Makerere University, University of Dar es Salaam and Nairobi University. The focus is on Problem Based Learning (PBL) and an essential element is the collaboration among the students from the two institutions.

AALTO UNIVERSITY

Aalto University brings together research and teaching from the field of Arts and Design, Business and Engineering. The team consists of students studying in the Masters Program of International Design Business Management (IDBM). The project is part of their course called IDBM Industry Project where ten student groups work with industry actors to co-create design solutions for the future

AALTO GLOBAL IMPACT

The PBL project is facilitated by Aalto Global Impact, which promotes the research and education of the university for societal impact.

INSTITUTIONS KENYA

C4D LAB

C4DLab is an R&D and Startup Incubation hub at the University of Nairobi. The lab aims at contributing towards building the Silicon Savannah, leveraging on the large University community.

UNIVERSITY OF NAIROBI

The Kenyan team is comprised of students from the University of Nairobi (UoN). The University of Nairobi is one of the largest universities in Kenya, and facilities innovative projects in various areas of human development through a network of partnerships within the region and beyond. The university sustains a variety of collaborations with different partners; in the healthcare field it cooperates among others with Kenyatta National Hospital.

MAKERSPACE

The client of the Kenyan team is Makerspace, a lab at the University of Nairobi that focuses on developing innovative technological solutions in the medical field with the aim to foster local startups and industries and reduce the cost of healthcare in Kenyan facilities.

APPENDIX

APPENDIX 1: FIELD RESEARCH INTERVIEWS

Carolina for Kibera (NGO)
Carolina for Kibera is an NGO initiated by individuals from both Nairobi and the University of South Carolina aiming to improve the healthcare level and to drive behavior change with regards to education and health in Kenya's biggest Slum, Kibera.

It was mentioned that one of the biggest challenges was to keep beneficiaries, because their lifestyle keeps them from attending the NGO's activities. Therefore, the NGO uses incentives, such as "baby packs" to attract and encourage them.

Regarding enabling factors, CFK has integrated members of the community to collaborate in their pursue, for instance, local teachers and community leaders, as well as patient that had concluded the program and are willing to share their personal journeys. In addition, they explained that some patient have faced problems with insurance programs, such as Linda Mama and NHFS, because either there is not notification they are registered or they got lost in the system due to corruption issues.

Community Chiefs
According to the interviewees' experience, delivery in hospital is being encouraged among pregnant woman of the community, because delivery at home assisted, assisted by a TBA, is perceived as a high risk and a practice of the past.

Moreover, they mentioned that most births occur at night, but unfortunately the local dispenser is not open 24 hrs. Therefore, patients must travel to the closest hospital, using the Tuk-Tuk as transportation (with a fee that increases almost 10 times during night shifts) by calling them via cellphone. In this regard, they commented people usually own basic Nokia models and not smartphones.

Finally, they showed a lack of understanding about the importance and goal of family planning, and they were not aware of Linda Mama.

County officials
The county follows a community strategy that relies on community health volunteers; these can also be recruited from traditional birth attendants. The intention is create incentives for agents from outside the official healthcare system to migrate into the system, most notably by offering a referral fee.
The experiences with the referral system differ depending on the density of facilities in the county's seven sub-counties. The county currently has nine ambulances that are located strategically to process referrals. As per Dr. Ibrahim, the referral system is mostly adhered to, with only emergencies being referred directly to high level facilities.

Outside of policy matters, there is only minimal collaboration between the national and the county government.
The county would appreciate a centralized digital patient information system, but does not have the capacity to implement one. Patient data can be obtained by private organizations, given patient agreement, but data collected by the government will not be shared with them.
Not more than 10% of the patients are covered by insurance, mostly through NHIF.

iHub startup centre

The iHub supports its startup members mostly with facilitating contacts to influential stakeholders, such as high ranking individuals from politics and business, and with providing infrastructure and trainings. The iHub has worked with over 355 startups that raised over 43m dollars investment.

The biggest challenge for startups in Kenya overall is to obtain funding. Many startups find their funding outside of traditional financers. The biggest share of solutions (more than 20%) provide financial solutions. Health and tech are more difficult, as it's hard to gain access to the required experts. Successful health solutions have been catered towards community hospitals who then recommend these to higher levels, rather than to patients.

The government has proclaimed an ambition to make Kenya a startup country, but this yet has to materialize in concrete policies. Generally, however, it is easy to found a company.

The cultural and economic diversity in Kenya heavily impacts the professionalism of a startup and the way it communicates its value proposition.

A vast majority of concepts are targeted to the metropolitan areas of Kenya, with only few aiming at rural areas, such as startups that provide internet or agriculture trading solutions.

Imani Private clinic

Imani clinic has implemented a local server-based web solution to record their patients' data. Yet, traditional forms (paper-based) have to be filled in with the same information in order to forward it to Ministry of Health.

In addition, the interviewee states illiteracy is a problem among some clients, because they do not know how to fill information or read a prescription. It was discussed pregnant women are not consistent with the scheduled check-ups and when they come for the first time with symptoms, sometimes patients have to be convinced about their pregnancy status.

Concerning the referral process, he added that one staff member generally goes with the patient to the next level facility, using their own transportation (car) or an ambulance from the Red Cross.

Kenyan mothers

From the interviews we found out that patients have different perceptions of TBA's work and hospitals, depending on their personal experience. On the one hand, with regards to clinics it is appreciated to find all services in one place, including training sessions, and they are regarded as a low-risk opportunity for treatment, although in public institutions medical professional are less easily available. On the other hand, TBAs are easier to reach, because hospitals sometimes are located far from the community. We encountered women who went through complications, up to loss of child, and attributed these to poor treatment performed by TBAs; naturally, they reported negative sentiments.

In addition, it was mentioned during the conversation that the Tuk-Tuk was used to travel from their village to the closest hospital, although it is not recommended for pregnant woman. Yet is the most accessible means of transportation, as sometimes members of the same community are owners (drivers) of the vehicle. During night times transport was reported to be drastically more expensive, leading to involuntary home deliveries.

Mothers mentioned that when looking information about pregnancy from internet, they find it mostly from facebook and facebook groups, since it is free to use.

Kenyatta Hospital
Kenyatta National hospital (KNH) is the highest level hospital in Kenya. We visited KNH two times and had the chance to inspect the labor ward as well as other departments, such as the procurement and maintenance of medical devices.

If a patient has severe complications, other clinics refer them to the KNH. In practice, this process is often not adhered to, as patients may just directly frequent KNH. KNH also has ambulances, but patients don't order them because they don't know where to call and what it would cost.
If a mother has a delivery, but she hasn't reported her pregnancy, it may be difficult to register the baby. It is also difficult to register babies that are born at home.
Mothers, who have delivered at home, can get free vaccinations from the nearest health care center. Some patients might lie about their medical history because they don't want to be judged. For example mothers who have new husbands, might not want to give information about a previous pregnancy.

It was evident that hospitals at all levels are severely understaffed. The triage system also takes time as many mothers are either referred to or attend Kenyatta without their medical histories.. This means midwives must spend more time assessing history before attending to the mother.

It was also interesting to discover more about the policy-driven incentives relating to Linda Mama, which pays clinics a fee for each child delivered. What this means is that clinics hold sick pregnant women until they deliver and then only refer them to Kenyatta at the final stages of their complications. This increases Kenyatta's maternal death rates.

A lack of resources was also evident, with Kenyatta Hospital only owning one ultrasound and one doppler machine, used only in cases of confirmation checks or emergencies.

There was also a discussion relating to patients' lack of education on the importance of knowing their medical history and reporting it accurately.

Nicolas von Fetter: Product Design Lead at M4ID
Before developing material for field research, the PBL team had a conversation with one design agency allocated in Finland which has been developing healthcare projects in collaboration with local organizations in Sub Saharan Africa, M4ID. The goal of the interview was to get insights into factors and particularities of the African culture which could be useful to guide the team members when carrying out interviews and observations in Kenya.
Nicolas von Fetter, product design lead at M4ID, explained that the following points were the most relevant for the aim of our future research:
People in Africa are not used to compensations for their participation, but a gesture of acknowledgement, such as providing refreshments or offering to pay their transportation to reach the place, is well received.
In East Africa, people are generally talkative and open. When possible, make use of visual tools such as diagrams and props to help them understand a question and get the best insights.
More importantly, he recommended to develop 2-3 ideas which could be presented or even prototyped locally in order to get feedback from local people, making most of the time

spend there and having opportunity to test an idea in real context.
In the healthcare field it is important to keep in mind that medical staff take their job seriously, so being mindful of the words and language use is crucial. In addition, one should strive for never going overtime. Healthcare systems are already understaffed and any time spent by a nurse is time they could use to help a patient.
Finally, he advised to find a local 'champion' who gets excited about our concept, because they will then help to push it along.

Traditional Birth Attendants
TBAs assist pregnant women not only from their own community, but also from others. They stated that their "knowledge" was simply acquired or a natural skill they were meant to use (by God), transferring this know-how through apprenticeship. Concerning hospitals and clinics, they claimed to recommend or approach them in case of underaged patients or emergencies, selecting the facility nearest to the village. In this regard, they mentioned that phone calls are the main means of communication with patients and clinics.

In addition, TBA usually join the pregnant woman on her ride to the hospital, sometimes accompanied by her mother or mother-in-law. Upon arrival, doctors demand information about the patient's condition from the TBA.

Finally, they said that Tuk-Tuks and Boda-Bodas are used to travel to the hospital because they can access the community easily.

United Nations
Quality of care and access to healthcare services remains an issue in marginalized communities, such as the northern regions, which leads to many deliveries at home. Despite clear standards being provided, it is difficult to monitor if they are adhered to in practice.
Complications during pregnancy are now majorly tackled with a community health strategy that relies voluntary health workers and retired or unemployed midwives to monitor pregnant women and provide access to healthcare.
A general digital patient information system would be within the framework of the referral strategy and the healthcare sector strategic plan. Some countries are experimenting with systems for referral networks that rely on GIS mapping, to map out facilities, manage referrals, and even tracking patients. As per the team, manually delivering the data forces professionals to close facilities at certain hours.
Linda Mama's reimbursement system does not take complications and follow-up services into account. The program's funds would be sufficient for this, but the policy design is not made for it. There should be a way for hospitals to claim reimbursements for such services.

Venoma Private Clinic
Venoma Medical and RHS Centre is a private clinic in Malindi. When they wanted to register a clinic, they had to ask a permission from sub-county, which overall took two years.

Most of their clients are women of low income and that's why they give them free t-shirts and transportation, which function as incentives to convince patients to come to the clinic. The introduction of provided transportation has generated more clients for the clinic. Furthermore, family planning and vaccinations are free for patients, as per national reimbursement policies. The clinic manager confirmed that there is an incentive to keep hold of pregnant women until delivery, whereas possible complications pose a financial

issue, as they are not covered and patients cannot always pay for their costs (the clinic manager claimed that these women were treated nonetheless).

The clinic reports patient records directly to the county, but they keep original records of them. They have also created their own booklet, a Mother and Child Health Booklet, to record all patient data from pregnant women and mothers.

APPENDIX 2: DETAILED DESK RESEARCH

MEDICAL DESK RESEARCH

Pregnancy

As a biological phenomenon, pregnancy is a similar process all around the world. Culture and beliefs are the main factors why this natural incident may be seen and experienced very differently.

Pregnancy lasts 40 weeks on average. During this time, pregnant women are recommended by WHO to be offered a minimum of eight contacts to health care to prevent perinatal morbidity. The guidelines also suggest counselling on healthy habits and nutrition, in addition to providing the women with vaccinations and medical examinations. (WHO, 2016)

The checkups with health professionals consist of some vital measurements and tests, e.g. measuring the fetus' heartbeat. Pregnancy is divided into three parts of which the last ends in labor, usually lasting 12 hours on average.

The World Health Organization has published guidelines on antenatal care for a positive pregnancy experience. The guidelines aim at reducing the risk of stillbirths and pregnancy complications. In Kenya, the neonatal mortality rate is over 10 times higher than in Finland - 20.9 deaths per 1000 live births in Kenya compared to 1.8 per 1000 in Finland (Worldbank, 2017).

In addition to measuring the heart rate of the fetus, the pregnant women are routinely tested for blood pressure and certain blood markers to spot pre-eclampsia.

In the developed world the women are also offered ultrasound and other more invasive tests to screen for possible developmental disorders of the fetus.

Fetoscope

The fetoscope is used in antenatal check-ups to point out risk-pregnancies early on. This traditional instrument has many variations in form and material but the basic function remains the same: the instrument is intended to work as an amplifier for the fetus' heartbeat. It is an essential tool to monitor labor in developing world settings. In the developing world the emphasis is on affordability and fail-safe functioning of the instrument in every condition.

The instrument demands a lot of knowledge and experience from the person performing the inspection as there are possible faulty signals interfering with the interpretation of the results. Also, the economic and geographic conditions play an important role in how effectively the results of the fetoscope examination can be utilized to reduce neonatal mortality. Even though an experienced midwife would able to spot a risk-pregnancy by using the fetoscope, the expecting mother might still be quite distanced from quality health care for special medical conditions. (Tasa, 2019.)

Checking the heartbeat is a routine procedure in antenatal checkups, usually performed by a midwife or nurse. During labor it provides a vital metric and gives medical personnel important information about the health of the fetus.

Antenatal Care

In Kenya the Ministry of Health provides the guidelines for maternity care and specifies the
In Kenya the Ministry of Health provides the guidelines for maternity care and specifies the
responsibilities of midwives working in various socioeconomic and geographical settings, for example the roles of a community midwife. In rural settings the distances are long, health facilities and educated staff are scarce and the population belongs to the lowest segment both in economic and educational standards. Thus comparing the tasks of a Finnish midwife working in standardized Neuvola facilities with her colleague working in Kenya does not do any favour to the issue.

According to a recent study performed in Kenya in 2017, the quality of antenatal and delivery care is distributed unequally - in the most impoverished areas the quality being the lowest and increasing significantly with greater wealth. The assessment was done based on metrics derived from facility infrastructure and clinical quality of both antenatal care and delivery care. The study states that instead of concentrating in improving access to health care the low quality of care needs to be addressed to achieve the national targets of maternal and neonatal mortality reduction. (Sharma, 2017.)

According to the Kenya Service Provision Assessment Survey done in 2010, the main reasons for not accessing the ANC as described by mothers were based on their economic standing, beliefs and fears and the level of their knowledge about pregnancy. The economic barrier was related to transport costs and to the disinformation about true medical expenses. Beliefs and fears affected mostly very young and old pregnant women who felt not confident in letting the community know about their pregnancy. One important factor not to overlook is HIV related fears. As the pregnant women are tested for HIV in the ANC check-ups, some women decide not to attend because of the fear of test results. But promisingly, the more women were provided with knowledge, the more positive attitude they had towards preventive health care. (Ministry of Medical Services, 2010.)

SYSTEM DESK RESEARCH

Political System

In 2010, Kenya gave itself a new constitution; this year thus marks a pivotal point in the overall development of the political system in general, and the health care system in particular. Most notably, the constitution proclaims a right to healthcare services, including reproductive healthcare (43 (1)) (Ministry of Health, 2014).

The constitution of 2010 also introduced the devolved government approach under which the country is organized as of today. In the devolved policy domains, which include health, the national government is accountable for the overarching strategy and policy development, whereas the county governments are responsible for policy implementation and the operational aspects of government (Ministry of Health, 2014).

County Level

Kenya as of now is divided into 47 counties, each of which is governed by its own county government. As part of the team's field research activities (see next section), two counties where visited: the capital region, Nairobi, and the coastal region Kilifi.

Healthcare System

The national government is mainly responsible for the country's overall health policy and regulation. Beyond this, it also governs the national referral facilities (level 6) and supports the county governments with capacity building and technical assistance.
(Ministry of Health, 2014)

Most operational responsibilities lie on the county level. Here, the county's respective health facilities and pharmacies as well as ambulance services are governed to promote primary healthcare to patients.
The county governments are also in charge of licensing and controlling undertakings that sell food to the public, and they govern adjoining facilities and services such as cemeteries, funeral parlors and crematoria as well as veterinary services. Beyond this, they are responsible for refuse removal, refuse dumps and solid waste disposal.
(Ministry of Health, 2014)

There are also different sources of healthcare funding, which include:

- General tax financing: There are a number of free healthcare services in public health facilities, including free maternity services.
- National Hospital Insurance Fund (NHIF): The NHIF is mandatory for formal sector workers, but is also open for the general population if they can afford it. It is the largest insurance scheme in Kenya.
- Private health Insurance: Even though the Kenyan private healthcare insurance sector has grown over the last twenty years, the sector is still quite small.
- Employer Self-Funded Schemes: Some employer offer self-insured in-house medical schemes that provide health benefits as incentives to their workers and dependents.
- Community based health financing (CBHF) schemes: These type of health financing schemes have increased over time and meet the needs of the lower income population who traditionally have been left out of the private insurance schemes and NHIF.
- Out-of-pocket health spending: The number of patients that pay their health services OOP in Kenya is very high. The OOP health spend is a big barrier for Kenyans accessing healthcare services as it drives the poorer households easily into poverty.
- Development partners & NGOs: Various development partners and NGOs have traditionally contributed significantly to healthcare financing and provision.

(Netherlands Enterprise Agency, 2016)

Not more than 10% of the patients are covered by insurance, mostly through NHIF.

DESIGN DESK RESEARCH

Solution Trends

Connectivity & Data: Technology enabled services for better communication, decision making and data capture is a prominent area in which solutions are being created, particularly regarding the transfer for patient data. There are several key areas that present opportunities for technological solutions:

- Electronic medical records and reporting
- Labour and care processes documentation
- Labour monitoring and timely decision making support
- Referrals

• Data collection and quality of care measurement
• Solutions for security and call for help. (M4ID, 2019)

Community and Awareness: Many organizations also focus on solving maternal health issues through community initiatives, which engage all members of the community to increase sensitization around maternal healthcare and infant mortality. (Ornella et al, 2006)

Self care: It is not uncommon to give birth at home in Kenya. Sometimes this is by choice or otherwise due to the fact that it is difficult to access a health facility, particularly if you are located in rural areas. Rather than change practices and try to convince mothers to give birth in the hospital, many organizations, including the World Health Organization are looking to reduce barriers to antenatal care and provide a dignified and sterile way to give birth at home. (Unicef, 2010 & Ayzh, 2019).

Education and management: Educating the community and women about their health is also a popular solution. We see this achieved generally through mobilising local champions or via apps which educate and provide employment opportunities to women. (Living Goods, 2019).

Reference Projects
Here are four social impact design projects that we used as benchmarks to better understand the types of solutions already existing in the maternal healthcare space.

The Lab.Our Ward: Project led by Finnish design firm M4ID (2019) was an in-depth human-centered design project sponsored by the Bill & Melinda Gates Foundation which presented solutions aligned to the "Arrival, Admission, Labor, Delivery and Postpartum stages in the care journey."(Reference book) The service design outcomes included along with a set of recommendations also a set of tools and new medical products, which M4ID is currently prototyping in India. Below are three of the solutions, which were of particular interest to us for means of benchmarking.

Ayzh Kits: In rural areas, it is not uncommon for women to give birth at home. To solve issues around giving birth at home, without sterile tools, a doctor, nurse or midwife, Ayzh, created The Clean Birth Kit. The kit is designed to prevent infection and the time of childbirth and costs just $3 and provides mothers with necessary tools like sterile wipes, gloves, soap, surgical scalpel, blood-absorbent underpad, umbilical cord clamp, and baby wiping cloth. (Ayzh, 2019)

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iDeliver: Technology innovation initiative iDeliver, is developing a tablet based service tool to support skilled birth attendants with data capture and documentation while providing decision support during the intrapartum care period. The tool aims to improve workflow and task management of hospitals and administrative staff and also enables smoother, faster

and better communication between hospitals and client. http://m4id.fi/project/ideliver/

Mobile devices in iDeliver are connected on Local Area Networks and powered by grid or sun electricity. The client files and entered delivery data can be later transferred to the network through satellite or cable connections. The initiative is lead by Merck for Mothers. **http://m4id.fi/project/ideliver/**

Living Goods: This is an example of how apps are being used to empower women in communities to take responsibility for maternal healthcare. The Living Goods app is aimed at recruiting, training, equipping ad managing a network of primarily female health entrepreneurs, referred to as Community Health Promoters. These women attend homes in their community and assist treating common illnesses such as malaria, pneumonia and sell

Living Goods equips every Community Health Promoter with a cloud-based app that enables them to accurately assess, diagnose, treat, and follow up with families. Community Health Promoters do not work as volunteers or salaried staff. This is an example of solutions which not only promote healthcare but also provide a stream of income to women thereby supporting their financial independence.

Culture Desk Research

Teenage Pregnancy

Adolescent pregnancy is common in Kenya. Almost a quarter of Kenyan women has given birth by the age of 18, and by the age of 20, almost half. According to Kenya Demographic and Health Survey (2014), 23% of adolescent girls aged 15–19 have an unmet family planning need. This means girls do not have the information needed, nor the supplies or services to prevent pregnancy.

Maternal mortality rates are twice as high among girls aged 15-19 when compared to adult women. Complications during pregnancy are the second cause of death for 15 to 19 year-old girls globally and the leading cause of death within this age group in Kenya (Laboso, 2018)

Poverty is also a contributing factor of teen pregnancies. With most families struggling to make ends meet, exploitative men who can meet the girls' needs demand for sex in exchange. According to (PMA) 2020 Kenya survey, poverty increases the risk of teenage pregnancy. Girls from poor households had a 26% chance of beginning childbearing earlier compared to their counterparts from richer households who are at 10% risk. (Waweru, 2018)

According to the UN Population Fund (UNFPA), which uses Kenyan health survey data, the rate for births among women aged 15 to 19 was 96 per 1,000 women in 2014. But this data also clearly shows a significant falling trend in pregnancy rates, from a high of 153 per 1,000 in 1989 - a drop of one-third. This can be attributed to sex education in schools, better awareness of contraceptives and improved prosecution of perpetrators. (Reality Check, 2018)

Tribes and Ethnic Groups
The traditions of almost all ethnic groups in Kenya involve the belief in an eternal, omnipotent creator envisaged as remote from men. Many indigenous religions also recognize spiritual forces at work in the world that are closer to the living and more involved in their daily affairs.

Beliefs in sorcery and witchcraft play important roles in many indigenous belief systems and often persist after conversion to Christianity or Islam even when other elements of traditional religions have faded.

Luhya: Luhya consists of 18 tribes with 5.3 million people. In earlier days, the society was entirely patriarchal: women were present not only as child-bearers but also as an indication of status. In addition, the practice of polygamy meant more hands to work the fields, an advantage in a society founded on agriculture. Today, things have changed, and once common practices such as polygamy are only practiced by few people, usually if the man marries under traditional African law or Muslim law. (Revolvy, 2015.)

Kikuyu: The Kikuyu is the largest ethnic group in Kenya with population of 6.6 million people (22% of whole population in Kenya). Kikuyu nation was divided into nine clans and they are economically farmers. Girls are made to work in farming, take care of children and help their mothers, while boys work with animals. Both girls and boys go through circumcision. Circumcision is considered as a type of rite of becoming an adult. After the mutilation, the daughter is in the care of her grandmother, she is responsible for the girl to become a good wife and a mother. (Organisation for Social Science Research in Eastern and Southern Africa, 2008)

Miiljkenda: The Mijikenda culture revolves around clans and age-sets. A Mijikenda clan consists of several family groups with a common patriarchal ancestor. Traditionally, each clan lives in one fortified village built in a cleared area of the forested ridges. Each village is lead by the eldest generation, who are responsible for such varied tasks as solving disputes, providing rain, and managing the kaya forests.

Like other Kenyan tribes today, Mijikenda people have assimilated to modern cultural practices, resulting in the disappearance of many of their traditional customs. Most Mijikenda people are now either Christians or Muslims; however, some still practice their traditional culture or a mixture of Christianity or Islam with their traditional religion. (Kenya Information Guide, 2015.)

Religion
These are the main religious groups in Kenya:

Christian missionaries: Churches were founded in the 1920s and 1930s, especially in areas where Kikuyu, Luo, and Luhya predominated.

Protestant Christianity (47.7%): The missionaries brought education and modern healthcare. Many schools and hospitals have been built by the church.

Roman Catholic Christianity (23.4%): The Catholic Church in Kenya is one of the biggest owners of land and property in the country. It is active in providing education, health, and other social services.

Tensions in the country between Christians and Muslims ha
due to the rise of Islamist radicalization, and terrorist attacks
Al-Shabaab, a Somali-based Islamist terror group (Elisha, 2

APPENDIX 3: PROTOTYPING SURVEYS

This section comprises the two surveys that accompanied the two correnspondingvideos during different iterations. They are a exact copy of the answers received.

Survey 1

What is your general impression /opinion about our service proposal after watching the video?

1. It is efficient and saves time
2. The proposal is good
3. It's a great proposal
4. It's an excellent idea in terms of sharing data among health clinics
5. It is a good service
6. Good
7. Excellent approach
8. I really like it and wish it would be implemented in the Kenyan system
9. Excellent

What aspect of the service do you consider the most useful and why?

1. The digital service is easier and its enlighten the client process in a clinic and his/her referrals
2. Onboarding process. This is because at this point relevant information regarding insurance and other related information is recorded and verified and there is smooth transition from reception to the point of consultation with the doctor.
3. Connection between the pregnant mothers and the hospitals... This is because it's important in tracking the well being or health of the pregnant mothers based on records
4. Sharing of data by only authorized medical personnel, increases privacy and reduces waiting time for clients.
5. Referrals part and text message notifications
6. The sharing of info will be essential in cases of emergency
7. Channel of processing information and communication process because the client is able to get prompt services with ease
8. The mobile phone messaging because it's the most common means of communication and socialisation.
9. Availability of patients information, no loss of information. The facility to receive the patient is provided with the patients details some of which can be left out or lost during the process of referral.

What would you change or include in Haikara System to make more efficient and reliable the onboarding process?

1. I would indicate time factor used after every patient in the consultation room
2. Incorporate a framework or procedure to follow in the event that the patient is not able to communicate medical history (emergency) and is not registered in Haikara system
3. Reduce the number of SMS or texts used since may be too much to the pregnant mothers, they may ignore so make it a whole system with smaller or less components

4. Including costs for services offered
5. Options for patients to input their symptoms incase they have a future disease
6. Most of the beneficiaries are mothers. They have feature phones no internet. The messages should be in a number of languages. I include key info e.g blood group and blood pressure readings.age etc
7. Nothing to be changed. It is ok the way it is.
8. Language options (Swahili)
9. A phone call to the referral facility is necessary to alert the ones receiving the patient to get information on time.In case the facility where the patient was referred to is not in a position to attend to the patient and is referred to another facility without being attended to, there should be a mechanism to ensure that the information is resent to the facility that will eventually attend t the patient

What would you change or include in Haikara System to make more efficient and reliable the referral process?

1. I think i would wish to give clear indication of emergency contacts to where the specific person in charge in that clinic whom you are referring the patient to
2. Speed in communication
3. none
4. Keep the CRFs short and clear
5. System proof for security breaches. Access to info by the pregnant mother. System to accumulate longtime info on the users as they get pregnant once or twice. Linking with other normal women hospital info and required scheduled test e.g pap smear, contraceptives etc
6. None
7. Periodic reminders
8. Scanning of investigation results done such as laboratory and radiology: to ensure completeness of information and authenticity of the results.

What part of the service do you think is complicated or hard to perform/understand?

1. The message from the computer of the clinic to the patient's phone how will it be using free wifi network or credit to transmit notification message
2. Non
3. Several SMS sent to the pregnant mothers and what language used
4. Maintaining the system to prevent breakdown so as to run efficiently all times
5. None
6. The logging in by the user to access their info
7. Nothing
8. How do I see my medical history when delete my message notifications
9. Procurement of the computer hardware that is required to run the system, not all facilities have access to computers. Capacity building on those to be running the system, there are a good number who are not computer literate and need some basic training

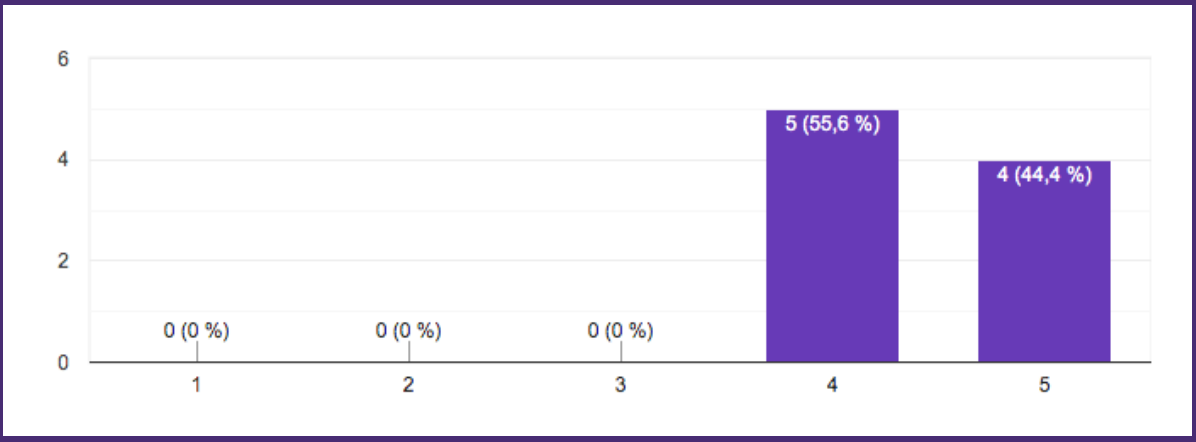
From your experience, is there any important information or process missing from our service proposal?

1. The link of computer from one clinic to the other to deliver information and the service provider in charge and time for the appropriate feedback and patients identification photo or card for security purposes
2. No. All important procedures are followed.
3. Nope
4. No
5. None
6. See above
7. None at all
8. Periodic sending of recent or full medical history
9. The system should be able to track time to avoid delays in service delivery. Timeliness is essential in referrals and should be of essence.

In the contrary, is there information or a step in the service that could or should be suppressed?

1. Patient diagnosis should be suppressed to other none service providers in the clinic accessing the computers
2. Privacy settings by the patient could be suppressed if it allows editing of data recorded by the doctor or if it permits the patient to block doctors from accessing data
3. The proposal is a good one
4. Clients HIV status in Medical records
5. Not really
6. None
7. No
8. In accessing the patient code at home: how many of the patients have computers at home and how many of them are computer literate.
9. If a patient can access information and do some alterations: patient safety will be affected if they change some information about them and it can result to litigation issues on the part of health workers

In a scale from 1 to 5, five being the highest score, how relevant do you consider this proposal?



Why did you give that score?

1. I think it will be a better way of avoiding delays and waste of time in a clinic and it will be good for pregnant mother who forget there ANC date for clinic get a message to remind them
2. The proposal covers on how to capture relevant patient data.
3. It guarantees patients privacy.
4. It is efficient in time management and results can be communicated to the patient at the comfort of their home.
5. Free and reliable flow of information in the referral process.
6. Because of the lots of information needed instantly whereas someone may be totally ill to respond
7. It lessens hospital workload since all data is automated
8. Because there isn't such programmes in developing nations such as Kenya for pregnancy monitoring. It would be a good start
9. Very innovative

Is there any feature or service you would wish Haikara System could offer you in order to facilitate the onboarding or referral process?

1. Creating awareness to all health centres about haikara system how efficient and reliable it is and my wish to be practice in all health centres
2. Haikara could be connected to GPS to recommend and direct patients to nearest clinic to them even before registration.
3. Nope
4. None
5. Telemedicine. Where you don't have to visit the clinic but can input your symptoms and a doctor prescribes drugs for you to.pick in your nearest participating pharmacy or lab for tests
6. Scheduled gynae tests
7. Yes- some training and also the right structures
8. No
9. Scanning of investigation results for authenticity of the documents. Sometimes they are redone as there is no evidence of them being done. this will save time and resources

Do you have any final comments on how to improve this service or any other thought you want to share with us?

1. Think means of transport should be included the haikara sytem during referrals
2. Run the proposal on real users for a given time to identify constraints and how to overcome them.
3. It's a great digital worth proposal
4. Including ecampus in the system for various medical condition
5. Collect gps location for clients to link them with the nearest clinic
6. See above
7. It should be implemented, then any loopholes could be identified and corrective measures taken.
8. No, but I hope it actually is onboarded
9. Already given my comments, looking forward to working with such a great method of referral

Survey 2

What is your general impression /opinion about our service proposal after watching the video?

1. Good if patients can keep their phones.Access to patients information can be through;ID, Registration number or Phone number.I would recommend biometric access as well.
2. It is a good proposal
3. It is a real problem that is being faced in the hospitals in the country and this innovation may just be the one to solve the problem of misinformation during referrals.
4. Simple and effective solution
5. It's a good idea that will enable quick service delivery to the client.
6. Excellent
7. Good
8. It's a good idea
9. Nice

What would you change or include in Haikara System to make more efficient and reliable the ONBOARDING process?

1. Biometric access
2. For on boarding mothers the entry requirements are identity card, phone number are basic, this would limit early pregnant mothers who have not attained the age to acquire national ID from accessing these services. I would make huduma number a requirement.
3. More incentives for the lower level hospitals. For instance, I would acknowledge them or reward them in the system for their effort.
4. Will include contacts of next of kin,contacts of the clinic in her permanent address to ensure easy tracing.
5. Anc visits
6. Inclusivity
7. Use the Huduma number instead of the ID, it carries more details as it has even the patients NHIF card number which may be essential during treatment.
8. Teamwork and more. Employment

What would you change or include in Haikara System to make more efficient and reliable the REFERRAL process?

1. Capacity building
2. Referral process is well coordinated in this proposal
3. I would find a way of linking its information database with the central database in the ministry of health. This will make the data-set much richer.
4. I feel like the issue of phone being lost (or any other inconvenience) should be considered when the patient is required to give consent to information access during an emergency. Maybe also include next of kin to give consent.
5. Include the contacts emergency service providers in the area,the person who attended the client
6. What about those who can't read or write
7. Include spouse details in the referral system
8. To do ASM

In your opinion, how do patients feel when registering on a medical service by providing an official ID?

1. Depicts credibility and authenticity
2. There is no big deal in using official ID.
3. I don't think there is a lot of concern. Patients generally trust doctors.
4. It would be very efficient instead of providing different cards which is normally the case today - currently we have NHIF and UHC cards
5. Most clients a not comfortable in giving there ID number to a facility, I don't feel comfortable myself giving out my ID details.
6. Efficient
7. Unease.....ID cards provide such private details as YOB, which most people I'm the setup I work don't like disclosed
8. They feel good

Do you consider it is important to use this identification method to register a new patient? Why?

1. Yes,keeps track of patients information and easy to retrieve.
2. Yes
3. Yes, because this will mean that looking up individual records much easier and faster in the system irregardless of the health facility you are in.
4. Yes. ID is the basic identification for every Kenyan
5. I don't consider it important, i prefer a client unique number to be used in the service
6. It's easy to search patient information without strain since its paperless
7. Information safety and privacy is guaranteed
8. Yes, it's easy
9. Yeah it is of greater use to I identify all new cases and recurring cases and all revisit

In your experience, how selecting referral options beforehand could help to improve the general process? (keep in mind that according to this proposal, only clinics registered on Haikara Health are able to share information and will appear as an option for patients)

1. This will be guided by access, quality, affordability of service s by intended service provider.Community members should be allowed to choose.
2. Yes, it could improve on referrals. Referrals require consent of patients and there is no problem if this consent is obtained in advance as it would limit on dangers in the event the patient is incapacitated to do so.
3. There may be bias in choosing of referral facilities by majority of patients based on perceived notions - about different facilities (such as being well equipped) hence some facilities may be shunned. This might overwhelm some facilities. The medical officer may be given the rights choose the referral facility.
4. Change of location for patients due to unavoidable circumstances can be considered. They may need to change referral hospitals when they shift
5. It doesn't really helpful because you choose a facility n this facility does not over adequate services
6. Capture all
7. Yes, the general referral process is improved as a patient will choose the clinic near her.
8. Of importance, many clinics should be registered on Hakira to give patients more options

What could be the pros and cons of using a SMS-based system as a method that patients must use in order to consent to share their information for referral purposes? (think about eg. cost and practical implications, such as emergencies)

1. Can cause some delays in times of emergency,it may be hard to verify whether it's the patient him/her self is giving the consent.
2. It is the safest, reliable and quickest means to convey information. It guarantees confidentiality as most phones have passwords and securities of operations. However sms is influenced by number of factors from costs of sending sms, powering of phones which in some places could be a challenge.
3. Pros: It is cheap, it is very accessible. Cons: Might not work if I lost my phone, Language barrier might be an issue
4. The phone might get lost at this convenient moment hence disenfranchising the patient who needs to give consent by SMS for medical care. One big pro is the convenience of knowing the stage of medical process and at your comfort of home
5. In rural areas people do not know how to use phones,there are no network coverage, phones might not be affordable to all people
6. Illiteracy
7. One may not have enough airtime to reply the SMS
8. Phones can be lost. A mother may not be in a position to understand the SMS(literacy levels)
9. Lack of stable and reliable systems of referrals

In your opinion, will patients be willing to send a SMS if it guarantees a safe way to share sensitive information with certified personnel?

1. Yes if sms are free
2. Yes
3. Patients will be willing and glad to receive these notifications as it will be an intended and informed communication, much as it should not be a bother
4. Yes, I would do it.
5. Yes. The wide majority of educated Kenyans understand the importance of privacy and data. However, remote communities may require a bit of sensitization.
6. They will be willing if the information is confidential and its not prone to tempering
7. Yes
8. Its nice
9. I think it will empower most of the service provider on how they handle patient and I think there will be a good communication between patient and service providers and it will create satisfaction

What do you think about a patient receiving a notification each time someone modifies her information in order to create a trustworthy system?

1. 50/50,if they can read and follow the prompts to the dot.
2. It would be good but if not coordinated well it might be a bother like
3. Awesome idea. I hope it includes also when the doctor modifies during checkup.
4. That is very important especially in a corrupt Kenya where data can be manipulated - without the knowledge of the patient- to suit a particular selfish interest
5. That will be ok to ensure a smooth and transparent process
6. Might be confusing
7. Creates more trust
8. It's good
9. I think for security purposes

What other kind of notifications could be included in the system?

1. Periodic log in using ones ID number
2. Christmas and easter notifications
3. Notifications about checkup after birth, probably for the next few months.
4. Maybe even phone call
5. Notifying CHA's and CHV's in there community unit.
6. Reminders on children immunization
7. Any facility added on Hakira system near you should be included in the SMS, to enable you change the facility if you so wish. Additional new services offered to mothers in the facility selected
8. Calls
9. I think any changes done or campaigns taking place in the clinic it will be of great importance if patient get notification for any changes

What information do you consider crucial to share with next level clinic in the electronic referral letter to facilitate the onboarding process?

1. To request for ID number from the patient for verification, code is sent to the patient which he/her intern shares with the service provider for access into the account
2. Medical history, personal data
3. Overall health of the baby, overall health of the mother e.g. heart beat, blood pressure ...
4. Patient biodata and all medical history
5. Everything about the client for good services
6. Ancs
7. Health status
8. My password

Is there any feature or service you would wish Haikara System could offer you in order to facilitate the onboarding or referral process?

1. Not at the moment
2. No
3. ranking feature for the hospitals so that we can tell the best hospital to be referred to.
4. The database could have the option of allowing statistical apps that can analyze medical data on a bigger scale and can be used in research-led policy making in a county
5. Referral distances
6. Funds
7. Transport used and identification number of ambulance used I thinks plate number should be included in the system

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