Possibilities of implementing a Swedish mobile health service in Kenya using an ICT4D approach
A field study

Rickard Magnusson
Christopher DiLorenzo
Abstract

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The purpose of this study was to evaluate the possibilities of implementing the Swedish teledermatological service iDoc24 in Kenya through already established organizations. The main source of information came from interviews within various organizations as well as case studies with patients within these organizations, where the service was tested in a Kenyan setting. Technically, no insurmountable barriers to implementation were found although some restrictions as to where the service may be implemented exists and the cheapest technology available is not recommended for the service. Financially, an implementation of the service would require a large amount of resources which would need to be procured; we have made some suggestions such as development aid organizations. Organizationally, it seems possible and advisable to launch the service within an already established and successful organization if the service is to be launched to the poorer rural communities. However, the service needs to add and change a few technical features before this is possible. This also results in a possible change in the organizational structure and how the service is used and for what purpose, thus ethical aspects needs to be considered here as well as legal. To the middle and upper class, it is recommended to launch according to the Swedish model due to the increasing presence of suitable phones by this target group, meaning that anyone with a suitable phone may use the service and pay full price.
Populärvetenskaplig sammanfattning

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# Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anamnesis</td>
<td>Medical history.</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communication Technology. Generally speaking it is the more formal version of IT, Information Technology.</td>
</tr>
<tr>
<td>eHealth</td>
<td>Health which is not person to person but happens via an ICT medium.</td>
</tr>
<tr>
<td>mHealth</td>
<td>More focused version of eHealth. Here m stands for mobile and a portable ICT is implied.</td>
</tr>
<tr>
<td>Telemedicine</td>
<td>Medicine through telecommunication.</td>
</tr>
<tr>
<td>Dermatology</td>
<td>The branch of medicine concerned with the diagnosis, treatment, and prevention of diseases of the skin, hair, nails, oral cavity and genitals.</td>
</tr>
<tr>
<td>Teledermatology</td>
<td>The practice of dermatology using telecommunication.</td>
</tr>
<tr>
<td>MFS</td>
<td>Minor Field Study.</td>
</tr>
<tr>
<td>SIDA</td>
<td>Swedish International Development cooperation Agency.</td>
</tr>
<tr>
<td>HCI</td>
<td>Human-Computer Interaction.</td>
</tr>
<tr>
<td>HCI4D</td>
<td>Human-Computer Interaction for Development.</td>
</tr>
<tr>
<td>NGO</td>
<td>Non Governmental Organization.</td>
</tr>
<tr>
<td>SEK</td>
<td>Swedish kronor (currency).</td>
</tr>
<tr>
<td>KSh</td>
<td>Kenyan shillings (currency).</td>
</tr>
<tr>
<td>CHW</td>
<td>Community Health Workers.</td>
</tr>
<tr>
<td>NWH</td>
<td>Nairobi Women’s Hospital.</td>
</tr>
<tr>
<td>Back-end</td>
<td>The back-end in this report refers to the iDoc24 web interface which dermatologists use to answer the cases.</td>
</tr>
<tr>
<td>Front-end</td>
<td>The front-end is the iDoc24 interface used for sending information to the back-end, generally speaking it is the mobile phone iDoc24 application but it could also be the iDoc24 web interface.</td>
</tr>
</tbody>
</table>
1 Introduction

Healthcare is a service that should be readily available for everyone. However, in large parts of the world this is far from true. Healthcare is usually a struggle in developing countries simply due to a lack of resources and that other things must take priority. One of the major problems with healthcare is one of logistics and expertise. It is very hard to have proper professional opinions in remote areas that are hard to get to due to a lack of infrastructure, or perhaps there simply are not enough trained professionals in the country. There are only two solutions to this problem, (1) one way is to improve education and infrastructure so more trained professionals can be available when needed. (2) The second way is to utilize the professionals the country already possesses better by increasing the efficiency of their diagnoses and supplying a way for the patients to supply their information to the medical professional. This could be done either by supplying better infrastructure and availability or by changing the means of communication.

In the developed world, the era of communication and information technology is in full throttle and the developing world is leapfrogging certain technologies. One such technology is mobile communication, which the Swedish company iDoc24 believes can be used as a luxury service in the developed world, but also as a way of facilitating expert opinions to people in developing countries. The service includes sending an image and some text describing the dermatological ailment to a dermatologist, who can then respond through a computer connected to the Internet, a phenomenon know as teledermatology. This means that as long as the patient has some way of taking and sending a picture through a computer or mobile phone, expert advice can be received. Having these capabilities accessible (either you own a smartphone or someone you know does) is certain in the developed world, but the service may need to be modified to work in the developing world. To investigate this the two authors travelled to Kenya for a 10 week long field study.

1.1 Purpose of the study

The purpose of this study has been to look at the possibilities and barriers of implementing a Swedish teledermatological service in Kenya. A practical case study of the service, which was provided by the Swedish company iDoc24, has been carried out in Kenya. A previous study has already been performed, focusing on economical aspects of the same issue without involving users; this study has continued where the previous one left off, but has focused on more technical aspects based on the previous findings. It has been investigated if rural or urban Kenyan populations were susceptible to a service such as iDoc24 and if any technical barriers exist. The final goal has been to provide iDoc24 with a report on how the service needs to change for a future launch in Kenya. The following questions have been answered:

- Are there any technical barriers preventing a service such as iDoc24 from launching in Kenya?
- How does the service need to change technically to fit the needs found in Kenya?
- What is the best way to scale up the iDoc24 service in Kenya?

1.2 Study breadth and delimitations

When looking at how a service can be implemented in another country, there are of course many possibilities, far too many to be covered in a master thesis. For this
reason, many delimitations have been made. The first choice that was made was to only focus on implementation through organizations as this was the recommendation from a previous study performed in the spring of 2011, described in 3.5. To implement with cooperation from local organizations was also in line with one of the main theories which this thesis uses, ICT4D\(^1\). In other words, the Swedish model of implementing straight to the general public has not been focal. The reason for this was that many of the findings that were made were believed to be applicable to this type of implementation as well, such as coverage for instance, and that the pilots that have been conducted in Sweden already gave a lot of insight into this type of implementation. Furthermore, it was found more interesting to look at different fields and different types of organizations, rather than to focus on one type of organization. Kenya was chosen as a geographical restriction, due to various reasons, such as language and political stability. The main language in Kenya is English, which is the same language as the iDoc24 application, making translations unnecessary. During the study, a visit was made to Tanzania to interview doctors. However, the results of the study will only be applicable to Kenya, since the visit to Tanzania was solely to investigate the possibility of having dermatologists in Tanzania to answer cases in Kenya. Three main organizations were chosen even though some independent people have been influential to the results of the study as well. These were believed to give a wide understanding of different possibilities to implementation in Kenya and were considered enough for the study. The organizations were chosen due to their use of technologies or their healthcare services. Based on these factors the organizations were chosen due to how interested they were in research partnerships with us and iDoc24.

All pictures in the report, unless otherwise stated, are photographed or created by the authors of the report.

1.3 Outline

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 2</td>
<td>Introduces the company iDoc24 and the service it provides as well as the reason for why a launch in Kenya is interesting.</td>
</tr>
<tr>
<td>Background</td>
<td></td>
</tr>
<tr>
<td>iDoc24</td>
<td></td>
</tr>
<tr>
<td>Chapter 3</td>
<td>Describes the present situation in Kenya when it comes to health and especially mobile health.</td>
</tr>
<tr>
<td>Background</td>
<td></td>
</tr>
<tr>
<td>Kenya</td>
<td></td>
</tr>
<tr>
<td>Chapter 4</td>
<td>Depicts and motivates the methods employed for this study.</td>
</tr>
<tr>
<td>Method</td>
<td></td>
</tr>
<tr>
<td>Chapter 5</td>
<td>Introduces the theories used for the study.</td>
</tr>
<tr>
<td>Theory</td>
<td></td>
</tr>
<tr>
<td>Chapter 6</td>
<td>Presents the empirical results which were collected during the studies duration.</td>
</tr>
<tr>
<td>Findings</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) See subchapter 4.2 Partnerships
Chapter 7
Discussion
Analyzes the findings based on the theories from chapter 5. Chapter 7 will also present some impressions from the authors, mainly about performing this type of field study in a developing country.

Chapter 8
Conclusions and Recommendations
Presents the results of the study and the recommendations to further research and to a possible implementation of the service.

Chapter 9
Final Reflections
Here the authors present their reflections on the study and its contents, as well as reflections surrounding field studies in the developing world and evaluation of the study.

Chapter 10
References
All of the references for the study are found in chapter 10.

Chapter 11
Appendix
The appendix holds information which is related to the study, such as the informed consent form and the questions which were asked of case patients.
2 iDoc24

iDoc24 is a small startup company that provides an advisory dermatological service through mobile phones as well as through their website. The service is advisory as opposed to diagnostic due to the legal ramifications of providing a diagnosis via a mobile phone. There is only one employee, founder Dr. Alexander Börve. However, Börve uses dermatological as well as technical consultants to run, maintain and develop the service. The company started in 2008 as a spin-off from a research project at Sahlgrenska Akademin. Initially it used MMS technology, but during the last two years, a web interface as well as an iPhone application has been released, and an Android application is in development. Börve has also gathered an advisory board with several highly credited people within dermatology. Börve is performing research on teledermatology and is publishing articles regularly on the subject. The research often uses the iDoc24 service, thereby continuously testing and refining the needs and requirements of it (Börve; iDoc24, 2011)

2.1 How it works

The iDoc24 service is available all over the European Union, but has mainly been marketed in Sweden. No matter which platform is used, the service works in approximately the same way. The user takes a picture of a skin disorder, fills out a form with information about the affliction, see figure 2.1, and sends it in to iDoc24. Currently, the only information that the application forces the user to submit is a picture, no text is necessary. In other words, if a picture is not added and the user tries to send in the case, an error message appears. This however, does not happen if any text information is missing. The service is anonymous and therefore no personal information is sent in. Instead, a random reference code is generated upon submission as the sole identifier for the case. The dermatologist then gets an email saying that there is a new case available and can log onto the back-end to answer it. Once logged in, the dermatologist views the pictures and the information sent in by the user, writes the appropriate response, answering what the ailment could be and how it may be treated, and sends it back to the user. The user can then see the response from the dermatologist by logging in with the reference code on any of the supported platforms. Instead of writing the answer for each case, the dermatologist has the option of using the standard answers available from the back-end. There is also a feature to add their own standard answers. (Börve; iDoc24, 2011)

2.1.1 Technical requirements

If using one of the mobile platforms, the service theoretically only needs a phone with a camera and the possibility to send an MMS, an iPhone or an Android (1.6 or later) phone with a camera, or a regular digital camera and a computer connected to the Internet. However, since a dermatologist has to interpret the picture, this requires a picture with good enough quality. Obviously, the better the picture, the easier it is for the dermatologist to interpret and give a good answer; naturally, a good camera is thus preferred. Also, to send in the case, the phone or computer has to have a good enough
connection. It might work on a very slow connection, but it will take a very long time to send in the case. (Börve; iDoc24, 2011)

2.1.2 Knowledge requirements

Except for knowing how to use the platform on which the case is sent in, the user also has to know what information to type in and how to take a good picture. On the iPhone and the Android applications, as well as on the web form, there are certain fields to fill out when describing the affliction, such as symptoms, duration, gender, allergies, etc., see figure 2.1. By having these predefined fields, the idea is that the medical knowledge of the one filling out the form does not need to be that of a medically trained professional. As for taking a good picture, there is at the moment no directions or information on how to do this on either of the platforms. (Börve; iDoc24, 2011)

2.2 Why iDoc24 in Kenya?

The study was performed in Kenya, mainly because English is the official language and that the iDoc24 service is already available in English, thus making it possible to try out the service without altering it and avoid language barriers in an initial study. The country is relatively politically stable and has a well functioning mobile infrastructure, especially compared to other kinds of infrastructure. The possibility to attract the attention of SIDA and other similar donor organizations is of course also interesting. Many Kenyans have no ready access to healthcare which a service such as iDoc24 may be able to alleviate. According to Börve (2011), not many alterations should need to be made to the service before a possible launch in Kenya. He would rather see that iDoc24 could license the service to organizations, since it is hard to work in a country one is not established in. Another reason is that iDoc24 already has established contacts in Kenya and the economical aspects of an implementation have been studied previously. However, no practical tests or technical evaluation of possible problems have been made, something that is definitely crucial for establishing a new service. (Asp & Darelid, 2011)

Figure 2.1: The iDoc24 iPhone application
3 The situation in Kenya

This chapter gives a short introduction to the Kenyan healthcare situation in general and what the ICT situation is currently like. It explains what kind of similar projects have been done and what the successes and shortcomings of those have been, as well as explains some of the terminology used in these types of studies. Finally, the most important parts from the previous iDoc24 study in Kenya are highlighted.

3.1 Kenya abbreviated

<table>
<thead>
<tr>
<th>Population of Kenya</th>
<th>Literacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>39,002,772</td>
<td>Total Population: 85.1%</td>
</tr>
<tr>
<td>Median Age</td>
<td>Male: 90.6%</td>
</tr>
<tr>
<td>Total: 18.7 years</td>
<td>Female: 79.7%</td>
</tr>
<tr>
<td>Male: 18.6 years</td>
<td></td>
</tr>
<tr>
<td>Female: 18.8 years</td>
<td></td>
</tr>
<tr>
<td>Life expectancy</td>
<td>Population living in poverty</td>
</tr>
<tr>
<td>Male: 50 (2006 est.)</td>
<td>56%</td>
</tr>
<tr>
<td>Female: 51 (2006 est.)</td>
<td></td>
</tr>
<tr>
<td>Populations growth rate</td>
<td>Telephone Main Lines in Use</td>
</tr>
<tr>
<td>2.691 % (2009 est.)</td>
<td>252,300 (2008)</td>
</tr>
<tr>
<td>Birth Rate</td>
<td>Telephones- Mobile cellular</td>
</tr>
<tr>
<td>36.64 births/ 1,000 population (July 2009 est.)</td>
<td>16.234 million (2008)</td>
</tr>
<tr>
<td>Child mortality rate: 7.8%</td>
<td></td>
</tr>
<tr>
<td>Languages</td>
<td>Internet Users</td>
</tr>
<tr>
<td>English (official)</td>
<td>3.36 million (2008)</td>
</tr>
<tr>
<td>Kiswahili (official)</td>
<td></td>
</tr>
<tr>
<td>Numerous indigenous languages</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.1: Kenya statistics (Official Republic of Kenya homepage; Allianz, 2011)

HIV/AIDS has become the leading disease killer in Kenya, now surpassing malaria and tuberculosis. The approximate number of people afflicted by HIV/AIDS in Kenya is around 6-8%, making more than 3 million Kenyans HIV positive. Another big killer is the traffic; with 510 fatal accidents per 100,000 vehicles, which makes Kenya the dubious winner in highest incidence of traffic related fatalities in the world. As a reference, it is 20 times higher than that of the UK. (Federal Research Division, 2007; WHO, 2011)

3.2 Health system in Kenya

The healthcare, education and fertility rates are very unevenly distributed across Kenya. The areas around the Central province and Nairobi have the best facilities and the Northeastern province is deemed to have the worst. 5.1% of the Kenyan GDP was

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2 Authors note: Having avoided traffic accidents our whole lives, we managed to get involved in two accidents during our 10 week stay in East Africa. Another illustrating example was one of the times when we took a Dala-Dala, the Tanzanian version of the Kenyan Matatu, a mini-bus making up the backbone of public transportation in both rural and urban Kenya. During the 1.5 h drive to the neighboring town there were 28 people in a bus that in Sweden legally would not hold more than 12 and no seat belts.
spent on healthcare in 2002, averaging $6.2 per capita, far below the WHO recommendation of $34. In the rural areas, due to financial reasons amplified by long transport distances, the people often only have the option of treatment at primary health facilities, which are often underfunded and understaffed. Among the ones that did not seek treatment for their problems, 44% were reported to do so due to financial reasons and 18% due to long traveling distances. As of 2006 there were about 17 doctor per 100,000 inhabitants in Kenya compared to 550 in Sweden, see table 3.2 (Allianz; Socialstyrelsen 2011). Finding statistics on Kenyan dermatologists and venereologists has been difficult; however, as a reference Tanzania has about 10 dermatologists.

<table>
<thead>
<tr>
<th>Type of personnel</th>
<th>Kenya</th>
<th>Sweden</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Number per 100,000 population</td>
</tr>
<tr>
<td>Doctors</td>
<td>6,623</td>
<td>17</td>
</tr>
<tr>
<td>Dentists</td>
<td>974</td>
<td>3</td>
</tr>
<tr>
<td>Pharmacists</td>
<td>2,860</td>
<td>7</td>
</tr>
<tr>
<td>Pharmaceutical technologists</td>
<td>1,815</td>
<td>5</td>
</tr>
<tr>
<td>BSc. Nursing</td>
<td>657</td>
<td>2</td>
</tr>
<tr>
<td>Registered nurses</td>
<td>14,073</td>
<td>37</td>
</tr>
<tr>
<td>Enrolled nurses</td>
<td>31,917</td>
<td>83</td>
</tr>
<tr>
<td>Clinical officers</td>
<td>5,035</td>
<td>13</td>
</tr>
<tr>
<td>Public health officers</td>
<td>6,960</td>
<td>18</td>
</tr>
<tr>
<td>Public health technicians</td>
<td>5,969</td>
<td>16</td>
</tr>
<tr>
<td>Dermatologists &amp; venereologists</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Table 3.2: Number of registered medical personnel in Kenya as of 2009 (Ministry of Medical Services; Socialstyrelsen, 2011)*

![Figure 3.1: Levels of Care Defined in the Kenya Essential Package for Health](image)

*Figure 3.1: Levels of Care Defined in the Kenya Essential Package for Health, (Ministry of Medical Services, 2011)*
The first official instance of treatment is the dispensaries, run by registered nurses and supervised by a nursing officer at the local health center. Here simple healthcare issues can be dealt with as well as uncomplicated malaria and skin conditions. The ones who cannot be treated at the dispensary are referred to a health center instead. For secondary care, there are Sub-district, district and provincial hospitals that have curative and rehabilitative care as well as surgical services. Tertiary care, by specialists, is possible at the general hospitals in Nairobi, see figure 3.1. Except for this, there is private and faith-based healthcare on different levels around the country. (Allianz, 2011) An estimation is that private and faith-based healthcare facilities comprise about 30-40% of the healthcare in Kenya (Measure DHS; Ministry of Medical Services, 2011). According to the Ministry of Medical Services (2011), the private healthcare deals mostly with curative care and not so much with preventive care. The healthcare facilities are broken down into different columns by management type in table 3.3.

<table>
<thead>
<tr>
<th>Type of service</th>
<th>Public</th>
<th>For-profit</th>
<th>Non-profit</th>
<th>Faith-based</th>
<th>Total private</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tertiary hospitals (level 6)</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Secondary hospitals (level 5)</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Primary hospitals (level 4)</td>
<td>225</td>
<td>12</td>
<td>5</td>
<td>23</td>
<td>40</td>
<td>265</td>
</tr>
<tr>
<td>Other hospitals (level 4)</td>
<td>22</td>
<td>41</td>
<td>59</td>
<td>52</td>
<td>152</td>
<td>174</td>
</tr>
<tr>
<td>Health centers (level 3)</td>
<td>473</td>
<td>21</td>
<td>88</td>
<td>139</td>
<td>248</td>
<td>721</td>
</tr>
<tr>
<td>Nursing homes (level 3)</td>
<td>3</td>
<td>89</td>
<td>54</td>
<td>9</td>
<td>152</td>
<td>155</td>
</tr>
<tr>
<td>Dispensaries (level 2)</td>
<td>2,393</td>
<td>74</td>
<td>380</td>
<td>509</td>
<td>963</td>
<td>3,356</td>
</tr>
<tr>
<td>Clinics (level 2)</td>
<td>20</td>
<td>1,126</td>
<td>693</td>
<td>102</td>
<td>1,921</td>
<td>1,941</td>
</tr>
<tr>
<td>Laboratory - stand-alone</td>
<td>0</td>
<td>52</td>
<td>2</td>
<td>0</td>
<td>54</td>
<td>54</td>
</tr>
<tr>
<td>Dental clinics</td>
<td>0</td>
<td>10</td>
<td>1</td>
<td>0</td>
<td>11</td>
<td>11</td>
</tr>
</tbody>
</table>

Table 3.3: Health facilities in Kenya (Ministry of Medical Services, 2011)

3.3 Telemedicine, teledermatology, mHealth and eHealth, what does it all mean?

The term teledermatology is used to describe the dermatology branch of the more general field of telemedicine; a science that signifies the use of information and communication technology, ICT, to increase access to healthcare and medical information. The term telemedicine is often used synonymously with the term eHealth, or when using mobile devices, mHealth. (Mars, 2008) Teledermatology could be performed using either video conferencing between the patient and the dermatologist, or so called store-and-forwarding technology, when pictures are sent to a dermatologist. Only a few studies have been made comparing teledermatology to real visits to a dermatologist’s office. However, small pilots have showed that the level of agreement between the two can be up to over 90%. At the same time, teledermatology has the potential to reduce unnecessary visits to the dermatologist by over 50%. (Burke and Weill, 2005) A study performed by iDoc24 founder Alexander Börve (2011) has showed that the iDoc24 service can reduce unnecessary visits to the dermatologist by up to 70%. These terms will be used interchangeably throughout this report since different theoretical and methodological literature uses different nomenclature.
3.4 ICT and teledermatology on the march

Most of the applications of teledermatology have so far been to aid general practitioners or healthcare workers to get opinions from specialists, either through real-time data transfer, such as video conferences, or through store-and-forwarding of data, where data, such as pictures or videos were sent to a specialist who later sent a response back to the local physician or healthcare worker with treatment recommendations. (Tran et al., 2011) The technological advancements of the mobile phone market over the last few years, especially in the area of built-in high resolution cameras, have made a whole new concept of teledermatology possible, which eliminates the need for local medically trained staff. What enables this possibility is the fact that, even though resources are scarce, almost half of the population in the developing world has a mobile phone today, a number that is increasing fast (Vital Wave Consulting, 2009). However, according to the World Health Organization, WHO,

"An overall lack of evaluation data, trials and published results concerning teledermatology initiatives in developing countries has limited the amount of evidence on the impact and effectiveness of teledermicine"

- (WHO, 2009 23)

Furthermore, WHO (2009) implies that in the studies that have been made, there has been a reluctance to accept the new technologies in the developing countries due to fear of the unknown and that the integration of the communication technologies will interrupt work flows and alter present work practices. Another challenge of teledermatology is overcoming ICT illiteracy. In other words, even if there is a service available, people do not know or dare to use it. The problem here lies not in medicine or finance, but in human-computer interaction.

The above describes ICTs in developing countries in general. However, there have been several initiatives of teledermatology in sub-Saharan Africa specifically. To name a few, a very early project was conducted between the Regional Dermatology Training Centre (RDTC) in Moshi, Tanzania and the University Hospital in Zürich, Switzerland during a one year time span around the year 2000. However, this used regular cameras and a computer connected to the Internet using a standard modem and telephone lines. Future potential was obvious but problems with maintenance of the technology and various connectivity issues were experienced. (Schmid-Grendelmeier et al., 2000) Another project, the Africa Teledermatology Project, conducted a large pilot, involving seven different sub-Saharan countries. Here, more than 140 cases were sent in involving 320 pictures during a time span of over a year in 2007-2008 using a mobile interface. This study however, did not assess the performance of remote local medical staff or patients and focused mainly on medical aspects. A few problems were reported, such as refusal to be photographed or variable stability in the telecommunications networks. Medically, the project seemed to be viable and a similar broad-based sub-Saharan service is recommended. It should be noted that the Africa Teledermatology Project was conducted using a similar service such as iDoc24, this service has however not been available for comparison in this study. (Kaddu et al., 2009) Yet another similar study was one conducted at Al-Azhar University in Cairo, Egypt, focusing on transferring both patient history and images from a technical standpoint. This study used only mobile technology, meaning that even the dermatologists answered the cases sent in using mobile devices, eliminating the need for PCs completely. (Tran et al., 2011) In the two later cases, a 4 and a 5 megapixel cameras were used. The common result of these studies were that the technology definitely has potential in Africa but that more research
is needed. They have not looked very much on HCI related issues at all, but primarily focused on making it work at all and see how medically viable it was, the answer being that it seemed to be very medically viable.

This study will build upon the findings of the previous studies but with a focus on both technology and a feasible implementation model of the iDoc24 service in Kenya. The study will focus more on finding a sustainable solution for implementation via different channels, such as in cooperation with a local organization. These aspects have not been the main focus of the previous studies performed and will hopefully bring a realistic view of the relation between Kenyans and mobile technology and teledermatological services.

3.5 The previous iDoc24 study

This study was performed by two business students during the spring of 2011 in Nairobi, Kenya. The purpose of the study was to establish the challenges and possibilities for implementing iDoc24’s service in Kenya. Mainly this was done from a business point of view and very few technical matters were covered and the service was never tested in a Kenyan setting. The study was conducted by the means of interviews with people from the health, telecom and management sector in Kenya and Sweden. Starting from 12 different factors, the results from this study was that the biggest challenges were price, scale, market prerequisites and deskilling of work. However, the biggest possibilities were scale, market prerequisites, process innovation and functionality. Market prerequisites and scale can thus be seen as both challenges and possibilities. The business students, Darelid and Asp, mean that this is since smartphones are still very limited on the Kenyan market, and the bureaucracy and government system is very slow. At the same time, mobile penetration was fairly high (55.9 %) due to price wars, which have made mobile devices cheap and smartphones affordable for an increasing number of the population (Asp & Darelid, 2011). Some mobile payment and insurance systems, such as M-PESA and Changamka have had a huge successes. When it comes to scale, the Kenyan market is characterized by a rapid uptake of new technological solutions as well as solutions that are proven to work. However, the limited consuming capacity of the Kenyan population is a clear challenge.

Price is possibly the biggest challenge and even though some income groups are similar in Kenya and Sweden, most of the Kenyan population have a much lower income than the Swedish which results in prices needing to be lower in Kenya. To the end customer the respondents of the study have suggested prices ranging from 100-500 KSh (≈7-35 SEK) for the service or even as low as 20 KSh (1.40 SEK) if targeted to the poorest slum areas, compared to 95 SEK which is the price for the service in Sweden today. However, Kenyans are used to pay for healthcare to a larger extent than Swedes, making it easier to implement a charging service. Deskilling of work refers to the fact that there is a big need for customization of the service depending on who the target market is, taking age, educational level, literacy, etc., into account.

The other two big possibilities except scale and market prerequisites were process innovation and functionality. Since the communication infrastructure is ever increasing, and there is a shift towards mobile solutions in general in Kenya, it increases the quality of service and adds to process innovation. Since other kinds of infrastructure is lacking in Kenya and since doctors in general, and dermatologists in particular, are scarce, the added functionality might be high. An added functionality of using the service as an

educational tool within healthcare facilities are also mentioned. Furthermore, to be able to customize the service, it is important to get knowledge about the local context in which the service is to be used and access the local resources through partnerships. By doing this, it might be possible to pull the service to the market instead of pushing it which many projects have failed to do.

As far as recommendations go, the study also mentions the need for partnerships, both with organizations and government to create a win-win situation. This way it is possible to involve the poorest and improve their quality of life. A possible strategy suggested by the study is for iDoc24 to form partnerships with organizations and through them pilot the service within those organizations to increase knowledge about the local environment, market and prerequisites as well as gather statistics and finally be able to modify the service to cater local needs.

The field study also mentions that human-computer interaction research about a proper interface is critical due to the nature of the consumer. Kenyans are not as used to computer and mobile technology as people in developed countries and a short learning curve should be a primary focus of the application. They thus conclude that

"Research on consumer behavior is critical in order to determine the future design of products and services successfully."

- (Prahalad, 2006 in Asp & Darelid, 2011 25)
4 Research methodology

This study has been conducted as part of a Minor Field Study (MFS) project, which is a scholarship given by the Swedish International Development Cooperation Agency (SIDA). The scholarship is applied for and awarded by different university institutions in Sweden. The first hand empirical data has been gathered during an eight-week field study in Kenya, during which, two case studies have been carried out along with multiple interviews, and discussion sessions. In addition to this, second hand data, in the form of articles, books and websites have been studied before departure to Kenya to give a clearer view of the situation and how the study should be conducted. The approach has been that of information and communication technologies for development, ICT4D, which is closely related to human computer interaction, HCI.

4.1 HCI versus ICT4D

This subchapter will give the reader a cursory understanding of the theories underlying implementation and use of technologies in a developmental context. HCI, is

“a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them”

- (Baecker et al. 2009).

No doubt, this sounds applicable to this particular case. Related to this is another term, ICT4D, which is

“the application of Information and Communication Technologies (ICTs) within the field of socio-economic development”

- (SARDEG, 2008)

Thus, it can be concluded that ICT4D is the study of ICT’s impact on socio-economic development. The field of ICT4D has gone through 3 phases. The first phase was the use of ICTs in the developing worlds public sector before the 1980s followed by use in the private sector. With the introduction of the Internet a lot of telecenter projects were started in the developing world, which marked the next phase of ICT4D. The third phase of ICT4D is happening right now and a large component of it is to switch from telecenters to mobile devices. (Heeks, 2008) When studying related literature, one sometimes finds the term HCI4D as well, which would be a combination of the two. So what is the difference between them? Dissected, ICT4D consists of two parts, ICT and D; just as with HCI, it is obvious that it has to do with information, computers and the people using them, but the key thing here is the D, development. Development, or rather international development or global development, refers to the goal of eradicating economic poverty around the world as well as undesired states of being that usually accompany it, such as starvation, lack of healthcare, lack of education , etc. Worth mentioning, is that this action could take place in richer countries as well as poorer ones, as most countries have a poor population. In general though, this is an activity that focuses on the developing countries. (Toyama 2010a)

HCI and ICT4D have a lot in common. Toyama (2010a) argues that they share four fundamental cornerstones: (1) qualitative methods and user studies, focusing on in-depth interviews, focus groups and the like to get a richer view of the cases studied rather than a representative sampling; (2) design and iterative prototyping, which
enables the researcher to be pragmatic, try different approaches, and see what actually works; (3) evaluation, to find out if the solution is in fact a solution to the problem at hand or something else; and finally (4) reflection, enabling self-criticism about the work.

There are however some common differences between HCI and ICT4D. The first is pragmatism; HCI researchers are, according to Toyama (2010a), prone to solving problems by using the latest technology, whereas ICT4D researchers focus on the technology that actually works in a poor remote setting for example, where there are barriers such as lack of electricity, a high level of illiteracy or when the primary factor for deciding on platform is cost. Another difference is the usual route to scale. A HCI researcher usually imagines that this would be done through commercialization of the product, whereas the ICT4D researcher usually has to go through NGOs, government, multilateral organizations or similar institutions to scale it up.

4.1.1 Field studies

On site research is another factor that differentiates the two fields. In HCI in the developed world, it is OK to develop a solution in a lab and roll out to the targeted user group based on similar user studies. In ICT4D, the cultural difference between the developer and the targeted user group is often to great for this to be enough. Furthermore, the technology that might work fine in a lab might have problems in a dusty and otherwise technology unfriendly environment. Going out to the field is therefore crucial for ICT4D research. Toyama refers to this as researcher immersion or “technology-focused poor man’s ethnography” since the researcher usually only spends a few days in the users environment (Toyama 2010a).

So what distinguishes field studies from regular studies? It is usually harder to control different variables but may in this case be beneficial since mobile devices are often used in an uncontrolled setting i.e. outdoors or in the car. Faulkner has the following to say about field studies:

“A field study is one that is conducted in the user’s environment. It gives the usability engineer a much better idea about the context in which the system will be operating. However, it is not without its difficulties. The user’s environment will be full of the distractions and extraneous noise that a real working situation necessarily contains - this can make observation difficult. However, it does allow the usability engineer to view the system as part of the end-user’s total environment. It will be possible to observe not just the immediate end-user using the computerized system but there will be other contacts and interactions that the laboratory studies cannot anticipate. For example, there will be interruptions to task and these may have effects on the way in which the system is able to perform. However, even field studies cannot give a true picture of how the system will perform in reality because end-users are liable to be influenced by the presence of the observer, especially if recording equipment is used. If the usability engineers have built up a good relationship with the end-users then field studies are likely to be more useful since the observer will be less of a novelty and may well be ignored.”

- (Faulkner, 2000 168).

A way of understanding how a service will be used in a location, is to imagine scenarios of the services usage. Researchers and users can look at features and functions
before they exist and attempt to address eventual problem areas and errors. To successfully create these scenarios it is important to have an understanding of the current methods being employed to solve the tasks which the service would replace. Done correctly, a scenario can potentially yield useful insights into how the users will work with the service. (Faulkner, 2000)

4.1.2 Field Studies in a Developing Country

Performing HCI research in developing countries imposes several methodological alterations by comparison to performing the same research in a developed country. An example is the ethical implications of providing technology used for research only to withdraw it when the field study is over. The technology may have made a large impact on a marginalized community. This is only one example of the importance of managing the expectations of people involved in the field study. (Chetty & Grinter, 2007; Ankowa, 2009)

The basic conditions and infrastructure of a developing country often puts constraints on the field study. For example, poor roads, crime, unstable electricity, corruption, etc., need to be taken into account when performing the study. Crime is especially troublesome since it puts the researchers and the research materials at risk. Crime, as well as other constraints, is however an important aspect to be considered when evaluating the applicability of the research; perhaps this technological device could have been implemented had it not been for the fact that it would probably be stolen. The researcher can never be prepared for all of these factors prior to entering the field. Basically, the methods used become altered when performing field studies in a developing country to better reflect the conditions on site. One such method is to substitute first hand data from the target community with second hand data from more accessible candidates. Although, this is obviously not the preferred method. (Ankowa et al, 2009) There also exists a difficulty in ascertaining truth in cultures where people are eager to please researchers. This is of course a problem in all countries, but even more so in the developing world because they may see the researcher as a person of higher status. Having multiple data sources is therefore very advisable. One way of minimizing this problem is to have group discussions as opposed to private interviews. (Ankowa et al, 2009; Chetty & Grinter, 2007) Chetty and Grinter have this to say about performing research in insecure environments:

“Although we are not currently aware of literature that discusses physical safety threats doing HCI or HCI4D research, this was a huge consideration in our plans. More generally, we would argue that HCI4D methods must account for the practical consequences of working in insecure environments. While it may be suboptimal to conduct user tests outside the "workplace" setting, in practice it may be the only option. Further, evaluation of HCI4D research needs to accommodate these choices that while not ideal, balance HCI with difficulties of working in this context.”

-(Chetty & Grinter, 2007 2330)

4.2 Partnerships

When immersing, it might be advantageous to partner up with local development-focused organizations since this can greatly reduce the immersion threshold. These organizations are often already trusted by the community and know the key players.
This way, unnecessary hostility, skepticism or unproductive hospitality might be avoided. These organizations might also know the local customs and ways of conducting business, thus avoiding unnecessary conflicts and time wasting. However, there might be another side of such a partnership as well. The partnering organization might have a naive view of the limitations and possibilities of technology or fail to recognize problems for some reason. Thus, a sense of HCI is important for the researcher. (Toyama 2010a, 53) Various organizations, doctors and test subjects have participated in this study. Most of their headquarters were located in Nairobi, Kenya. The main organizations were AfriAfya, a nonprofit ICT organization that provides ICT centers for marginalized Kenya; AMREF, a nonprofit organization that has several hospitals and clinics scattered over several African countries and offers free healthcare, mainly to the marginalized; finally Nairobi Women’s Hospital, which is a for-profit chain of three hospitals in Nairobi, mainly targeting the urban middle class, but to some extent also the lower class. These organizations were chosen after having researched what organizations would be suitable for this study and selected so that they would represent different approaches: nonprofit versus for-profit, urban versus rural, and ICT focused versus health focused. In the case of AfriAfya and AMREF, the main contact person was the ICT-officer and in the case of Nairobi Women’s Hospital it was the head of pharmacy.

4.3 Methods

Two small case studies were carried out with actual cases sent in to and answered by dermatologist. This was done with AfriAfya and Nairobi Women’s Hospital. Due to complications and bad timing, it was not done with AMREF. Along with this, doctors and other personnel from these and various other organizations have been interviewed.

4.3.1 Case studies

The case study with AfriAfya was the first to take place. This was carried out in the Nyakach district in the Nyanza province in western Kenya, where AfriAfya had one of their resource centers. During one full day, eight cases were sent in using the IDEOS (see 4.4). The test subjects were varying in gender and age and were selected arbitrarily based on people who had some form of skin issue and wanted to volunteer for a free consultation. To participate, the test subjects had to read and sign an informed consent form, available in both English and Swahili, see appendix 2, explaining the purpose of the study. Working as volunteers at this resource center were a group of community health workers (CHWs), a group of, with some exceptions, elderly women with very limited medical training. The original plan was to have these CHWs ask test subjects the necessary questions, fill out the form on their behalf and send in the cases, all to best emulate a likely scenario if the service would have been readily available for them. It was quickly realized however, that extensive smartphone training would be necessary so we had to send in the cases ourselves. After the cases had been sent in, the test subjects were interviewed about the experience, see appendix 1. This of course was not the optimal solution, but the only one available at the time.

The second case study, performed together with the Nairobi Women’s Hospital, had two parts. During the first day, only two suitable patients were available. The same protocol procedure as in Nyakach was followed, but instead of asking questions and sending in cases ourselves, a general practitioner assigned to the study did it. It was then discovered that the general practitioner had a suitable phone of her own. By installing
the service on her phone it was possible to continue the case study without us being present, and so it continued for about a week, resulting in five further cases sent in. The phone used for the last five cases was a Samsung GT i5503 phone running Android 2.1 with a 2 megapixel camera. However, even though this phone had a camera with a lower resolution, the optics were better than that of the IDEOS, resulting in better pictures overall.

The cases sent in during both case studies were all answered by a Swedish dermatologist. They were later also compiled into PDFs and sent to a Kenyan dermatologist for a second opinion and then relayed back to the test subjects.

4.3.2 Interviews

Interviews were held with various organizations. Considering the type of person being interviewed, different templates were used. Mainly, they were divided into tech, medical and test subjects. All interviews were semi-structured and the interviewees were encouraged to give elaborated answers. However, since the different interviewees had very different backgrounds and roles to play within the organizations, the template questions often had to be adjusted before each interview to be relevant. Depending on available time for each interview, questions had to be skipped to make room for the most important ones in some cases. This was especially true for the different dermatologists since they often had very limited time and a room full of patients waiting for them. Notes were taken manually for each interview and the goal was to record as many of the interviews as possible as well. However, in several cases it was decided best not to record, so that the respondent would not feel threatened. This was particularly true for interviews that contained sensitive information. In many cases, group interviews were held due to either time constraints, or where it was found advantageous for other reasons. For example, when interviewing the CHWs in Kisapuk, it was possible to interview 14 health workers in 3 sessions in one single day, see figure 4.1. This of course had its disadvantages as well, such as fear of speaking out opinions. However, in the cases where group interviews were held, it was with already established groups and people that already knew each other well. The interviews were also carried out in places the interviewees were used to and comfortable with, without recording devices, which should decrease these fears. Since the questions were asked the group and not each individual, is hard though to distinguish exactly who in the group that said what, the opinions will therefore be credited to the group as a whole for all the group interviews.
The sampling procedure used was convenience sampling (sometimes known as grab, accidental or opportunity sampling) which is a type of non-probability sampling which involves the sample being drawn from that part of the population which is readily available and convenient. A researcher using convenience sampling cannot scientifically make generalizations about the total population from this sample because it would not be representative enough. (Wikipedia, 2011) Regarding a field study in a developing country it became clear that it was not interesting to see what the entire population situation was, concerning a teledermatological service. Therefore convenience sampling was used to collect the opinions of certain groups which the researchers chose. The different sample groups who were interviewed were organizations, health workers (including dermatologists) and prospective local representatives in rural Kenya. Obviously this will give a bias to the results, but it is a bias that was sampled for and is therefore known.

4.4 The Technology

To be able to display the service and have the option of sending in test cases to Swedish dermatologists a smartphone was obtained. The mobile phone was a Huawei IDEOS, which had a price tag of 7999 KSh, approximately 571 SEK or 81 USD. In other words, the IDEOS is very cheap by smartphone standards; it has a 3.2 megapixel camera, 3G HSDPA technology, Wi-Fi, runs the android 2.2 Froyo operating system, and comes in three stylish colors. The choice of using an affordable mobile phone was made to give more credibility to the study by constraining quality; if the service works on the IDEOS, it probably works on any Android smartphone, as far as picture quality and usability goes.

Even though the iDoc24 Android application had not been launched to the public at the start of this project, it was reasonably finished except for some tweaks, bug testing and additional payment methods, which needed to be added. However, there was also a noncommercial variant, which sent in cases for free to a demo version of the back-web. This was reasonably functional with only a few changes needed. A copy of the demo back-web was created for the sole purpose of the study with the help of iDoc24 IT-consultants and after a few tweaks to the application it was working. However, there were a few bugs that needed to be corrected to get it to work in the IDEOS, due to variances in hardware and software versions from other Android products. An example was that the camera application was not functional from within the iDoc24 application and had to be augmented, which was possible thanks to previous android programming knowledge and a few hours of googling. Other smaller issues were solved with the same means. The web version was not adapted to this version of the back-web due to limited resources and thus not tested. The main reason for this was also that the initial purpose of the study and why it would be interesting to investigate the possibility of implementing it in Africa was due to the high numbers of mobile phones even though the numbers of PCs was very low.

4.5 Aims and Objectives

These aims and objectives were put in place before departure to Kenya, to provide a framework for evaluation of the possibilities for implementation. They could be seen as a more concrete checklist to answer the first purpose question: Are there any barriers preventing a service such as iDoc24 from launching in Kenya? This checklist were based loosely on goals set up for a tuberculosis telemedicine project also carried out in Nairobi, Kenya, but were modified to fit this project (Hoffman, 2009). These goals have been a guiding light when testing the service in the field.

- To test the quality of image capture (resolution, etc.) with a sample mobile phone.
- To test the reliability of the transmission of pictures and text to the server from different locations, some rural, in Kenya.
- To assess the basic receptiveness of patients to the use of technology and image capture.
- To ascertain which ICT mediums are available for receiving health messages from doctors.
- To assess patient preference as to the content of the queries. What they are comfortable disclosing, as opposed to what the doctors need to know.
- To assess which types of participating organizations that are compatible with the service.

Before going to Kenya, three main scenarios of implementation were drawn up, see figure 4.2. Scenario 1 is the same as in Sweden, also referred to as the Swedish model. Here, the patient uses their own mobile phone, sends in a picture, pays to iDoc24, who in turn pays the dermatologist for the service and keeps a certain percentage. The main problem with this approach, as described above, is that even though many Kenyans have mobile phones, they do not meet the requirements for the service. Scenario 2 and 3 involves partners, where an employee has a phone that meets the specifications and lets people send in their cases from that phone instead. If the partner chooses to charge the patients or not is up to them. In scenario 2, the partner
then pays iDoc24 a certain cost per case and iDoc24 in the same way as scenario 1. In scenario 3 on the other hand, the partner pays a subscription fee to iDoc24 for using the service and then deals with the local dermatologist separately, without interference from iDoc24.

**Figure 4.2: Implementation scenarios**

Before arriving in Kenya, the most plausible scenario to implement was thought to be scenario 2, since most organizations probably would not have access to dermatologists and that it would just be simpler to have one central dermatologist hub working for iDoc24, minimizing the number of necessary liaisons. Scenario 3 was primarily intended for healthcare organizations that already had a dermatologist on staff. Scenario 1 is somewhat ignored here since it is considered to be more of a marketing issue rather than a HCI4D issue since most of the people that have the necessary phones belong to the upper class and live in the major cities. Thus, the HCI issues that might arise if implementing scenario 1, such as unreliable networks, problems with taking pictures of dark skin, etc., were expected to be covered when investigating the other scenarios.
5 Theoretical framework

This chapter describes the theories that were used to structure and analyze the findings of the study. Most of the theories are specific ICT4D theories but the PACT theory is a regular HCI theory. Finally, it is explained how these theories will help structure the analysis.

5.1 Technology as an amplifier

Toyama (2010b & 2011a) argues that technology can only act as an amplifier of human intent and capacity, and is not inherently good or bad. Therefore, just implementing a new technology into a new market does not guarantee good results if the intent to use it for good does not exist in that particular market. The impact is multiplicative, not additive. Where then, does this intent come from? Toyama claims that it is necessary that the community trusts the service or product and the institution that delivers it, and that the necessary financial infrastructure is present. To change the mindset of the people, they have to be empowered and sensitized. As an example, in the 1950s, when the television was starting to spread across the North American and European markets, there was a widespread belief that it would be an instrument of education. Some even believed that schools as they knew them would be obsolete due to this wonderful technology. However, when looking at the television now, it is easy to see that this is not the case, possibly because people’s intent was not education but entertainment. Another example is guns. Many people would probably argue that it is more appropriate for military or police to carry guns than children or criminals; even though the technology is the same, the intent differs. Toyama’s advice is to find organizations that already have a positive affect on their environment and piggyback on them to amplify their effect with the particular technology.

5.2 PACT

PACT stands for People, Activities, Contexts and Technology and is a framework for designing interactive systems presented by Benyon et al. (2005). It is used to describe the way people use technologies by undertaking activities in a certain context, and the way these four elements change in relation to each other. Below, the elements are described in more detail, focusing on how they vary from a Swedish setting to an East African one. This will constitute the core of the theoretical framework used in this thesis. The purpose of the PACT framework in this study is to be able to label the findings for a more structured analysis.

5.2.1 People

Benyon et al. (2005) describe three different aspects of people: physical, psychological and usage differences. The physical differences may include appearance differences, such as skin color or differences in size, but may also take into account things such as color blindness, shortsightedness or any kind of physical handicap. Psychological differences may refer to a person’s psychological abilities, such as spatial ability, but may also refer to so called mental models, the way one perceives an activity or language or cultural differences. Usage differences refers to the way people use technology, if they are expert or novice users and if the user group is homogeneous or heterogeneous. Worth mentioning is that in a homogeneous group, it is easier to get user
inputs to the design team, since few users represent the whole population better in such a group.

5.2.2 Activities

The activities that are carried out can of course be of very varying types, making it hard to set rules that apply to all. However, Benyon et al. (2005) present a few features that should be focused on, these are: Temporal aspects, encompassing frequency of activities, temporal clusters of the activity, response times and time stress, such as how well an activity can be performed in a stressful or noisy environment. Cooperation deals with whether the activity can or must be performed alone or in a group. Communication then becomes important. Complexity separates well-defined activities from vague ones. Well-defined activities may be performed by using a step-by-step procedure, while vaguer ones need a freer design. Safety-critical features include handling mistakes and errors as well as more safety-critical activities. Finally, the nature of the content may vary between different activities, if a large amount of data needs to be entered, then a keyboard may be necessary or if large amounts of data needs to be displayed then an adequate display needs to be available.

5.2.3 Contexts

All activities are carried out in a context. A context may be seen as surrounding an activity or gluing different activities together as part of a larger context. Benyon et al. (2005) divides context into three groups: physical environment, social context and organizational context. The physical environment is very important. For example, weather or low bandwidth may make it impossible to carry out the activity. The social context may play a big role in how an activity is carried out. There may be guides or trained staff to help with the activity or the user may be left to herself. If the activity is carried out together with someone else it may involve privacy issues or other requirements. Social norms may also not allow all kinds of designs in certain situations. Finally, the organizational context may take into account changes that new technology may have on existing power structures.

5.2.4 Technologies

Technologies are the last part of the PACT framework. Benyon et al. (2005) focus on four main components of technology: Input, output, communication and content. The optimal input method may vary between different kinds of data. Touch screens are good if there are only a few options to choose from, whereas keyboards might be preferable if a lot of text needs to be typed in. Output is also something that needs to be considered. Spoken output has to be remembered while written may be viewed repeatedly. When it comes to communication, bandwidth and storage options, etc., are necessary to keep in mind. Finally, the content needs to be up to date, accurate, relevant and well presented.

5.3 Attributes of success

Fajans et al. (2007) have come to the conclusion that the attributes of success can be divided into four categories: Innovation, referring to transferring an innovation to a new setting and scaling it up; the resource team, referring to the team that is trying to implement the service; the user organization, referring to the hosting organization such as the institutions responsible for providing health services; and finally the scaling up strategy. The different attributes and their requirements are summarized below.
Innovation

- based on sound evidence or espoused by respected persons or institutions in order to be credible
- observable to ensure that potential users can see the results
- relevant for addressing persistent or sharply felt problems
- have a relative advantage over existing practices
- easy to install and understand
- compatible with the potential users’ established values, norms and facilities
- testable without committing the potential user to complete adoption

Resource team

- effective and motivated leaders who command authority and have credibility with the user organization
- a unifying vision
- an understanding of the political, social and cultural environments within which scaling up takes place
- the ability to generate financial and technical resources
- relevant technical skills
- training capacity
- management skills.

User organization

- the members of the user organization perceive a need for the innovation
- the user organization has the appropriate implementation capacity
- the timing and circumstances are right
- the resource and user organizations are similar in characteristics and are in close physical proximity

Scaling up strategy

- clear messages through which the advantages of the innovation are made visible
- personal contact and informal communication
- early involvement of members of the user organization
- adaptation of the innovation to the local context
- technical assistance and a supportive approach
- sufficient time to implement new approaches
- training support to ensure skills transfer
- systematic use of evidence on the process and outcomes of scaling up

5.4 Scaling up

First, what does scaling up mean, and furthermore, why is it important? It may be defined as
“...the effort to magnify the impact of health service innovations successfully tested in pilot or experimental projects, so as to benefit more people and to foster policy and programme development on a lasting basis.”

-(Fajans et al. 2007 p. 2)

The importance of thinking about scaling up at an early stage is clear when you consider that, throughout the eHealth and mHealth sector, a common problem in Africa is that very few pilot projects have been able to scale up and become an established service. (WHO 2009, WHO 2011) Figure 5.1 displays different projects within the field of teledermatology over the years and which stage they have reached. What is worth noticing here is that very few projects in Africa have managed to go beyond the pilot stage. Many circumstances make it harder to establish a service here compared to anywhere else.

![Figure 5.1: Teledermatology initiatives by WHO region (WHO 2009).](image)

Fajans et al. (2007) present a framework on how to think about scaling up pilots. They identify attributes of success, key choices in planning the strategy as well as environmental factors that need to be taken into account when scaling up. Fajans et al. mean that there are many dimensions to take into account when planning a scaling up strategy. These are divided up into five categories: The type of scaling up; dissemination of the innovation; organizational options; costs; and monitoring and evaluation.

### 5.4.1 Types

Fajans et al. (2007) differentiates between spontaneous diffusion and guided scaling up. Spontaneous diffusion refers to the type of upscaling that happens by itself, an epidemic or viral upscaling if you will, resulting in a very cheap and efficient upscaling. This however, is not one of the more common ways of scaling. Guided upscaling on the other hand, refers to a more controlled upscaling that may be further categorized into 3 sub types: horizontal scaling up occurs when a service or product is introduced into a different location or larger population; diversification, meaning that additional features are added to the existing innovation; vertical scaling up is when an innovation is institutionalized, usually to increase sustainability. Fajans et al. stresses that upscaling usually implies several of these types of strategies and very seldom do they occur by themselves.
5.4.2 Dissemination

When scaling up, different types of communication are usually needed to spread information. However, impersonal ways of communicating, such as web sites, manuals or guides are often not enough. More personal ways are often needed, such as workshops, onsite visits and technical support. These personal solutions may vary from short term to long term and are used to adapt the innovation to new areas. (Fajans et al., 2007)

5.4.3 Organizational choice

When scaling up an innovation, Fajans et al. (2007) divide the different organizational choices into five categories: additive versus multiplicative strategies; centralized top-down versus decentralized bottom-up approaches; flexible, adaptive strategies versus implementation of standard packages; gradual versus rapid implementation; and finally participatory versus management or expert-dominated approaches.

Additive strategies are when the same resource team that implemented the first innovation are going to implement the next; while multiplicative strategies involves other organizations dividing the burden, but often also increases the cost and time it takes to develop training and settling on common goals and visions. Multiplicative strategies might also be more unstable since different organizations might be driven for different purposes and might be affected by for example local political changes.

The advantage of a central scaling approach, for example with a government authority, is that it is often possible to implement something on a larger scale with a larger mandate. However, it is hard to ensure that the innovation is adapted to local contexts. With a decentralized approach however, one usually partner up with various smaller NGOs, and they do not have the reach that a central authority has, and with a decentralized organization comes many decision-makers. The advantage is that the innovation may be tailored to fit local contexts and involve the local community.

Fajans et al. argue that organizations that are flexible and able to learn are more likely to succeed than organizations bound by rules and standardization. Since rules and culture vary between areas, it is important to be able to adapt the innovation to fit the local needs throughout the scaling process. However, key ingredients that has lead the innovation to success should be maintained sufficiently.

When it comes to gradual versus rapid implementation, Fajans et al. stress that a gradual implementation is preferred due to the possibility to adapt the innovation to local contexts and learning by doing. They mean that within healthcare, it is hard to get good treatment and adhere to new policies if implementation is rushed.

Finally, referring to participatory versus management or expert-dominated approaches, Fajans et al. argue that by letting stakeholders participate, the chance of local needs being accommodated for increases. However, participation is often costly and there is a limit as to how much participation is feasible.

5.4.4 Costs

There are many types of costs involved when scaling up an innovation, for example, expanding to new population groups or geographical areas; for evaluating; and for getting political support. It is very important to know about these costs when scaling up. However, it may not be necessary to be able to fund all of these costs through external funding. By using the resources within the health system or through resource
sharing with other similar organizations it might be possible to reach economies of scale. (Ibid.)

5.4.5 Monitoring and evaluation

Since scaling up is not a routine process, existing evaluation methods are seldom enough to capture the progress of a scaling up process. Instead, special research methods should monitor the progress and whether the innovation is being implemented as expected or not. Letting the resource team take part in positive results may act as a motivator. (Ibid.)

5.4.6 Environmental factors

When planning for scaling up an innovation, a major challenge is to find where the possibilities for a scale up are. A scaling up advocate needs to be aware of her surroundings. By looking at policies it is possible to find windows of opportunities due to new decision-makers or coalitions of governments, meaning that NGOs or other organizations need to be aware of new paradigms. It is also important to be aware of the bureaucratic system, about the constraints and the enabling factors. Also, it is important to understand that most bureaucratic systems have a will of their own. The characteristics of the health sector is another factor that plays into scaling up an innovation. In most developing countries, the health sector is one of the weaker ministries and has a low budget. Therefore, it is usually hard to rely solely on the government system and often it is good to bring in other actors as well. Also, political change results in varying priorities, which might open up or close windows of opportunity. Socioeconomic and cultural contexts also affect scaling up. They decide the demand for the innovation and create opportunities for scaling up. Here, social networks, religious leaders, the role of women versus men in a household, local leadership structures and so on are important to think about. Finally, Fajans et al. (ibid.) argue that the innovation needs to consider the health needs as well as their perception of the innovation.

5.6 How to make money from poor people

Toyama (2011b) argues that it is very hard to get rich and help the poor simultaneously. By helping them, he means making a meaningful affect their lives for the better. Making some money and still being able to justify doing good is possible, but making a lot of money is harder. The main solution that Toyama provides is to employ and involve marginalized people rather than just selling to them. This way, they are empowered rather than just exploited. Trying to reach several goals in parallel might be hard and often raises some ethical issues as well, such as if the company makes a large profit off the poor then the net result is probably that it takes away more resources from the poor than what is generated in the first place. Serially, it is easier; first get rich, then help the poor à la Bill Gates. Toyama (2011a) also sets up three scenarios: If interested in profit, focus on business or turn to other more profitable markets; if interested in development, partner up with an organization that already has an impact and support them with technology; if really interested in development, start with a real problem and work your way back to an optimal solution, the solution might be one that does not even require advanced technology at all.
5.7 Operationalization

The different theories in this chapter have served different purposes. The PACT theory has been used to categorize the findings and label them to get a more structured analysis. There were other theories that could have done the same job but PACT was chosen because it is a general theory and easily understood as well as not too specialized, which made it applicable in many situations. The rest of the theory, more specific to HCI4D, was mainly categorized into two groups, success factors and scale up theory. The findings have been matched with these success factors to see if and where there is a risk that a possible implementation would not be initially successful. After that, the findings have been matched with the scale up theory to see whether the service could be sustainable in the long run and if any changes would need to be made, and in that case, at which stage. The last piece of theory concerns ethical issues and have been treated separately in the analysis. The purpose of this was that during the study, a few ethical issues arose, some of which affected the study to a certain degree. Besides, one of the initial intents of implementing this service in Africa, would be for development purposes and this section was used as an evaluation of that purpose.
6 Findings

This chapter presents the findings made during the study. They will be presented here as objectively as possible for analysis in chapter 7. Since different methods were used within the different organizations, such as regular interviews, group interviews, discussions, short meetings and cases, and the data extracted from these are very different and hard to compare to each other, the chapter is structured in a way to make it easy for the reader to follow what has been done within each organization. To protect the privacy of the respondents most names have been omitted and codes have been used. For an explanation, see the reference list in chapter 9.

6.1 AMREF

<table>
<thead>
<tr>
<th>Interviewee</th>
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<tr>
<td>AMREF A</td>
<td>ICT project officer</td>
</tr>
<tr>
<td>AMREF B</td>
<td>General surgeon cooperating with AMREF.</td>
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</table>

Initially made famous as the flying doctors\(^5\), AMREF (African Medical Research Foundation) headquarters is near Wilson airport in Nairobi. AMREF tries to have doctors and supplies transported to patients who cannot visit a hospital. They currently visit approximately 150 hospitals 3 times per year in Kenya. (AMREF A, 2011) Although AMREF started out in 1957 as the flying doctors, delivering healthcare to the very remote places in Africa, they have since then expanded and now their services include training of medical personnel and actively fighting diseases, such as HIV and malaria through various projects. (AMREF, 2011)

AMREF has previously piloted a telemedicine project which was initially implemented in 4 of the 150 hospitals, to see if they could deliver healthcare remotely with ICTs. The telemedicine project was successful and it was broadened to 40 hospitals. The rural doctors received advice through the Internet using a computer, camera, printer and scanner. Initially there was a dedicated e-mail system called Telemedmail but more often than not a regular e-mail would need to be sent with additional information, which was not a part of the Telemedmail. Thus, they have now abandoned Telemedmail and simply send information using regular e-mail. (Ibid.)

\(^5\) If you do not know about their work, please see their homepage at http://www.amref.org.
6.1.1 AMREF and iDoc24

AMREF Telemedical Project Officer

Two people were interviewed with ties to AMREF. AMREF A is the project officer of AMREF telemedicine, and is trying to deliver healthcare with the help of ICTs. AMREF A (2011) thinks that the service would be beneficial in Kenya, even more so if it could be altered to incorporate the common diseases of Eastern Africa. However, people in Eastern Africa rarely go to the hospital unless they truly suffer. Skin related issues are largely ignored unless it hinders their work or becomes truly disturbing. There are currently no dermatologists working for AMREF, but if they would use the service they could get some. It would be preferable for AMREF to have iDoc24 supply the dermatologists.

The marketing value of the service through AMREF would be very simple. Hospitals never say no to the help that AMREF provides; AMREF also hosts many meetings and conferences. AMREF A thinks using the hospitals as a hub and then having CHWs travel into the communities would be the best way of implementing the service, since it is hard to make people change their habits. (Ibid.)

In Sweden the service is used by civilians. However, in Kenya this would probably pose a problem due to low technological dissemination and a comparably poor understanding of skin diseases. Thus, the person using the service should ideally possess both a technological prowess (received through training or previously accrued in some other way) and a basic knowledge of health related issues. In rural hospitals, the doctor is responsible for supplies, treatment and other administrative tasks to keep the hospital running. These doctors are already very busy and would probably not have time...
to use the service with patients. A better candidate would probably be nurses or CHWs. (Ibid.)

Rural people would need to have the service and technology explained for them to be able to trust it and see the value of it. Using existing relationships between CHWs, nurses and patients would facilitate trust in the service. Many already see technology as a solution provider, although a fair amount are still suspicious of it. To ensure that the service and mobile phone is handled properly AMREF A recommends a small write up explaining important aspects such as taking fair quality photos and using a touchscreen. (Ibid.)

Mobile coverage is not very reliable but at least it works sometimes. Possibility a partnership with a mobile service provider would be beneficial for implementing the service. However, despite the slow and unreliable mobile service if the service would be explained to people they would not mind waiting for the results. AMREF A sees several possible ways of relaying the message back to patients such as SMS, e-mail or contact with a centralized health worker who could then distribute the information. If, for example, a rash needs to have further testing done, a nurse could revisit the patient, perform the testing and send in the updated information along with the original information. Many cameras have been stolen from AMREF. The mobile phone would be easier to track since it uses the network service. Incentives and training would be needed to avoid the mobile phones being broken or misused. There are also some who will be too afraid to report a stolen or broken mobile phone. (Ibid.)

AMREF offers their services for free and AMREF A does not believe patients would be willing to pay for the service unless they are suffering quite a bit. A pilot study would be needed to find a good way of implementing the service among patients and health workers. If a pilot study is performed and proven to work it may be easier to find investors and it would also clear up many trust issues. (Ibid.)

Doctor working with AMREF

AMREF B (2011) is an “ICT friendly” general surgeon who has worked together with AMREF in remote areas. He has previously used ICTs, provided by AMREF, to get consultation and advice from doctors. AMREF B has noted that the acceptance and usage of ICTs by doctors is extremely varied. In AMREF B’s estimations only about 30% of hospital staff have basic computer literacy. This situation however, is changing as the hospital where AMREF B works is now training and building awareness of ICTs for the staff who do not know how to use ICTs; generally, the younger generation of staff do not need the ICT training.

AMREF B feels that medical officers, who receive approximately 5 years of training, and perhaps clinical officers, 3 years of training, would be best suited to use the service. Even remote areas have an Internet connection at this point so connectivity should not be a problem. AMREF B believes that using the existing AMREF setups, for example Makindu where they have 6 computers and a camera, may be beneficial to cut down on hardware costs. Using existing setups would be preferable from a cost perspective but the mobile solution is good due to its intuitiveness and simpleness, as compared to the more complex operation of using a camera and a computer. People in rural areas will not have a problem with technology being used if they are sensitized to how it would help them. However, they care much less about dermatological afflictions than infectious diseases. The people of Kenya have approximately the same dermatological issues as the Europeans but with less means of accessible healthcare. An obvious advantage is that the iDoc24 service would potentially eliminate the need for
transport for many patients; in some cases it is nearly impossible for a marginalized Kenyan to go to a proper hospital. (ibid.)

6.2 AfriAfya

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<tr>
<th>Interviewee</th>
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<tr>
<td>AfriAfya A</td>
<td>ICT field officer</td>
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<tr>
<td>AfriAfya B</td>
<td>Head of knowledge management unit</td>
</tr>
<tr>
<td>AfriAfya C</td>
<td>Project accountant and Director (2 people)</td>
</tr>
<tr>
<td>CHW group A</td>
<td>CHWs in Nyakach</td>
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<tr>
<td>CHW group B</td>
<td>CHWs in Nyakach</td>
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<tr>
<td>CHW group C</td>
<td>CHWs in Nyakach</td>
</tr>
<tr>
<td>Kisapuk teachers</td>
<td>Principal and teachers of school in Kisapuk (3 people)</td>
</tr>
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AfriAfya (African Network for Health Knowledge Management and Communication) is a nonprofit Kenyan NGO whose mission is “To link information processes with communication technologies (ICTs) to generate, manage and disseminate information.” (AfriAfya, 2011). In practice, this includes setting up ICT resource centers, see figure 6.2, in remote locations, usually in schools or other community buildings. AfriAfya is an offshoot of AMREF and their headquarters lie in conjunction with one another. However, AfriAfya’s resource centers are not linked to AMREF activities. (AfriAfya B, 2011)

6.2.1 Employees

AfriAfya A is the ICT and field officer for AfriAfya. In his experience the doctors in the field essentially “superguess”, meaning they guess what ailments a patient has since they cannot afford traveling to a real hospital. He believes that this service could help the rural doctors improve their superguessing. (AfriAfya A, 2011)

AfriAfya B (2011) heads the knowledge management division at AfriAfya and ensures that information is well kept, processed and communicated. CHWs are volunteers and receive very basic training. A lot of capacity building by local NGOs and the district health office builds their capacity around community based healthcare. AfriAfya as such does not build the resource centers, they just ask for a room in a community building such as a school. Electricity and housing is too expensive so AfriAfya tries to get solar power to the more remote areas of operation. AfriAfya B believes that the iDoc24 health service could be implemented in any resource center, especially in areas where there are few alternatives for healthcare. However, an issue would be whether the rural and marginalized would be able to pay for the service. It would be more likely that AfriAfya would receive funding and offer the service. Another possibility would be if the mobile phone providers would pitch in, since it would be a nice feature to have on their platform.

According to AfriAfya B (ibid.), communities are always very suspicious with gadgets, but with time even the rural communities will have phones for SMS and receiving calls. To address this issue, every AfriAfya worker recommended sensitizing and capacity building so that the community can understand and trust the service.
(AfriAfya A; AfriAfya B; AfriAfya C, 2011). An issue may be that AfriAfya does not have working knowledge within this area of operation. For credibility purposes it may be good to form a cooperation, preferably with iDoc24, where AfriAfya would provide local knowledge and training and the partner company would provide the front- and back-end and maybe a connection with the doctors. (AfriAfya B, 2011)

AfriAfya C (2011) consists of two people where one is the director and the other is the project accountant at AfriAfya. For the iDoc24 service they would need funding for travel, training, airtime and buying or repairing computers. The money AfriAfya makes goes to maintaining their current resource centers. The setup for implementing the iDoc24 service in cooperation with AfriAfya is seen in the following way:

- AfriAfya seek funding for a pilot.
- AfriAfya would take care of the contact with local dermatologists.
- A Swedish representative for iDoc24 would make sure the service would be locally sustainable. AfriAfya would help with this and receive necessary training from the Swedish representative.
- iDoc24 would need to provide the software, training and address the requirements of the service and augment it to fit them.
- Once iDoc24 had trained AfriAfya, AfriAfya would take care of local training of CHWs and others.

Exactly how the business side would work out was very unclear. The best solution would be if iDoc24 gave an estimate of what a subscription would cost and from there AfriAfya would be open to working out a feasible business plan in cooperation with iDoc24. They were also open to the idea of abandoning mobile phones and using only existing resource center technology (computers, cameras and the Internet). (ibid.)

### 6.2.2 Resource Centers

The resource centers consist of computers, a connection to the Internet and sometimes some additional hardware (printers, cameras, etc.), see figure 6.2. Three resource centers were visited. Two in the Nyakach region in western Kenya, close to Lake Victoria, and one in the Maasai village of Kisapuk, near the Tanzanian border.
Nyakach #1

Located in a primary school, this resource center is, at the time of visit, temporarily set up in a tin shed since the main building is being renovated. This however, did not hinder the locals from occupying all the eight computers crammed into the shed, sitting 2-3 at each computer learning the basics of e-mailing, see figure 6.3. Most of these people were teachers from the nearby schools. The AfriAfya approach is to teach some authority figures who have a large outreach, such as teachers, the basics of using a computer well enough so that they in turn can teach others, including students and other locals. During the visit, a meeting was held about responsibilities of the teachers, how to involve the other communities and who should be ambassador for which school, etc. During this meeting, it became evident that involving the community and sensitizing people is crucial to gain their trust. AfriAfya’s model where people teach people and many people have a small responsibility seemed to work very well here and created a self stabilizing organization, giving everyone an incentive to contribute.
Nyakach #2

The CHWs of the Nyakach north location in the lower Nyakach division in the Nyakach district consist of approximately 40 women and 2 men. They are volunteers and each have allotted “villages” where they collect health related information that they write up on a chalkboard back at the resource center, see figure 6.4. An example of the information they collect is how many mothers are going to natal clinics instead of traditional midwives; due to local culture many people still prefer to use traditional midwives instead of natal clinics. This information is later sent to government bodies (usually the ministry of health) to motivate different local health actions, such as sending specific medicines. (CHW group A; CHW group B; CHW group C; AfriAfya B, 2011) If they would be paid, there would be a risk of them doing it for the money instead of for the service. They are currently using pen and paper to perform their work but AfriAfya are working to give them smartphones in the future. (AfriAfya B, 2011) The visit consisted of group discussions with 3 groups of between 4-6 CHWs. During these discussions it became evident that many of the CHWs had skin issues and it was decided that on the following day some test cases would be carried out, using the CHWs as well as others from the local community as patients together with a participating Swedish dermatologist. It was noted that the mobile net coverage was fairly stable in this area of Nyakach. (CHW group A; CHW group B; CHW group C, 2011)
Findings from the discussions

Overall, the CHWs were very positive to the application. There were many caveats but the common consensus was that they needed this service yesterday. Every CHW has approximately 50-80 houses which are their explicit responsibility. The main work for a CHW is at their farm or a small business, which they usually tend to do in the morning before doing their volunteer work. All the CHWs have received primary healthcare training and to increase the communities trust of the CHWs they take a vow of silence and the community patients are designated by numbers instead of names. (ibid.)

It turns out that the CHWs have previously used personal digital assistants, PDAs, for recording research data from questionnaires and for taking their reports to their supervisors. Approximately 20 percent of the CHWs were trained for one full day in the usage of the PDAs. Many of the CHWs did not feel that one day of training was enough for the PDAs and they foresaw that the iDoc24 service would require at least one week of training, preferably from a local organization such as AfriAfya. The CHWs who used the PDAs felt that it made information collection and transfer easier. (Ibid.)

Traveling is a major issue in the rural settings, even going more than a few tens of kilometers is almost unthinkable. Paying for a good doctor on top of that is unaffordable unless the ailment is very severe. The CHWs feel that this service would allow them to tell people if they need to go to a hospital before the affliction becomes a serious (and usually more expensive) health issue. It would be greatly appreciated if the service would encompass all the common ailments and not just the dermatological disorders. Some people truly do not have the resources to go to a hospital and having this service
could provide some basic information which may help them despite their lack of resources. (Ibid.)

The local communities will need to be made aware of what the service does and why. The easiest way is through town hall and church meetings. In the CHWs’ opinions the service will be received well by the community and there will not be any theft of mobile phones. A way to avoid theft is to keep the community invested in the service, which they will implicitly be since they are receiving healthcare through it. The CHWs believe they understand the difference between different types of doctors and easily could convey this to the community to make them see the value of getting specialized advise. (Ibid.)

The CHWs thought that it would be very hard to have people pay or use anything unless they could trust it. The general notion in the community is that people in cities are not as trustworthy as rural people are. Several believed that the service would need to be free, at least initially, until it became obvious to the community that it worked as advertised. Many people would have a hard time seeing the service as a replacement, even partially, to visiting a doctor and would therefore not want to pay sums which equalled the cost of transport to a specialist doctor and the doctor’s fee. A public doctor in a government hospital is free in Kenya but seeing a private doctor costs money. The CHWs also initially believed that the community would have a hard time understanding that the doctor answering their queries would need money. What all of this adds up to is that a low, essentially symbolic, fee was deemed most reasonable. The fee would hinder the villagers to send in anything and everything to the service and may pay for repairs and other necessities the service would require on site. To have them pay more would result in only the most serious cases being brought forward, and the community would need added sensitizing to have the community understand the worth of the service over going to a private hospital. The consensus was thus that the price would need to be either free, meaning an alternative way of making the community have a stake in the service, or less than 100KSh, about $1. Initially, they thought a price of 5-10 KSh would suffice, but when it was mentioned that this service could at least partially replace the transport costs and that the doctors would need to be payed somehow, they increased what they were willing to pay to between 50-100KSh. (Ibid.)

The resource center itself is found in a room with a desk and 3-4 computers, only two of which seemed to be working at the time. This resource center is located in the building that the local CHWs use as their base, which also happened to be the office of the local chief.

The Nyakach case

Eight cases were sent in using the IDEOS at the Nyakach location. At first, it was planned to let the CHWs use the phone and send in the cases themselves but limited experience with smartphones made it not possible, resulting in us sending in the cases ourselves, thereby losing the possibility to evaluate them using the service. Sending of information to the iDoc24 Africa back-end failed twice, causing the application to freeze. It seems as if the problem occurred when the phone switched between 3G and 2G connection, believed to be caused by the poor quality of the phone rather than problems with the connection itself. Other than that, there were few problems. Sending in the cases took about a minute each. The answers however, possibly much due to a bug in the demo version of the service limiting the information getting sent in, were inconclusive, resulting in poor results. The problems here were the quality of the pictures, too little anamnesis as well as the fact that several of the ailments presented
were far beyond the scope of teledermatology, resulting in “GO TO DOCTOR!” answers. When asked how much the test subjects were willing to pay for the service, the answers ranged from 500-2000KSh ~ $5-20. Generally, this number was about a fifth to half of what they thought it would cost to see a specialist. The best way to receive the answer for most of the respondents would be through SMS. Generally, getting the answer within a week was considered acceptable. The importance of sensitizing the community was brought up by several of the respondents.

Kisapuk

Kisapuk is a Maasai village in Kenya near the border of Tanzania, see figure 6.5.

![Kisapuk Primary School](image)

*Figure 6.5: Kisapuk Primary School*

When driving here, after a one hour drive on a small dirt road off the main road, no one, except for some Maasai on foot with their cattle, had been encountered. Suddenly, a concrete school building appeared among a collection of mud hut. What struck us as odd was the solar power panels on the roof of the school building and the huge satellite dish in the schoolyard, see figure 6.6. Except for the donated solar power, there was no electricity in the village and the resource center therefore acted as the main power hub for the village, where everyone could charge their mobile phones, of which there are 40-45 in the village of about 2000 inhabitants. However, due to the polygamous ways of the Maasai, one so called homestead usually inhabits 20 family members, resulting in almost half of the homesteads having access to a mobile phone. Like most of the rural Maasai, most of the villagers keep cattle as a way of making a living. Kisapuk had received much help from the EU in the form of water collection and storage, as well as the solar power. Needless to say, these are among the poorer in Kenya, but thanks to these donations, they are self reliant during draughts. There is no healthcare within an hour’s drive, but about once a week, there is a mobile clinic that
passes by and offers primary healthcare, primarily to children with nutritional problems. (Kisapuk teachers, 2011)

Figure 6.6: The Kisapuk Primary School where one of the AfriAfya resource centers are located

The AfriAfya resource center is located in a donated room in the school building, the only non-mud building in the village. The building was simple but when entering the computer room, it was jammed packed with brand new and modern technology, which the locals could use for a small fee. This included, among others, mobile phone charging, printing, Internet access and, interestingly enough, laminating. The computers and Internet access were however free for students at the school. The resource center had a very slow and unstable connection to the Internet through one USB modem with a wifi signal.

iDoc24 in Kisapuk

Two teachers and the principal of the school were interviewed and they were managing the resource center with AfriAfya. The idea of a service such as iDoc24 available in their village, was received warmly since it is a long transport to see a dermatologist, approximately 3-4 hours directly by car. Besides, no one in the village has a car, so they have to rely on daily non-direct Land Rover Matatus, see figure 6.8. There are many afflictions which they believe that this type of service could help with. For example, scabies and ringworms are quite common, but sometimes there are other afflictions that look like scabies but are in fact something else. In that case, what usually happens is that the affliction is treated for scabies which does not help and when it is finally discovered what the affliction is, which often requires a long transport to the doctor, the affliction has been going on for some time and is harder to treat. Diseases usually spread very fast since people share a lot of the tools and equipment. There is for example only one pair of scissors in the village which is used by everyone and quickly spreads diseases. (Kisapuk teachers, 2011)
When it comes to technology, it seems as if it is highly trusted here and according to the Kisapuk teachers (ibid.), there is no fear of taking pictures for example. Curiosity here is always positive, never negative. However, they still believe that it is necessary to sensitize the people in the advantages of the service; people in the bush like shortcuts, they just need to be aware of them. The most suitable people to carry the phones would be the CHWs and the receptionist at the local dispensary as well as the manager of ICT centers, such as the one in the Kisapuk school. They believe in first offering the service for free to create trust in the community and then start charging for the service. However, fees of more than 100KSh (~$1) would result in only the most severe cases getting reported. Part of this fee should be for maintenance and repairs. Since AfriAfya takes care of much of the reparations for the resource center and provides the Internet, and has done so for the last 4 years, they would be the ideal maintenance and service partner in this case. Training in using the phones would be necessary, and using the AfriAfya model where previously trained people train the next users would be suitable even for this service. They believe that 1-2 days of training would be enough. They would see an increased value in the service if it would be possible to forward the answer to, for example, the local dispensary and send answers to personal mobile phones by way of SMS. However, they do not see a need for translation to local languages, even English would work since there is always someone in the local community that can translate. Many see anyone in a white coat as a doctor, whether it is a nurse or a dermatologists; the increased value of specialized healthcare is thus probably not a good selling point in this community.
6.3 Nairobi Women’s Hospital

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Title</th>
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<tr>
<td>NWH A</td>
<td>Business development manager</td>
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<tr>
<td>NWH B</td>
<td>Head of the pharmacy</td>
</tr>
<tr>
<td>NWH C</td>
<td>General practitioner</td>
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The Nairobi Women’s Hospital, NWH was approached to see if a hospital would be interested in implementing the service in some shape or form. Here, three people were formally interviewed, the business development manager (NWH A), the head of pharmacy (NWH B) and a general practitioner (NWH C). A smaller case study was also conducted where the general practitioner sent in cases to a Swedish dermatologist. Discussions with others also occurred, such as nurses, head of medicine and patients, although not in a formal setting.

6.3.1 Organization

NWH is a chain of three hospitals, see figure 6.8, that are, quite counter-intuitively, not exclusive to women; they accept male patients as well. Besides the hospitals, NWH also runs pharmacies connected to the hospitals. Since NWH is a privately run hospital chain, they need to consider marketing aspects. They target mostly upper and middle class customers, even though they have customers from all classes, and work closely with insurance companies (not many lower class people have insurance in Kenya). Except for conventional marketing, through their website and so on, they also market directly to people by, among others, giving free checkups, going to church and giving speeches about cancer or do mammograms at shopping malls. (NWH A, 2011) By the impression that was given, NWH seems to be a very entrepreneurial organization that knows how to make money and have launched a number of smaller projects related to their main business, such as medical waste collection and incineration.
6.3.3 Medical and usability aspects

NWH C (2011) works as a general practitioner at Nairobi Women’s Hospital and was kind enough to try out the service on her personal Android mobile phone, and sent in a total of five cases during approximately two weeks. The cases were sent in when a patient visited for a dermatologically related issue specifically or when such an issue
was discovered during a different examination. Overall, NWH C found the application easy to use and did not require any training at all to send in cases. Time for sending in a case was approximately one minute if the network was stable. However, the walls in the NWH building were very thick stone and thus coverage was often bad resulting in longer sending times, solved by putting the phone in proximity to windows, etc. The problems with a crashing application experienced with the IDEOS however, was not experienced with NWH C’s phone. Another bug that was discovered after the case study was that the “other information”-field in the application was not functioning. This resulted in much information lost in the cases, which made them hard to answer and thus the responses from Dermatologist B (see below) were often that more information was needed.

According to NWH C (ibid.), people who own a smartphone could probably send in cases themselves, although having a doctor use the service would be preferable, since a doctor knows which information is needed by the dermatologist to give a proper diagnosis. The doctors would not need to receive much, if any training, in NWH C’s opinion, as it is clear which information belongs where on the interface. If used by a doctor, NWH C believes that the service is good, needed and makes sense for middle and lower class people; the rich simply go straight to a dermatologist or use the application themselves. If used by a nurse, they would need training in asking the right questions.

The need for the service exists. NWH C (ibid.) estimates that she finds skin conditions on 10% of her patients, which are generally not the reason they are visiting. However, whether the patients treat the condition depends entirely on the severity of the condition and the patients economic situation. If the location or nature of the skin condition is deemed to be of a shameful nature by the patient, anonymity may be preferable to receive truthful information for diagnosis.

An improvement to the form would be inclusion of tribe and HIV status. Other additional features that were desired were pictures in the dermatological encyclopedia. If given the choice, NWH C would prefer using a web interface on the computer, as opposed to the mobile phone. This would allow for better pictures, but would require an external camera and importing of photos to the computer. Using the service this way instead of using the mobile service would not be a problem however (Ibid.). NWH C does not believe that age or gender would have much of an impact on which patients would be willing to use the service.

Both NWH C and AMREF B (6.1 AMREF, above) felt that bandwidth would be an issue. It should be noted that AMREF B felt that this issue was due to the areas of use being remote while NWH C felt that bandwidth would be an issue within Nairobi (AMREF B; NWH C, 2011). In the NWH case, there was a fast wireless Internet connection available in some parts of the hospital but it was not available in the examination rooms at the time of the study. However, fast Internet connection is available at the hospital and an additional wireless router should solve the connectivity problem.

After the cases, the test subjects answered a few questions, see appendix 1. These were either in the form of a short interview or a questionnaire if interviews were not possible. The answers from the questionnaires were somewhat short but the results were nonetheless that the test subjects felt comfortable using the service, however, they all responded that they would try to get a second opinion from another doctor or dermatologist. The need for personal history as required additional information was reported. To see a dermatologist for their issue would cost them about 3,000-3,500KSh ~ $30-35, and a suggested suitable cost for the service would be around 200-500KSh ~
When asked about the best way to convey the answer from the dermatologist, e-mail was preferred.

6.4 Dermatologists

During the study several dermatologists were consulted for their opinions about the service.

<table>
<thead>
<tr>
<th>Interviewee</th>
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<tr>
<td>Dermatologist A</td>
<td>Swedish dermatologist answering iDoc24 cases</td>
</tr>
<tr>
<td>Dermatologist B</td>
<td>Swedish dermatologist specialized on tropical diseases</td>
</tr>
<tr>
<td>Dermatologist C</td>
<td>Three Tanzanian dermatologists</td>
</tr>
<tr>
<td>Dermatologist D</td>
<td>Kenyan dermatologist, answered cases from Nyakach</td>
</tr>
<tr>
<td>Dermatologist E</td>
<td>Kenyan dermatologist</td>
</tr>
<tr>
<td>Dermatologist F</td>
<td>Kenyan dermatologist</td>
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6.4.1 Swedish dermatologists

Dermatologist A (2011) is a Swedish dermatologist who has been involved in iDoc24 for about a year and has answered approximately 100 cases. According to him, the service and the setup of having dermatology consultants answer cases works well. However, he feels that if the service scales up, there is an issue of finding dermatologists that are interested in working this way and that are competent to do so. Working like this more than a few hours a day would probably not be sustainable in the long run. The biggest problem as he sees it is that the picture is given much credence while the complementary information is insufficient. Because it is a very different way of working with dermatology, compared to seeing patients in person, probably not all dermatologists would feel comfortable working this way. Since the anamnesis is often limited and insufficient, it is often not possible to diagnose the case properly, thus the dermatologist must be comfortable giving imprecise advice rather than making an exact diagnosis based on all possible data. He says that forcing the user to enter information in all text fields should be added. The most common missing information is the duration of the affliction. He makes an analogy between doctors and journalists saying that both jobs contain digging for information. Often patients have the notion of doctors being capable of making a diagnosis just by showing the affliction, which is not the case; the anamnesis is crucial. Optimally, the application should have this journalistic feature built in somehow. He estimates that half of the pictures are parsimonious and one-fifth of the pictures have deficient quality. Mainly, the problem is that they are out of focus. If this is due to wrong focus or bad lighting is hard to tell though. However, it is definitely the ability to focus well, rather than having high resolution that makes for a good picture in this case. Since many use this service for sensitive afflictions, they often take the picture themselves and it may sometimes be hard to get a good picture in that situation. He has had some experience with patients with dark skin and is of the opinion that even though some might be more experienced with dark skin, it is generally harder to diagnose and requires more analysis since the colors of the skin do not vary as much as those of lighter skin. The anamnesis therefore becomes even more important when
diagnosing patients with dark skin. Generally, it takes about 2-3 minutes to answer each iDoc24 case. Due to the limited information, you either know or do not, there is not much to think about. When it comes to the back-end, he thinks the interface is easy and works well. He has not used all features available, such as entering new standard answers and he feels that a short training would be beneficial, especially for dermatologists that are not as used to using computers. Technical features that are sought after are magnification of the pictures as well as a mobile interface so that it would be possible to answer the cases on the go.

Dermatologist B (2011) works for Karolinska Institutet in Stockholm as a dermatologist. She has a specialization within tropical diseases and helped with answering the cases the authors submitted during the study. She has worked in several African countries and believes that the iDoc24 service could work internationally in much the same way as in Sweden. The middle class in Kenya may be open to the service but implementing it to Kenyans in rural locations will be much harder, if not impossible. It would also be hard to implement the service somewhere without medically trained personnel to handle the service, to make sure proper information is provided in the submission to the dermatologists. Even having CHWs, whom receive basic medical training, may not be sufficient to make a proper diagnosis. She found it very hard to make a diagnosis due to the poor picture quality, the lack of anamnesis and the fact that the dark skin makes the tint between a problem area and a healthy area harder to distinguish. A possible solution would be to allow for correspondence between health worker or patient and the dermatologist, but she does not feel this is a good solution as it would be hard for the doctor to call it an advisory service as opposed to a diagnostic service. The implementation of correspondence to the service would make it more like the regular work a dermatologist does, where they ask the patient questions and inspect different areas of their body. To be able to give a better answer she would also like for previous treatments and more specific questions about how the affliction originated to become standard information sent to the dermatologist. The danger exists in becoming an actual doctor for the people using the service as opposed to a highly qualified superguess; the difference is significant.

In Dermatologists B’s opinion it is very important that the dermatologist has qualified local knowledge of diseases, infections, insect bites and the like. An important aspect for those dermatologists to keep in mind is that the patients are very different from in Sweden, in Kenya the affliction has usually progressed much further than it would have in Sweden among other things. In summation she believes that the service would have a hard time in rural Kenya but that it may be marketable to middle class urban Kenya.

6.4.2 Tanzanian dermatologists

The Regional Dermatological Training Center (RDTC) is a training center for dermatologists which is located in the Kilimanjaro Christian Medical Center in Tanzania. Here, three dermatologists (denoted Dermatologist C here) were group interviewed. Since the year 2000 they have trained approximately 11 dermatologists, which is a master degree after 4 years of study. They also train clinical officers (3 years basic medical training) in dermatology for 2 added years at the RDTC. The doctors at the RDTC have had previous experience with similar technology in the shape of a learning platform, see 3.4. This platform was not a success due to shortages of electricity and not enough user participation. They still use teledermatology with regular emails where previous students, as well as other dermatologists, sends in pictures and
then usually consults with more experienced dermatologists at RDTC by phone, making a dialogue possible between dermatologists, something that the dermatologists at RDTC see as very important, and maybe even essential when using teledermatology. Their opinion was that only dermatologists spoke the correct “language” to be able to describe an affliction in a satisfactory way. In fact, they felt that a nurse or general practitioner would not be able to provide satisfactory information to the dermatologist answering the questions. (Dermatologist C, 2011)

The Dermatologist C (ibid.) group felt it was very hard to draw the line between an advisory (the iDoc24 service is an advisory service) and a diagnostic treatment, despite one being in person and the other by a technological medium. Africans have more pressing issues than their skin, and will always give them priority if they do not hinder their survival in some way. There are less than 10 dermatologists in Tanzania, which means there is approximately 1 dermatologist per 4 million people. This means they are extremely overworked, and using time, which could have been spent treating patients, to give advice seems like a waste, putting high requirements of the efficiency of the service. To them, the focus is on how they can properly help as many people as possible during the time available. At the moment, a large part of the Tanzanian population are either unaware of their need of a dermatologist or they do not have the monetary resources to pay for a visit. The dermatologists at the RDTC do not view this service as a way of solving this issue.

The dermatologists at the RDTC must build up the patient’s trust in them. When the patient first arrives there is little trust until the treatment begins to work. The dermatologists believe building patient trust through a mobile phone would be very hard. To make things worse, they believe that a patient who goes to a healthcare worker in the field would loose trust if they send the query to another doctor. Different tribes have different relationships with new technology, which may need to be taken into account for an eventual pilot. (ibid.)

6.4.3 Kenyan dermatologist

During the study three Kenyan dermatologists were interviewed. They all run private clinics in Nairobi but caters to different target groups. Generally, these dermatologist were very busy and therefore there was limited time for each interview. However, the main concerns were picture quality, money and connectivity (Dermatologists D, 2011). As far as training goes, they did not believe they would need any extensive training to be able to use the back-end of the service since both the dermatologists as well as other staff in the clinic were computer literate. However, some concerns about legal aspects when it comes to working with a Swedish company came up. Registering the company in Kenya was suggested. (Dermatologists E, 2011) Dermatologist F (2011) gave second opinions on most of the cases sent in during the case studies. Worth noticing is that he did not use the web interface to do this since it does not currently allow second opinions in an easy way. Each case was therefore compiled to a PDF document, containing both pictures and text. Here, most of the “other information” field information was also showed which made it possible to give better advice in many of the cases which had received an unclear answer, due to lack of information, at the initial submission. Only a few could not be resolved after this, either due to bad picture quality or lack of anamnesis. The PDFs were later showed to Dermatologist B again and she agreed with Dermatologist F in most of the cases.
6.4.4 Compensation

In general, the Kenyan doctors’ price estimations per case were quite varied. They were generally open to variable pricing depending on who the patient was. Thus, a comparatively low price would be possible for rural cases while upscale cases, for example sent in by locals who owned a smartphone themselves and lived in Nairobi, would pay significantly more. The price estimations given were: 1500 KSh ~$15 per case for locals, 5000 KSh ~$50 per case, between 2-5000 KSh ~$20-50 per case and finally between 1-1500 KSh ~$10-15 per case. (AMREF B, Dermatologist D, Dermatologist E, Dermatologist F, 2011). Compared to the Swedish dermatologists interviewed, <100 SEK ~<$15, these estimations were quite high.

AMREF B (2011) felt that marginalized people should not pay more money than they already pay for the initial visit at the doctor, even if the doctor uses the service to ask another doctor for advice. However, if they go to a dispensary they should probably pay for the service. People in Africa have come to expect things for free, thus the issue of awareness is very important in his opinion. According to Dermatologist A (2011), the compensation for this type of work would probably need to be higher than that of the regular per hour rate for a dermatologists, otherwise there is not much incentive other than curiousness to attract new consultants. Since probably not all of the dermatologist would feel comfortable working this way either, the number of consultants available is smaller, boosting up the necessary compensation.
7 Discussion

In this chapter, the analysis from the findings is presented, and has been structured according to the theories presented in chapter 5. The results have been divided into three main blocks: implementation, focusing on getting initial traction on the Kenyan market and overcoming the initial obstacles, and adapting the technology to the needs in Kenya etc.; scaling up, focusing on the more distant future, looking at what is important in the long run to get a sustainable service; finally ethics, discussing ethical aspects encountered during the study.

7.1 PACT Analysis

The general situation regarding iDoc24 in Kenya was analyzed using PACT.

7.1.1 People

The test subjects involved in this study range from middle class technology users to the marginalized rural users with a very rudimentary understanding and experience of technology. For this analysis we are splitting them into three fairly homogeneous subgroups: The rich-urban Kenyan, where rich includes the middle class as well; the rural Kenyan; and the poor-urban Kenyan who lives in the slum. Our experience is mostly with the rich-urban and the rural Kenyan, and thus we will discuss them with more detail than the poor-urban Kenyan. The rural Kenyan lacks technological knowledge but has the option of receiving technology thanks to foreign aid. The rich-urban Kenyan has knowledge of technology and may have enough money to buy some technologies for herself. The poor-urban Kenyan lives in, or in proximity, to a city and has some knowledge of technology but no money to buy it, and certainly no means of buying a smartphone. Their physical characteristics were very similar. Most importantly, from a dermatological point of view, was that they had dark skin, which affects how some skin conditions will appear to a dermatologist. Seen from these perspectives it can be concluded that the different homogeneous groups would probably require different versions of the iDoc24 service.

7.1.2 Activities

The iDoc24 service would play essentially the same role for the rich-urban Kenyan as it does in Sweden, acting as an advisory service for people with money and technology. The role would have to be significantly redefined for the rural Kenyan and for the poor-urban Kenyan, where it would become a method of primary dermatological healthcare. The rural Kenyan is constrained due to the transport to proper healthcare while the poor-urban Kenyan is not, meaning that the service would be different between these two groups as well. Taken to the extreme, one might hypothesize that the service could still be needed for the rural Kenyan while it would be superfluous to the poor-urban Kenyan. Filling these different roles would require a different approach from how iDoc24 has worked earlier. The change would require significant development on the service and its business model, where cooperation with local organizations may be beneficial.

7.1.3 Context

The rural areas of Kenya are less adapted to varying climate conditions and the people there are more susceptible to overexposing themselves to the sun. There is not
always lighting available which could affect the quality of the pictures. The need of lighting when taking a picture may lead to many pictures being taken outside, in the sun, which raises a slew of privacy concerns. Maintenance of the technology required to send pictures and text is a lot easier in an urban setting than in a rural setting.

7.1.4 Technology

A civilian user will generally provide less relevant information in their submission than a user with basic medical training. It is also reasonable to believe that a civilian rich-urban Kenyan will have a higher quality submission than a rural Kenyan. The importance of proper training to make the submissions more likely to receive proper responses is therefore a necessity for rural Kenyans. Training should ideally be carried out by someone who is on-location, such as AfriAfya. AfriAfya can offer a training program which is proven in the rural Kenyan settings with other technologies. We believe that partnering with organizations who are already active in the same context, and use similar technologies to the iDoc24 service, is the smartest approach to implementing the service through organizations.

Maintaining technologies in Kenya is a very substantial issue. Maintenance in urban Kenya is significantly easier (access to technicians, replacement parts, electricity, etc.) than in rural Kenya. If, for example, a person working in a rural medical dispensary was given a mobile phone to use the service, it would be very hard to assure that it would remain functional, and without proper training and security issues that it would be used correctly or remain at all.

The service would probably need to undergo some technical changes to work in Kenya. Most of the changes are for the rural Kenyan setting, while the rest of them are due to having a central person collect several cases for other people, such as in an urban hospital. One of these technical changes would be to collect and batch send several cases to the dermatologists back-end. Network connection in Kenya is surprisingly stable but in the more remote areas it can be unstable (and that goes for the electricity as well).

7.2 Initial Implementation

This section analyses the initial implementation phase, mostly based on the theory described in subchapter 5.3.

7.2.1 Innovation

The innovation, iDoc24, has numerous factors that adds to its credibility. It stems from medical research at a very respectable medical institution in Sweden and is used frequently for research purposes. Furthermore, the iDoc24 advisory board contains many esteemed members within dermatology. The service delivers easy and fast results and is easy to demonstrate, since there is no geographical barrier. The lack of geographical barriers makes it possible to access the back-end with any Internet connected computer, while the front-end can be installed on almost any smartphone. When showing the service to people, it was easy, even for computer illiterate, to understand the purpose and advantages of the service. The acceptance of long delays between sending in a case and getting an answer was high, especially in the rural areas. In the city, acceptance of delays was slightly lower. Still this acceptance was far beyond the iDoc24 goal of answering within 24 hours.
There is definitely a need for dermatological medical care in the locations where this study was carried out. However, the dermatological needs were often suppressed by other medical needs, due to large costs, especially in rural areas. Here iDoc24 could possibly play an important role, such as distinguishing between common afflictions such as scabies, which usually has designated drugs in the local dispensary, and other afflictions with similar symptoms. Many of the medical issues that surfaced during the study were way beyond the scope of iDoc24. These serious ailments might have been discovered at an earlier stage, had the iDoc24 service been available. Nonetheless, several dermatologists were skeptical whether less educated Kenyans would be capable of providing the necessary anamnesis. If the service uses an intermediary with medical skills, such as a community health worker, nurse or a GP, it changes from being an advisory service to becoming a diagnostic tool, which it is not built for and may not be sufficient for. There are, to our understanding, no other similar services available on the market in Kenya and the main alternatives to getting dermatological advice or medical care are through the usual healthcare channels, such as dispensaries, clinics, primary hospitals, etc. Therefore, if there would be an organizational and technical setup so that the service would function sufficiently and be made available at an affordable price, it would definitely have an advantage over the existing possibilities.

When looking at how the service would be implemented technically, setting up the phones or computers with the service is simple for any tech person, making it possible to outsource most of the support and maintenance to the user organization. One of the main problems when looking at the mobile interface, is that the rural population has limited experience with touch screens. This makes it hard to understand and interact with the service for this target group without extensive training; this was evident when visiting the CHWs in Nyakach. When used by someone with touchscreen experience, such as NWH C, none or limited training seems to be necessary, due to the intuitiveness of the application. Since the web interface of the iDoc24 service was not tested during the study, not much can be said about how well this would function. However, if launched within an organization such as AfriAfya, where many people receive training in computer usage and the basics of the Internet the web interface may be a more suitable solution in this specific case; since a regular digital camera could be used instead of a mobile phone, which would most likely result in a better picture. Generally, using existing technology would most likely result in an economically feasible solution. Due to the nature of the service, it is very easily testable without the user having to adopt to the service completely in any way, be it economically or organizationally. This goes both for the mobile as well as the web version of the service.

Except for the usability difficulties due to lack of mobile touchscreen experience and the likely shortcomings when it comes to providing satisfactory anamnesis, few compatibility problems were encountered. Some people were initially skeptical when approached with the service, but soon accepted the service and agreed to participate. Most of the approached were very interested and when the purpose of the service was explained, many instantly wanted to test it. Taking a photo of the test subjects was not an issue, no matter the medical problem. It is worth mentioning that there were no cases where the medical issue was located in a private area, thus no conclusion about reluctance to taking pictures of private areas can be drawn from this study.

7.2.2 Resource team

The leadership of iDoc24 (Dr. Alexander Börve) is located in Sweden. If the leadership were located in Kenya the situation would, obviously, be substantially...
different. It is simply harder to implement services and build partnerships when geographical, cultural and political barriers exist. The iDoc24 service lacks a unifying vision for Kenya and is actively trying to find its place in different segments of the market. Dermatologist B and Börve have experience within Africa but Dermatologist B feels that the service would be hard to implement in rural Kenya. By sending students to Kenya, iDoc24 is trying to understand the political, social and cultural environments to some extent, which should help with an eventual implementation and scaling strategy being formed. We feel that this lack of a unifying vision may be a good thing at this stage, since it would be bad business to decide on a set vision before investigating the situation in Kenya thoroughly. However, once the decision is made to implement the service a unifying vision is essential, which can also be related to what Toyama (2011) has expressed regarding non contradictory goals. It is our belief that iDoc24 alone may have problems financing the resources which are needed to have a proper implementation and scaling in a developing country. Either a partnering user organization would need to procure financing somehow, or the implementation must require very few resources, or in some other way be funded by a donor organization. It is hard to say if iDoc24 will be able to allocate the relevant technical and management skills to train the user organization in Kenya. If, and this is a big if, the implementation in urban or rural Kenya can provide significant return on investment to iDoc24, we find it likely that someone with relevant skills should be able to launch the service successfully with a strong partnership with the user organization.

7.2.3 User organization

All the approached user organizations saw a need for the service within their activities and was exited about the opportunities it presented. Implementing this service however, would require mobile phones and training to be done by a local organization. The CHWs or other representatives would also need to sensitize the community as to what they are doing, so the community does not get skeptical. Issuing the phones to for example the CHWs may cause the community to think that the CHWs are making money and have ulterior motives for their actions.

As described earlier, one of the main reason for this initiative was the widespread use of mobile phones in Kenya. However, even though smartphones are starting to get traction in Kenya, only the rich-urban Kenyans can afford them currently. Therefore, when it comes to timing, launching the iDoc24 service now definitely faces the challenge of overcoming the “smartphone illiteracy”, while if it waited a few years or so, it might not have to deal with that problem, at least not to such a large extent. This does not mean that iDoc24 should give up on Africa. There is much to learn from carrying out pilots and the service could certainly be implemented within certain organizations where the technology is already present.

Fees and responsibilities are definitely issues that need to be studied in detail to figure out the best way to have local communities not abuse the service, and have the resources to run it effectively. Could they have the service for free and simply use some sort of controlled honor system where they would “check-out” the phones, and then check them back into a responsible party? How would this hinder the use of the phone by the locals for every scratch on their bodies? Perhaps their culture would prohibit this in some way? Having the community be proud and vested in the service seems to be of utmost importance, but nonetheless if it is to be used in such a poor rural setting, large amounts of help in budget and training will be needed, which is why having an organization such as AfriAfya participate with a local presence is pivotal. Theft in the
rural places visited during the study seems to be very low since the villages are closed
groups and outsiders are easily recognized. They also know that the technology serves
the whole community.

7.2.4 About dermatologist costs

It is difficult to draw any statistical conclusions about how much a dermatologist
would need to be payed for answering cases. This is obviously not their usual modus
operandus, and should not be treated as such. The compensation per case for the
Kenyan dermatologists thus needs to be evaluated further. During several of the
interviews, there was not time to show the dermatologist every aspect of the service and
they did not have a chance of working with the service themselves. There was no
negotiation at the time and therefore it is natural to believe that the initial compensation
rates put forward by the dermatologists are somewhat above what they would be willing
to settle for. Regardless, a conclusion can be drawn; the per minute compensation most
likely needs to be higher than that of a regular dermatologist salary (which varies a lot
depending on the type of dermatologist) to give the incentive to work this way,
especially since not all dermatologist might be suitable or willing to work like this,
making the supply of dermatologist smaller which increases the rate. It’s also evident
that at least the initial rate was higher in Kenya than in Sweden, possibly due to the lack
of dermatologist in Kenya. If it is assumed that the patient pays (as opposed to being
subsidized by an aid organization for example) for the iDoc24 service and the
dermatologist, then only severe cases will get sent in. Only cases that are locally
treatable should be sent in, since the rest of them will result in a “GO TO THE
DOCTOR” response, which is what the patient should have done in the first place.
Getting only “GO TO DOCTOR” responses for serious ailments would undermine the
services credibility. Thus it is very important for patients to be informed of and
understand the proper use of the service.

7.2.5 Aims and Objectives Resolved

Before we set out to Kenya it was decided to check some basic factors to give a
quantifiable statistic of how suitable the Kenyan market was for the iDoc24 service.

- To test the quality of image capture (resolution, etc.) with a sample mobile
  phone.
  - The image quality could use improvement, but was suitable for simpler
    advice to be given. It is recommended to have a better camera than the
    IDEOS. If using a computer interface instead of a mobile interface, a
    regular digital camera is preferable
- To test the reliability of the transmission of pictures and text to the server from
different locations, some rural, in Kenya.
  - Sending of pictures to the back-end worked slowly and was only needed
    to be repeated twice. This issue has since been fixed by iDoc24.
- To assess the basic receptiveness of patients to the use of technology and image
capture.
  - The patients were very open towards the service after it was explained to
    them. We do not foresee any problems with this as long as there is a
    credible local presence.
• To ascertain which ICT mediums are available for receiving health messages from doctors.
  ○ The responses would be sent to the patients by mobile phones or computers without too many issues, depending on where the service is implemented. Generally, SMS seems to be the most suitable medium.

• To assess patient preference as to the content of the queries. What they are comfortable disclosing, as opposed to what the doctors need to know?
  ○ Rural Kenyan patients were comfortable disclosing everything. The problem is rather that they do not know what to disclose. Urban Kenyan patients were more candid, but they would also potentially perform the service on themselves which may negate this.

• To assess which types of participating organizations are compatible with the service.
  ○ Aid organizations that are focused on either healthcare or technology are likely to be suitable partners. We highly recommend a continued dialogue with AfriAfya.

### 7.3 Scaling up

Since the service is still in its infancy in Sweden after some time now, and fast spontaneous diffusion has not occurred here, it is not likely that it will occur in Kenya either. At least not initially if following scenario 1 - the Swedish model. It is however not likely if following scenario 2 or 3 either since the hardware and necessary training is not present. Since the service would no longer be an advisory service alone, but have a whole new role as established above, it might not even be preferable to a slower guided upscaling process. If it would be spontaneous, infancy defects might be hard to get rid of, possibly resulting in a nonfunctional system. There is an obvious horizontal upscaling when bringing the service to Kenya but the service definitely needs to be diversified as well, having more functions added to function well in Kenya, not only technically but organizationally as well. By forging strong partnerships with already established and recognized local organizations and design with the end user in mind, it is possible to have a diversified and vertical upscaling simultaneously, adding features as they are needed by the end users.

During this study it has become evident that if the service is to be launched within an organization, training of the people handling the phone definitely needs to take place. Due to costs of transporting people to a central training facility, the most practical way is probably for one or several trainers to go out to the different sites and perform workshops onsite. This way, the users will feel more comfortable, and the problems that might occur onsite becomes more evident.

A multiplicative strategy is reasonably necessary for implementation of iDoc24 in Kenya. An additive strategy would require very large resources from iDoc24 to build up the knowledge base and the social capacity to launch the service even on a small scale. However, when partnering up for a multiplicative strategy, it is important to see that the partnering organization has the same values and expectations. A decentralized approach, such as partnering up with AfriAfya for initial pilots, would make it possible to get in contact and develop the service gradually with the end user in mind and get a service that really answers to the needs of the local communities. After such an initial pilot and
the service has been verified to work and procedures for training, maintenance and support has been established, it will be easier to establish if it is worth scaling up. In that case, a more centralized and rapid implementation approach could be sought after, such as through the health ministries. The partnering organization during the initial pilot should probably be a fairly small organization. In that case, it is more likely that they have more at stake, thus investing more heavily in the partnership. In this case, since iDoc24 and the user organization are small companies, they are more flexible and can adapt their working methods to complement one another.

Financial resources will be required to access the Kenyan market. Kenya is geographically very separate from Sweden and iDoc24’s presence there is essentially nonexistent. Possibly more significant than accessing the market is scaling in said market; truly existing there in a significant way requires even more financial resources. It is possible to share this burden local cooperative organizations and possibly even branches of government. In our opinion it would be very hard for iDoc24 to scale in Kenya without local influence and cooperation, from for example AfriAfya, AMREF or the Kenyan ministry of health.

It is hard to say how iDoc24 should practically attempt scaling up in Kenya, as well as if they should attempt it at all. Initially an evaluation of the Kenyan market should be performed to establish if it is suitable for the iDoc24 service. The work we and the two previous students performed with iDoc24 in Kenya can be said to be a first step in this process. The results of our evaluation point clearly towards that local cooperation and presence (of either dedicated people within the resource team or of an iDoc24 employee) is all but required for the venture to be successful. We definitely agree with Fajans et al. about letting the resource team take part in positive results to motivate their work. Motivating the resource team is especially important in this case due to the lack of a local iDoc24 presence.

One should not consider only constraints when attempting to enter a new market. There may be several boons in the form of new opportunities for funding, less tax and in development countries the possibility of tapping into foreign aid funding. The obvious reason for entering the Kenyan market is of course gaining access to more patients, but the economics of running a service must not be forgotten. Although we have not studied the health system in Kenya in detail, it is obvious that the iDoc24 service has great potential to help, health wise. Also, there is much foreign aid available to be placed into healthcare services which could possibly be tapped into. Having a resource team localized in Kenya will be absolutely vital to succeed in identifying local opportunities and evaluating constraints. In the end, a decision must be made whether an implementation followed by potential scaling of the service should be undertaken and how it should be carried out. Unfortunately, we believe that only urban Kenya holds enough potential in the initial stages, unless financial aid is procured in some manner.

7.4 Ethical Aspects

During the study several ethical issues were encountered. The first ethical issue was whether it is possible to help the poor and get rich at the same time. According to Toyama, this is a very difficult thing to do. The problem lies in focusing on two goals at the same time, especially if the goals are contradictory as they often are. In Kenya, the solution might be to try to separate the goals so that they cannot be contradictory but synergistic.

Before leaving Sweden, one issue that arose was the possible misuse of phones. For example, if the CWHs through AfriAfya or some donor would get one or several
phones and the iDoc24 service made available to them, including airtime, would they make private calls or use the phones in ways which were not agreed upon? When asking Dermatologist C this question, we got a very interesting response. If a gadget can do something that people need, then why have it lying in a drawer and only be useful 5% of the time; would that not be misuse of the phone? The answer to this has to be yes. If people want to use the phone, then let them. The more they use it, the more they learn. If a new piece of technology is introduced to a community that has numerous possibilities, it would be stupid to restrict people from using it to their advantage and learn about the platform. Obviously, the airtime needs to be restricted if it is not an unlimited data plan and the conditions for the phones use must be clear. The point is that using the phone exclusively for the iDoc24 service would be a waste. A system for restricting airtime has to be established during the implementation phase. However, this should not restrict the use of the phone more than necessary.

A final ethical issue worth addressing is the expectations of the service. Since the scarcity of medical care is great, the poor will be very interested in every possibility made available to them. Once the role of the iDoc24 service in rural Kenya is identified, it is important to highlight this and stress that this is not, and will not be, a 100% substitute to a real doctor or dermatologist. Also, if a pilot is performed in Kenya it should definitely be completely transparent to the rural Kenyans. If the rural Kenyans believe they will definitely receive and continue to use the service being piloted, they will be distraught if this is not the outcome. Put simply, there are potential cruel pitfalls involved with providing a community with a service which is significantly better than what they are currently accustomed to and then removing it from them.
8 Conclusions and Recommendations

In this chapter the questions which constitute the purpose of the study (found in 1.1) are answered with relation to the results of the study.

Question 1, technical barriers: The technical barriers which hinder an implementation in Kenya are not as numerous as might have been expected. The mobile network is already “good enough” for an implementation and while smartphone usage is low in rural Kenya it is surprisingly high, and definitely on the rise, in urban Kenya. Also, computer usage is high enough among doctors to support their use of the iDoc24 back-end. By piggybacking on existing technological implementations such as ICT centric resource centers, with established procedures for maintenance and training, we do not see any technical barriers in Kenya that are insurmountable.

Question 2, changes to the service: We believe the most important technical changes to the service are (i) to store several cases while offline and make batch sending of cases possible. (ii) To support local modes of payment, such as M-PESA as well as a system for handling subscription payments (which would include a system for sending in pictures without paying that prevents abuse). (iii) Although not a strictly technical change to the actual service, the creation of documentation to facilitate training in the use of the service (with possible basics of using a touch screen included) would be a very good idea. The service is already easy enough to use but facilitating training and proper use would improve it greatly. All in all, the technical shortcomings are few and surmountable, the challenges lie in the organizational and financial. An added feature which would be very beneficial to rural CHWs would be to allow basic statistics to be collected on the phone, this could also be solved with a separate application.

Question 3, implementation and scaling: Depending on available resources, a good first step would be to implement the service within one organization, for example AfriAfya, for a longer pilot. During this pilot, it would be possible to discover and correct more technical bugs and flaws in the service as well as to come up with a good system for maintenance, support, training model and evaluate the dermatologists answering the cases. It would probably be enough to do this for 3-4 months, during which time enough information could be collected. After this, an implementation model should be established, describing which methods could be standardized when implementing into different organizations and which needs to be customized to each organization. This model should also include how maintenance and service should be taken care of. The possibilities of having one central service and maintenance provider for Kenya/East Africa compared to if each organization should take care of it themselves, should be evaluated further. This study shows that AfriAfya might be a suitable such organization but there may of course be others and a wider search is recommended before implementation.

It is interesting to consider the fact that this service could help people in rural areas of Kenya. To do so it would need to go through a radical metamorphosis. The point of the service is to help people who are wondering about basic skin conditions. Since the rural Kenyans do not have any, or very little, medical treatment available, their problems will be far too serious for a teledermatological service to properly address. This gives the interesting situation where to improve their healthcare with the iDoc24 service they would first need to improve their healthcare in a more general sense. This relates to Toyama’s argument that if you really want to help, the most suitable solution might not be technical. It was pointed out by Dermatologist B that the service might not be suitable in a place where not even the most basic primary care exists, resulting in high expectations and wrong usage of the service.
We completely agree with Toyama’s opinion that if you want to help someone with your company you are probably better off implementing a service somewhere where it will be financially more lucrative, and then sending a doctor (even if you are an IT company) or educator to the marginalized. If the corporation wants to help someone, their business idea even if it is in healthcare as in this case, may not be suitable, and simply focusing on profit might be what helps the marginalized the most.

To get the synergy effects discussed in 7.3 it might be preferable to launch to both the poor and the rich simultaneously. By launching to the middle and upper class according to scenario 1 - the Swedish model and to the poor according to scenario 2 or 3, it is possible to keep them separate. In this case, the first scenario (scenario 1) target population could pay for themselves according to market prices and make for a profitable business, expanding in its own pace, while in the second and third scenario (scenario 2 and 3) the target group could get subsidized fees and would probably expand slower, or not at all. This, however, requires donor funding. The non-profitable business can therefore act as a kind of R&D subsidiary of the profitable one. This way, they both benefit from each other. The less-profitable business brings experience and knowledge about how the service needs to change to be able to be profitable in other markets, letting the profitable business grow as the dominance of smartphones and better education increases. This is facilitated by the previous evaluation of the pitfalls and possibilities already inherent in the Kenyan market. By having the profitable business, the less-profitable business gets more recognition, making it easier to attract more donors and adds to the credibility and sustainability of the service.

8.1 Future work suggestions

- Use of technologies in rural developing settings, especially when introduced to technology which far surpasses the technologies currently in use.
- Since this study did not include any test of implementing the iDoc24 service according to scenario 1 - the Swedish model, this needs to be looked into. This especially includes marketing and maintenance aspects as well as possible local software development.
- Legal aspects of the service need to be investigated since this has not been covered at all in this study. The same goes for patents, marketing and branding issues.
- What risk of misuse exists for implemented technologies in a developing setting. How will they use it and what tactics can be employed to enforce proper use?
- Will advice work as a diagnosis when primary healthcare is unavailable?
- Which responsibilities exists for the health worker using a teledermatological service in their work?
- Ethical implications surrounding technology based healthcare in the developing world. This research proposal is vaguely defined due to many different areas being available for research.
- How do you distinguish which local actors are most applicable to implementing services and technologies into the local context?
- From various sources, specifically AMREF, it was concluded that Kenyans do not care about dermatological afflictions that do not hinder their work. A study that checks if a dermatological service would be relevant in Kenya at this point in time at all may be a good idea.
9 Final Reflections

When performing field studies in a developing country, it is hard to be as effective as when it is being performed in a developed country. Good infrastructure, the absence of bribes and just higher efficiency overall, speeds up the process of contacting and establishing meetings, etc. Cultural issues, such as time keeping is also a major difference when planning and performing a field study abroad. For this reason, the feeling that more could have been done has always been present: interviewed more doctors, more patients, more government officials or sent in more cases, etc. Scientifically, the study has become less specialized on the interaction of developing countries with technology and more focused on the social conditions of the interaction and more specifically how to implement technologies in a developing country. For example, it has not been possible to have consistent enough data to triangulate any ironclad statistical findings from. This does not mean that it is worthless, far from it, but it is hard to verify the accuracy of the findings. On the other hand, this is a very hands on study, with the purpose of finding a feasible way of implementing technologies in the context of the developing world. Here, several approaches exist, which were evaluated in the beginning of the study. Either an even broader study could have been undertaken encompassing more aspects, such as launching the service within the public healthcare system or directly to the market in the same way as in Sweden. In this case however, it might have resulted in even less accurate results and might have been hard to funnel down to concrete results. Another scenario could have been to focus solely on one organization, such as AfriAfya in this case, and do several case studies, interviewed more people within that organization and established a more detailed implementation plan, resulting in more accurate results. The big risk with this approach, and the reason that our approach was chosen, was that if the chosen organization was deemed not suitable to serve as a local partner, did not have resources enough for a more in-depth study, or in some way were hard to cooperate with, it might have jeopardized the whole study, or given a precise result for the particular case but had not said anything about other organizations. The way the study was conducted was thus, even retrospectively, considered to be the best method.

In retrospect however, some aspects of the study could of course have been done differently. Mainly it would have been interesting to get more information from the dermatologists and have several dermatologists try out the web interface. During this study, the interviews with the African dermatologists were very brief due to limited time. In most cases we were invited during business hours, came into a waiting room filled with patients, had to wait for a while but still got to pass all the waiting patients to see the dermatologist. In a situation like this, when there are 15 people waiting for the doctor, it is just not appropriate to take up an hour of his or her time, even if that would be the optimal amount of time to go through all aspects. In retrospect, it would also have been interesting to have the CHWs receive a few days of training in smartphone usage prior to the case study in Nyakach making a deeper analysis possible of issues of using the phone by rural people.

Concerning information gathering using questionnaires, interviews, group discussions we would recommend group discussions and interviews over questionnaires. The answers given in Kenya tended to be very short and biased towards what the person being interviewed thought we wanted to hear. This behavior can be rectified in an interview, but not in a questionnaire. Overall the group discussions were the most consistent source of information, although in depth interviews were very useful if the person being interviewed had equal or greater social stature to the interviewers.
When performing field studies in Kenya (and probably the situation is similar for other developing countries) one must sometimes move outside of the preferred methods of information collection to be able to collect any information at all.
10 References

10.1 Published sources


### 10.2 Unpublished sources


Toyama, K., 2011a. “Wireless Wednesday” at the mLab, Nairobi 2011-08-17, http://www.youtube.com/watch?v=POKZ5a6i40M.


10.3 Interviews

Authors note: If any of these names are in the wrong order or misspelled it is unintentional, and we apologize for this; East African names are tricky for Swedes. Interviews are performed as personal interviews unless explicitly stated otherwise. Per requests, most interviewees are anonymous, supplanting their real name is a descriptive coded name.

AfriAfya A; Field-ICT officer, AfriAfya. Nyakach & Nairobi (2011-09-Several occasions)

AfriAfya B; Head of the knowledge management unit, AfriAfya. Nairobi (2011-09-09)

AfriAfya C; includes the Project Accountant at AfriAfya, and the Director at AfriAfya. Nairobi (2011-10-04)

AMREF A; Project Officer of Telemedicine for AMREF. Nairobi (2011-09-02)

AMREF B; General surgeon, cooperates with AMREF. Nairobi (2011-10-06)

Börve, Alexander; Founder, iDoc24. Skype interview. Uppsala (2011-08-10)

CHW group A. Community Health Workers in Nyakach. Third group discussion. Nyakach (2011-09-14)

CWH group B. Community Health Workers in Nyakach, First group discussion. Nyakach (2011-09-14)

CWH group C. Community Health Workers in Nyakach. Second group discussion. Nyakach (2011-09-14)

Dermatologist A; Swedish dermatologist consultant, iDoc24, Skype interview. Uppsala (2011-08-09)

Dermatologist B; Swedish dermatologist, Karolinska Institutet & iDoc24. Stockholm, Telephone interview (2011-11-21)

Dermatologist C; 3 Tanzanian dermatologists, Regional Dermatology Training Center. Group interview. Moshi (2011-08-25)

Dermatologist D; Kenyan dermatologist. Answered cases from Nyakach. Nairobi (2011-10-05)

Dermatologist E; Kenyan dermatologist. Nairobi (2011-10-05)

Dermatologist F; Kenyan dermatologist. Nairobi (2011-10-04)

Kisapuk teachers; Includes the headteacher of Kisapuk primary school, the manager of AfriAfya Community Learning Center at Kisapuk, and the secretary of AfriAfya Community Learning Center at Kisapuk. Group interview. Kisapuk (2011-09-30)
NWH B; Head of pharmacy, Nairobi Women’s Hospital. Nairobi (2011-10-06)

NWH A; Business development manager, Nairobi Women’s Hospital. Nairobi (2011-10-05)

NWH C; General practitioner at Nairobi Women’s Hospital. Nairobi (2011-10-07)
11 Appendix

11.1 APPENDIX 1

Questions for the test subjects (patients):
Prior to the interview, the interviewee will be asked if they want to participate in the study and if so, to read and sign the ICF.

Questions by medical personnel during examination (based on information in the iDoc24 form, answers will be entered onto the mobile phone and sent to the dermatologists):

Where on your body are the symptoms located? (face, back, arm ...)

Please describe your symptoms. (itching, hurts stings, none...)

Please try to estimate how long you have had the problem. (24 hours, week, month, year, always, comes and goes...)

Is there anything else you think would be relevant for us to know with regard to the symptoms? (eat something odd, special appearance of the rash, injuries nearby...)

(if female) : Are you pregnant?
(if female): Breast feeding?

Do you have a fever?

Do you take any medicines or drugs? Which ones?

Do you have an allergy?

Questions by investigators after examination:

How did you feel about answering these questions?
   Are all of the questions valid?
   Were any of them hard to answer for some reason?
      If so, which and why?

Have we forgotten any questions that are important to take into consideration with regards to your symptoms?

Do you trust that a skin doctor will receive your question and answer it?

Do you see an increased value in having a specialist skin doctor answer the case rather than getting diagnosed by a nurse or regular general practitioner?
How will you act on the answer?

Will you try to get a second opinion?
   If yes, from where?
How much would you be willing to pay for this service?

How much does it cost for you to see a doctor regarding these symptoms?

How would you like to receive the information from the skin doctor?

How can the service improve?

Other opinions/questions?

Questions for after the subject has received the information from the dermatologist (if possible)

Are you satisfied with the answer?
   If not, what is missing?

Will you act upon the received information?
   If yes, how?
   If no, why not?

How can this service improve?
Questions for the medical personnel (dermatologists, nurses, MDs):

Prior to the interview, the interviewee will be thoroughly informed of the functionality of the service.

Word list:
End-receiver – patient, whose information has been provided to the service
End-user – person who interacts with the mobile phone

Would it be interesting for you to use this service?

Do you have time to use the service?

Would you be comfortable working this way?
   If not, why?

How much time do you think you would be willing to work with this service?

Do you have the necessary technical hardware requirements to use the service?
   If not, could you/your organization get this hardware or does it need to be supplied to you externally?

Do you have the necessary technical knowledge requirements to use the service?
   If not, how would this best be obtained?

Who are the end-receivers of the information provided by this service based on gender/age/social groups/economical situation/other factors?

Who are the beneficiaries of the service?

Who should use the phone? Anyone/nurse/clinical officer/MD/dermatological training necessary?

Is the information provided by the form sufficient?
   If not, what else is needed?

Is a one-way conversation sufficient?

Would the end-receiver know what to do with the information provided from the service?
INFORMED CONSENT FORM

This informed Consent Form is for men and women who have a possible visible skin ailment. Two university level students from Sweden are carrying out the research for Uppsala University and the Swedish company iDoc24. The study is sponsored by SIDA (Swedish International Development cooperation Agency) and the principal investigators are Rickard Magnusson and Christopher DiLorenzo.

This Informed Consent Form has two parts:
  • Information Sheet (to share information about the research with you)
  • Certificate of Consent (for signatures if you agree to take part)

You will be given a copy of the full Informed Consent Form

PART I: Information Sheet

Introduction
Our names are Rickard and Christopher, working for iDoc24 and performing a study for Uppsala University. We are doing research on an advisory service for skin diseases. We will give you information and invite you to be a part of this research. Before you decide to be a part of this research you can talk to anyone you feel comfortable with about the research.

If there are any words that you do not understand, please ask me to stop as we go through the information and I will take time to explain. If you have questions later, you can ask them of a medical person or investigator.

Purpose of the research
Skin problems are hard to diagnose unless you can see them. Sometimes patients cannot visit skin doctors and the skin doctors cannot visit the patients. The reason we are doing this research is to improve the capabilities of medical institutions to provide expert advice where it would otherwise not be available.

Type of Research Intervention
This research will involve a picture of your skin and some relevant questions. This research is advisory and will not actually treat your skin condition, only tell you a skin doctor’s recommendations. These recommendations will be provided at a later time to the medically responsible person that is on site.

Participant selection
We are inviting any person who thinks they may have a skin condition to participate in this research.

Voluntary Participation
Your participation in this research is entirely voluntary. Even if you agree at first you can always choose to stop participating. This research will not affect the way you will be treated regardless of whether you choose to help or not.

Procedures and Protocol

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66
We will ask to take a picture of your skin affliction. We will then ask you some questions that you may choose to answer or not. You will be completely anonymous to the doctors. After the skin doctor responds from a computer at another location the results will be presented to you via an SMS message or via E-mail. Should you not own one of these we will have to discuss how to give the information to you.

**Duration**
The duration of the study should only be about 10 minutes.

**Benefits**
If you participate in this research, you will get a skin doctors (Preferably from Kenya or Tanzania but possibly from Sweden) expert advice on your skin condition. There may not be any benefit for you but your participation is likely to help us find the answer to the research question. There may not be any benefit to the society at this stage of the research, but future generations will hopefully benefit.

**Confidentiality**
The information you give us (including the picture) will be used by the investigators and will be evaluated by skin doctors. Your name will not be mentioned in any publication, and any confidential information that you do not want the investigators to use, will not be used. Please mention which information you regard as confidential!

**Sharing the Results**
This research will become a report, which will be read by iDoc24 and the University of Uppsala. It may be published in select journals, but none of your confidential information will be included.

**Right to Refuse or Withdraw**
You do not have to take part in this research if you do not wish to do so. You may also stop participating in the research at any time you choose. It is your choice and all of your rights will still be respected.

**Who to Contact**
If you have any questions you may ask them now or later, even after the study has started. If you wish to ask questions later, you may contact any of the following:

- Christopher DiLorenzo 0712 120 414 christopher@idoc24.se
- Rickard Magnusson 0712 120 414 rickard@idoc24.se
- Dr. Pranav Pancholi 0203 753 356 donypancholi@yahoo.com

This proposal has been reviewed and approved by KEMRI, which is an organizations whose task it is to make sure that research participants are protected from harm. If you wish to find about more about KEMRI, contact [name, address and telephone number].

You can ask me any more questions about any part of the research study, if you wish to. Do you have any questions?
PART II: Certificate of Consent
I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate as a participant in this research.

Print Name of Participant__________________

Signature of Participant ___________________

Date ___________________________
    Day/month/year

Statement by the investigator/person taking consent
I have to the best of my ability made sure that the participant understands that the following will be done:
  • Take picture of skin ailment.
  • Not receive any immediate medical treatment by investigators.
  • Answer a few questions.
I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this ICF has been provided to the participant.

Print Name of Investigator/person taking the consent________________________

Signature of Investigator/person taking the consent__________________________

Date ___________________________
    Day/month/year

Participant’s copy
I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate as a participant in this research.

Print Name of Participant__________________

Signature of Participant ________________

Date ___________________________ Day/month/year

Statement by the investigator/person taking consent
I have to the best of my ability made sure that the participant understands that the following will be done:
• Take picture of skin ailment.
• Not receive any immediate medical treatment by investigators.
• Answer a few questions.

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this ICF has been provided to the participant.

Print Name of Investigator/person taking the consent________________________

Signature of Investigator /person taking the consent__________________________

Date ___________________________ Day/month/year

Investigator’s copy