Finding the formula for sustainable ICT
Lessons from the One Laptop per Child project in Rwanda

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Abstract

This thesis identifies threats to, and strengths in, the One Laptop per Child (OLPC) deployment in East African developing country Rwanda, and discusses what effect these characteristics may have on the long-term sustainability of the project. The main data collection method used is interviews, performed during a two month field study in the Rwandan capital of Kigali. By using a framework based in the field of technology transfer, a comprehensive picture of the project is presented, covering the whole process from early decision making and acquisition to the potential assimilation and development of the technology. The most important strength in the OLPC project has proven to be a strong will and commitment of the local organization as well as the country’s government to see it through. A well-adapted organization of support and technical assistance has also proven to work well so far. However, as the project increase in size over the next few years, several threats are also identified. These threats include a lack of financial means and skilled personnel, strong technical dependency on the OLPC organization and insufficient plans for the future expansion. We argue that the project would become more sustainable if expansions were to cease and a larger focus was put on securing the current deployments.
Preface

This minor field study was carried out during a two months stay in the Rwandan capital of Kigali. It was a great experience – both during our research and in between – and it opened our eyes to developing work in a way that we may not have expected. A lot of people helped us before, during and after trip, too many to mention them all. We would, however, like to thank a few people who had a significant role in making the study possible.

First we would like to thank the Swedish International Development Cooperation Agency (Sida) for providing the Minor Field Study (MFS) scholarship and thus a wonderful opportunity for students to go abroad and see (and engage in) developing work first-hand – something everyone should do. Secondly we would like to thank our supervisor, Clas Lindberg, for providing guidance and valuable help regarding this essay as well as the application for the MFS scholarship. Thirdly, big thanks to our local supervisor in Rwanda, Sylvia Umutesi Karenzi, for introducing us to the people at the Rwanda Development Board section IT. Lastly, but not least, much gratitude goes to Martin Carlos for sincere hospitality and putting so much effort into providing us with data and interviewees.

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Introduction

Information technology is not a magic formula that is going to solve all our problems. But it is a powerful force that can and must be harnessed to our global mission of peace and development.¹

The above statement, from a speech by UN secretary-general Kofi Annan in 2000, stresses the fact that bridging the digital divide between the poor and the rich countries of the world cannot be done overnight. It also implicates that the use of Information and Communication Technology (ICT) is one favourable and significant way countries can increase their developmental pace and thus improve living standards for the population.² By transferring ICT from a developed country, many developing countries hope to improve technological capabilities and advance the capacity to generate their own technology.

One of the countries that have embraced this way of thinking is Rwanda; a small and poverty-struck country in East Africa. In its desire to leave poverty behind, a long-term plan called Vision 2020 was published in 2000, outlining an agenda to transform the country into a medium-level, knowledge-based economy by the year of 2020. Due to the lack of sea-access and few natural resources, it was acknowledged that ICT would have to play a central role in this transformation. The Vision 2020 plan declare ICT as crucial in two out of six main areas; among them education, where an increased use of computers in schools hope to improve ICT skills among the young. Based on such expectations, the Rwandan government has collaborated with the One Laptop per Child (OLPC) association, a non-profit US-based organization focused on the creation of educational tools for use in the developing world. Together they have initiated a project to deploy “low-cost, low-power, connected laptops with content and software designed for collaborative, joyful, self-empowered learning”³ in primary schools around Rwanda. As of late 2009 the project has deployed 10,000 laptops and another 110,000 are scheduled to arrive during the coming year.⁴

Although it might turn out to be beneficial for the country, research also indicates that any transfer of ICT is complex, risky and time-consuming, especially in developing countries.⁵ This is mostly due to the inherent characteristics of the technology itself and the complex processes that are involved in a successful adaptation to local circumstances. The majority of these processes require a high availability of financial, human, physical, and technological resources, as well as a strong absorptive capacity in the host country. Intertwined in the process are also the differences in languages, business practices, policies

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² The use of the term ICT instead of IT is a choice of the authors. We consider ICT to be an internationally more accepted term to describe information communication technologies. However, when quoted, authors or interviewees who use IT will not be edited. Instead IT should be considered synonymous to ICT in this paper
³ The One Laptop per Child Website, Vision, wiki.laptop.org, 13September 2009
⁴ Interview with One Laptop Per Child employee 2 October 2009
and regulations, economic situation, political system and technological infrastructure. Earlier studies show that if inadequate attention is given to these factors then the project may not survive over time. Such is demonstrated in Heeks’ summarization of ICT projects, where almost all are described as failures or partial failures:

- Health information systems in South Africa; evaluations reported a widespread partial failure of high cost systems with little use of data
- Information systems in the Thai public sector; most projects seem to be failures at all governmental levels
- Donor-funded ICT projects in China; all were found to be partial failures
- World Bank-funded ICT projects in Africa: assessment studies reported almost all as partial – often sustainability – failures

In some instances, the initiative succeeds at first but is then abandoned after a few years. An example is the setup of touch-screen kiosks for remote rural communities in South Africa. These were initially well received by the communities. However, the kiosks’ lack of updated or local content and lack of interactivity led to disuse, and they were removed less than a year later.

The OLPC project in Rwanda – being one of the largest ICT projects to date in the country – inevitably faces this dilemma. Enabling laptops in primary schools require training of teachers and students, skills to supply a technical infrastructure, and maybe most importantly, an ability to support and maintain these on a continued basis. If the above topics are not taken into consideration the result may severely impair the use of the new technology and its application over time. How are these obstacles handled by the OLPC project, and what can we learn from them when implementing other ICT projects in developing countries?

1.1 Purpose

In a broader context, the purpose of this thesis is to contribute to the understanding of ICT transfer to developing countries, and the difficulties inherent in such a transfer. In the smaller context, we aim to highlight some of the issues and opportunities faced when trying to create a large, sustainable computer environment in a developing country. Our results and conclusions are mainly useful for other OLPC deployments, but may also be useful for companies or other institutions contemplating to implement high-tech ICT tools in a low-tech location.

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1.2 Aim
The aim of this study is to answer the following research question:

- In terms of maintaining, operating and developing the OLPC technology: to what extent can the Rwanda OLPC project be regarded as sustainable?

To answer this question, we will analyze the following three aspects of the project:

- Prerequisites; the sequence of events and activities that led Rwanda into the project
- Expansion; the capacity to allocate financing, skills and acceptance to expand the project in accordance with the initial plan
- Support and development; the ability to maintain and develop the technology over time

It is, as we will further explain in chapter two, important to take into consideration certain key events when discussing the sustainability of an ICT project. We will, however, due to constraints in time and financing, focus on the process of the project up to today (that is late 2009) in terms of the three aspects above. A discussion on their impact on the project’s sustainability, and suggestions how to handle them, will be the focal point of this paper.

The project will be seen strictly as an ICT project in context of the developing world. No part will be taken in the controversial discussion on the actual educational benefit of deploying laptops to developing areas. In other words, we will only examine the sustainability of the technology as an enabling tool, rather than evaluating the educational philosophy of the OLPC project. In relation to this, it is also important to understand that project sustainability not is the same thing as project success. To grasp this reasoning we must define success. If success is "most stakeholder groups attain their major goals and do not experience significant undesirable outcomes" then it is possible for a project to sustain without achieving success. It can be enough if a few stakeholders find the project useful and support its continuance; this can hardly be regarded as successful though. One can argue, however, that sustainability is one of several elements that must be present for the project to become successful.

1.3 Methodology
Sustainability is a broad term that is central to our study and therefore deserves a few extra words of discussion. In recent academic literature it has become a popular “buzz-word” primarily associated with environmental studies. As a result, the number of alternative meanings has also grown rapidly. What we seek to describe, however, is very specific. Sustainability is simply the ability to uphold balance of a certain state in any system; the ability or capacity of a system to maintain itself. In this paper we reduce the definition yet a little more and describe it as the practices that would ensure the continued viability of a product or practice into the future.

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To evaluate the sustainability of the OLPC project, an analysis framework derived from the academic field of technology transfer is used. This framework, a five phase model for technology transfer, will be discussed and presented in more detail in chapter two. The use of this model as a central framework is valuable in a number of ways. Firstly, the model provides us with a structured, chronological approach in which to collect the relevant data. Secondly, it provides a series of important milestones by which the sustainability of the OLPC technology can be estimated. The model, as it is based on research in developing countries, recognizes differences in culture and its implications to some extent. It is nevertheless important to consider the context of Rwanda and its social and economical structure from a perspective based on our own, subjective experiences as well.

Data collection

Our approach consisted of four data collection methods: Interviews, literature study, survey and observation. A large part of the data collection was carried out as a minor field study financed by a scholarship from the Swedish International Development Cooperation Agency (Sida). The on-site work was performed during a two month stay in the Rwandan capital of Kigali. During the visit, some ten interviews were held and one paper-based survey distributed. Extensive observation was also made during the whole period of stay. The field study, however, was not the only data collection part of our study. Initially, during our preparations in Sweden, much time was spent reading general information on the OLPC initiative. The primary resources included OLPCnews.com, an independent blog site where news regarding OLPC is presented and discussed regularly, and the OLPC wiki, where volunteers publish their experiences from deployments all over the world. The latter one is wiki-based, similar in construction to the perhaps more well-known Wikipedia. We consider the wiki-format to have several beneficial attributes; it is more up-to-date than traditional websites and erroneous information usually gets corrected (or commented on) by the many readers of the website. It can, however, be very informal and sometimes not complete due to the lack of an editor. Therefore great importance was placed on minimizing such unreliability and bias. This was done by carefully cross-referencing data where possible, usually by comparing the data to information given by interviewees.

Both of the above mentioned OLPC communities are largely based on people working voluntarily with the initiative. The independent format has made them very information-rich and open to intensive debates. We gained valuable understanding of the project’s fundamental elements by visiting these sites on a frequent basis. The information attained there also laid the foundation for our understanding of the different stakeholders involved in the project. We identified four major actors: Rwanda Development Board section IT (RDB-IT); the government-body responsible for executing ICT policies, Ministry of Education (MinEduc); the ministry responsible for education policies, core team; the local agents supplying the laptop to the schools, and finally; the schools themselves (including teachers and students). Based on these observations, we structured an approach where we would attain the views of all parties concerned. We identified the local recipient of the project, MinEduc, and the technology supplier, OLPC, as well as the schools where the deployments had taken place so far.
In order to capture key events in the project our primary method was interviews. There were three main reasons for this, as is also argued by Hay. These were to investigate the complex behaviours and motivations behind specific decisions in the project, to collect a diversity of meaning, opinion and experiences on the key events, and lastly, to initiate a discussion on our research and who could be interesting for us to interview in regard to it.\(^\text{10}\) On-site in Rwanda, we first spoke to a project manager who helped us establish contact with people who had been involved in the project. Amongst them was the project coordinator responsible for the initial stages of the OLPC project (but who is currently on another project) as well as managers from the nation-wide monitor and evaluation team. These interviews were formal, and to increase accuracy we used recording equipment. All of them were also semi-structured; we let the interviewee speak relatively freely regarding a given milestone in the project (see appendix A for interview guides).\(^\text{11}\) As our understanding of the project increased, we specified our questions to capture critical events in the project.\(^\text{12}\) Where applicable, the technique of “triangulation” was also used; information on areas of special interest where collected from one interviewee and then compared to data from other interviews and observations. If inconsistencies were found, we examined the topic closer in search for why.\(^\text{13}\) Due to our interviews being very open and that several respondents spoke freely without any regard to consequences, we have chosen to keep their names confidential. We have, however, kept their organizational role in the paper to strengthen the validity of certain arguments. In all, the formal interviews at RDB-IT and MinEduc can be considered our most useful oral material. A number of orientating interviews were also conducted in addition to the semi-structured interviews. These were carried out without recording equipment and with the aim of getting a better understanding of the project and the relevant background information. Although less significant, some of the gathered oral information also consists of non-formal interviews, or in other words, small talk performed spontaneously in restaurants, cars or sometimes even bars. These were mainly useful to get the public’s view on the project.

In order to capture the view of the end-users – the students – a survey was distributed. The survey served two purposes. First, it enabled us to get an understanding of the local knowledge of the project and what impact the project has had among the students and parents. Secondly, it provided a natural meeting point where we could discuss the project with the students. When completed, we had surveyed a total of 91 primary school students in three different sectors in Kigali: Kacyiru (34 respondents), Nyamirambo (28 respondents) and Kagugu (29 respondents). The reasons for selecting these three sectors were two-fold. We wanted to reach students with laptops as well as students without laptops; and we wanted to reach students from different social backgrounds. The numbers of respondents were sufficient


\(^{11}\) We begun using well-specified questions; however, as we grew more confident we increasingly improvised in regard to interesting themes that came up during the interviews. This methodology is described in Hay, I.(ed.), p.82.

\(^{12}\) As described in Hay, I(ed.), p.83.

\(^{13}\) As described in Hay, I(ed.), p.84.
to achieve reasonable reliability, according to Kitchen and Tate.\textsuperscript{14} In the first sector, Kacyiru, the survey was conducted in the vicinity of a football field where many primary school students were gathered. At the actual time, 34 students of primary school age were at the location and every each of them was given a question form to fill in. It may be debated that the sample acquired at the football field is not randomly chosen and can therefore not be seen as representative for the whole area. Two arguments support that the sample was unbiased though. Firstly, the students came from many different schools in the area and secondly, both genders as well as students from all grades were represented. We argue that the gathering factor, interest to play football, is not something that influences the students’ knowledge regarding computers or the OLPC project. The strategy for the distribution of the survey in the two other sectors, Nyamirambo and Kagugu, were slightly different. Instead of being concentrated at one certain place, we were walking around to gather answers from students in the near approximate of the sector’s largest primary schools.

Surveys should in general be kept short, because the respondent often quickly loses interest.\textsuperscript{15} As the survey was directed towards primary school children with – one can argue – an even shorter attention-span than the average respondent, we focused our questions around three simple topics (see appendix B). Still, the conduction of the survey was not problem-free. A few issues could be directly derived from the cultural context. To begin with, the survey could not be formulated in a language known to the authors, as the children only speak Kinyarwanda fluently. We were therefore dependent on an accurate translation. For this we used our supervisor Sylvia Umutesi Karenzi who has a degree majoring in communication. In field, we also used an extra interpreter to collect the answers. The interpreters were in all cases secondary school students that voluntarily helped us to localize the students as well as to gain their attention. We noticed a tendency of the students to “help out” others students who were less able in reading, thus possibly inflicting error to the study. In those cases, we instructed the interpreter to read the question out loud instead, followed by the alternative answers.

Another issue was the understanding of how to tick a box in the answer sheet. Again, we used the interpreters to make sure that the students did not tick multiple boxes, as this would have severely impaired the study in terms of reliability. Even though much care was put into this, three of the answers had to be dismissed due to erroneous answering (multiple ticks in the same question, along with obvious contradictions, e.g. “no computer in school” combined with “yes, I have an OLPC laptop”). Two out of three dismissed answers came from the survey in Kagugu area, and one from the survey distributed in Kacyiru. We do, although they might be somewhat problematic, still consider the results of the study useful for discussion.

1.4 Disposition

The paper is split up into five chapters. It starts out with an introduction to ICT and its role in development in general and Rwanda in specific. We also present the OLPC Rwanda project

\textsuperscript{14} See, for example, Kitchen, R and Tate, N, 2000: \textit{Conducting Research into Human Geography}, Essex: Pearson Education, p. 59.
\textsuperscript{15} Kitchen, R and Tate, N, p. 51.
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and its current status in this part. The introduction chapter, furthermore, discusses how sustainability is a tough dilemma for ICT projects and especially so in developing countries. We identify three important aspects that need to be addressed to achieve durable results from projects of this kind. Chapter two discusses ICT transfer and key aspects in evaluating such a project. We end the chapter by developing a five phase analysis framework based on this discussion. Chapter three introduces the context of the project; first, an overview of Rwanda and second, a summary of its current policies in education and ICT. In this chapter we also describe what Rwanda aims to address with the project and how well ICT is recognized within the country. Chapter four goes more into detail about the project specifics by summing up our observations and results from the field study. The chapter is split into three phases: initiation, expansion and continuance, each one corresponding to one or several phases in our analysis framework. In chapter five we apply our analysis framework to the results. From this we render a number of strengths in, and threats to, the sustainability of the project. Lastly a discussion is carried as to how these threats can be diminished and what we can learn from an ICT project of this scale. Chapter six offers our conclusions and suggestions for further studies.
2 FRAMEWORK FOR ICT TRANSFER ANALYSIS

The research field of technology transfer is wide and used quite differently depending on the context of transfer. In section 2.1 we will discuss how technology transfer can be applied to our context, how to define its fundamentals and what limitations a use of this concept involves. In the subsequent part, section 2.2, we will construct a framework for understanding the specific transfer currently taking place within the OLPC project. This we will do by presenting previous research made in the field of ICT transfer, namely two specific models that have been used for evaluating other ICT projects in developing countries. Based on the two models, a third one is derived and proposed as the main framework of this thesis.

2.1 Definitions and concepts

The term technology transfer involves two intricate concepts that need to be clearly defined, technology and transfer. Al-Mabrouk and Soar discusses the concept of technology and defines it as a “set of knowledge, skills, methods and procedures associated with the production of socially useful services from products of the natural environment”.16 However functional, a more familiar and for this study more useful definition of technology is “application of scientific or other organized knowledge - including any tool, technique, product, process, method, organization or system - to practical tasks.”17

The concept of transfer is equally complicated. It has most commonly been linked with the systematically organized exchange of information between two enterprises.18 In this study the concept of transfer is identified as the dynamic application and utilization of information from one geographical area to another. Putting these two concepts in relation to each other, technology transfer is defined as the knowledge, skills, methods and procedures generated and developed in one location and transferred to another, where is it is used to achieve some practical end.

Another important concept that requires an understanding is developing countries. Developing countries are often bundled together into one category, although they often share only a few characteristics. In the available literature there is no single, internationally-recognized definition of a developing country, and the levels of development may vary widely within this category. To keep in mind therefore, is that developing countries are neither economically nor culturally homogenous.

The concept of ICT transfer to developing countries

ICT can be described as “the application of computer, communications and software technology to the management, processing and dissemination of information.”19

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16 Al-Mabrouk, K and Soar, J, 2009: Building a Framework for Understanding and Improving Information Technology Transfer Process in the Arab Countries, University of Southern Queensland, p. 3.
17 United States National Library of Medicine, HTA 101: Glossary, nlm.nih.gov, 7 September 2009
characteristics of ICT make it different from other technologies. ICT brings with it a high risk of technological obsolescence as computer systems rapidly becomes outdated and replaced by a new generation of computers or software. This risk stems from four major factors:20

- **Moore’s law**, the industry self-fulfilling prophecy that describes the long-term trend in the history of computing hardware in which the number of transistors that can be placed inexpensively on an integrated circuit has doubled approximately every two years
- The fact that advanced computer technologies and software tend to be sold when they are at an experimental stage, without rigorous testing in the market, and therefore running the risk that they or their producers “die out” soon after purchase
- The widespread (however diminishing) problems of incompatibility (different systems not working together) and lack of flexibility, sometimes making it problematic to upgrade or extend information systems with new hardware or software components
- The increasing number of problems that can be expected as the computer gets older and thus closer to the end of its expected life span (usually 3-5 years)

With the previous section in mind, the concept of **ICT transfer to developing countries** can be understood as the specific transfer of ICT-related technologies to a region with largely different cultural context. Odedra discusses the difficulties of this transfer and defines it as being a problem of knowledge transfer (or know-how) about a number of aspects.21 These aspects include knowledge on how a particular system works, how develop its applications and, finally, how to maintain it in terms of producing the different system components and assemble them. The success of the transfer process depends upon a number of factors: The capability of the local people to undertake the technology according to their needs, the awareness of the value of information in an organization or nation and, lastly, the national and organizational infrastructure. These factors are dependent (directly or indirectly) upon the economic and political conditions in the country, the training and education facilities there-in as well the development priorities and plans of the government.22

### 2.2 Earlier studies

This section will introduce two models used for analyzing ICT transfer to developing countries. Relatively few empirical studies have been conducted in this field, therefore the models need to be discussed with their original context in mind. From the two models we will derive a third model (see 2.3) containing the most important aspects.

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22 Odedra, M, p. 28.
The information technology transfer model (ITT model)

The ITT model, presented by Al-Mabrouk and Soar in 2009, is based on literature on IT, technology transfer and ICT transfer. Its empirical material is collected in the Arab countries of the middle-east. However, the conclusions of the paper aim to provide a generic model for understanding the process of ICT transfer. For us, this model presents a useful method by which the skills and technologies that are transferred – as well as the process in which the transfer takes place – can be understood and analyzed.

Mabrouk et al argue that the IT transfer process should be seen as a dynamic and logical structure split into stages, ranging from assessment and selection to the actual development of the imported IT (see figure 1).

![Figure 1. The ITT model. It describes the process of transferring a technology from a developed country (left in the figure) to a developing country (right in the figure). (Source: Al-Mabrouk & Soar)](figure_1.png)

The key participants (seen as large oval circles) in the IT transfer process are the technology supplier, developed countries, and the technology recipient, developing countries. According to Al-Mabrouk et al, participants require the support of IT technological resources specified as knowledge (or know-how), skills, infrastructure, technical, managerial capabilities, technological hardware and R&D. The model also illustrates the stages (visualized as small

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23 Al-Mabrouk and Soar, p. 4-15.
24 Al-Mabrouk and Soar, p.6.
ovals), by which the IT transfer process can be described. In the bottom rectangular box a feedback system called the IT Transfer Control System is presented. The purpose of the control system is to ensure that the technology comply with the suppliers own organizational goals and interests, and do not impact negatively on their competitive advantage in the region. What we extract from this model is primarily the six stages. Applying them to our model (see 2.3) will give us a systematic set of key events that we aim to investigate closer in context of the OLPC Rwanda project. Mabrouk et al’s discussion on the stages is the foundation of our interpretation; therefore we shall look into them a little bit more.

The initial assessment & selection stage is about assessing the requirements of – and the alternatives to – the new technology. This stage is in most cases undertaken before the acquisition of the technology, but may also stretch over the first years of its implementation. The second stage called acquisition involves the actual purchase and distribution of the hardware and software technology, as well as training and assistance in installations. The third stage, adaptation, is defined as the time when understanding of the technology by the people who use and maintain it has been reached. An alternative way is to see the acquisition and adaptation stages as sub-stages to another stage; the adoption stage (represented in the figure with a dotted line). Absorption & assimilation is the fourth stage. When this stage has begun, the recipient has learned to alter and adjust the technology to improve or adapt its use according to the local conditions and needs. When reaching the fifth stage, diffusion, the technology is fully understood by the recipient country. In a techno-economic sense, diffusion on IT knowledge affects all society, industrial and service sectors. The diffusion of a technology is always followed by the diffusion of information about the technology, argues Al-Mabrouk et al. The last stage of the model is development, which confirms that the technology has been fully transferred. At this point the recipient can, on their own, derive new products or systems from the transferred technology.25

The information technology life-cycle model (ITL model)
The second model we will present is the ITL model, presented by Baark and Heeks in 1999, consists of five phases (see figure 2). The authors developed the model based on experiences from several ICT projects in China. The model adds an important dimension to our framework; namely the cyclic behaviour of the transfer process.

25 Al-Mabrouk and Soar, p. 6-14.
Baark and Heeks argue that the life-cycle approach should be seen as a time-continuous process rather than a process limited to discrete stages. It adds the important characteristic of non-linearity; instead of seeing the transfer of a technology from one location to another as a single process it also adds the aspect of regular infusion of new technology. New technology can either be new in terms of an upgrade to the existing technology (a new technology generation) or simply be an entirely new technology not used nor seen before. These infusions are sometimes introduced as early as in the first and second phases of the current implementation process.

Except for the attributes above, the model and its five phases are in content similar to the six phases of the model presented by Al-Mabrouk and Soar. However, where the ITT model was mainly based on earlier literature and theories, the ITL model is rather derived from praxis and empirical studies.

### 2.3 The continuous ICT transfer model

The framework that will be used in this paper is called the continuous ICT transfer model (see figure 3 on the next page) and is derived from earlier research in the field of technological transfer, primarily the two models presented above. We consider it important, due to the characteristics of ICT (mainly its rapid development and compatibility issues, see discussion in section 2.1), to view such technologies as having a rather short life-cycle. The following part aims to take that into consideration as we merge the two models, combining their characteristics into a more comprehensive model. We will also discuss the phases of

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26 Baark and Heeks, p.5
27 Baark och Heeks, p.4-5
transferring an ICT technology, with focus on common obstacles along the way. In order to achieve sustainable transfer, all phases in the process must be taken into careful consideration.

![Figure 3. The continuous ICT transfer model. This model is a combination of the stages (phases) presented by Al-Mabrouk et al and the cyclic behaviour of the model presented by Baarks et al. (Source: Author.)](image)

The continuous ICT transfer model is made up of two main stakeholders and five phases, much like the ITT and ITL models presented in the previous section. Efforts have been made to put the notion of time more into focus. In section 5.2 of this paper we will discuss the limitations of this model, and also propose a few changes to improve its validity. These limitations will be based on experiences from the field study.

**Choice of technology**

The first phase of the continuous ICT transfer model is *choice of technology*. This phase begins with the agreement between two actors (the technology supplier and the technology recipient) to transfer a given technology. Overall, the choice of technology phase intends to identify opportunities and challenges involved in the sustainable adoption of a technology. It is important, during the early stages, that the recipient country formulate a set of clearly defined goals and also estimate the probable impact of the technology in the local region. The goals and the expected outcomes should be codified into new policies or integrated with existing policies.

A second part of the phase involves the evaluation of all candidate technologies. The most common method for doing this is by assessing suitability based on the set of goals that was previously defined. The evaluation and comparison of the candidate technology can be done using several assessment strategies. Such strategies usually involve the use of a pilot project or another pre-project evaluation approach where the technology is deployed on a small scale and under a short period of time. From this, the actual impact of the technology can be estimated.
Another method involves analyzing the outcomes of similar transfers of the same technology. This latter strategy must only be undertaken if the conditions of the previous transfers are sufficiently analogous to the conditions of the current situation. When the technology choice has been made, the phase ends with negotiation and signing of contracts.\textsuperscript{28}

\textit{Acquisition}

When the technology supplier is chosen, the next phase of the continuous ICT transfer model starts; \textit{acquisition}. The acquisition phase is defined as where the actual physical transfer of the technology is taking place, both in terms of time, space and methods of transfers. This includes establishing a time-frame, shipping methods and distribution within the country. Decisions in the technology acquisition process should be made hastily to avoid losing the advantage of the technology. Due to the complex characteristics of ICT it may also become obsolete after only a few years, thus further increasing the need of quick decisions.\textsuperscript{29}

\textit{Adaptation}

The third phase of the continuous ICT transfer model, \textit{adaptation}, is an ongoing process spread over the whole life-cycle of the project. It includes matching and adjusting the transferred technology to the users and operators in the developing country. Such an adaptation spans from altering the physical form of the technology to adjusting inherent cultural assumptions (in terms of, for example, language or content) to local circumstances. This phase also involves reverse adaptation; matching the recipient country to the new technology. The recipient country must adapt to the new technology in areas such as human resource development and training. They must also make sure that other technologies that are to be integrated with the new system will be compatible with the transferred technology, and that preparation of the physical environment is done in time.\textsuperscript{30}

\textit{Assimilation and use}

\textit{Assimilation and use} describes the developing country’s capacity to use, understand and absorb the details of the technology on their own, including its practical use. When a developing country can "use [the technology] efficiently, and support its use, it can be said that technology has been absorbed in that country."\textsuperscript{31} The requirements of the assimilation and use phase refer to the following topics:\textsuperscript{32}

\begin{itemize}
  \item The acceptance of the technology (mentally by local people, and physically within the environment)
  \item The motivation to make it succeed (for example, where there exists a perceived need or benefit within the developing country, supported by appropriate government policy measures such as regulation and pricing to create a positive climate)
\end{itemize}

\textsuperscript{28} Al-Mabrouk and Soar, p.7
\textsuperscript{29} Kahen, G, p. 1-8.
\textsuperscript{30} Cohen, G, p. 112.
\textsuperscript{31} Ibid. p. 10.
\textsuperscript{32} Cohen, G, p.116.
- The ability to support the technology (either a finished product and/or a production process) locally. Ultimately, this includes the availability of skills to adapt technologies to the local environment and to further develop them.

**Development**

The fifth and last stage of the continuous ICT transfer model is development. When this phase is reached, the technology has been fully understood by the developing country and can not only be used as originally intended, but also developed and improved into new technologies. The newly developed technologies may furthermore be marketed locally or overseas. The control and evaluation of the newly developed technology is a crucial and difficult task in all organizations, and especially so in developing countries where a lack of appropriate institutions is common.

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33 Al-Mabrouk and Soar, p.12-14.
34 Baark och Heeks, p.5.
3 OLPC RWANDA - CONTEXT AND BACKGROUND

This chapter aims to give a contextual view of the conditions in which the OLPC project is implemented; First, a brief introduction to Rwanda and its recent development; secondly, a discussion on the current status of ICT in Rwanda; thirdly, a summary of the OLPC initiative; and fourthly, a description of the characteristics of the technology being transferred in this initiative.

3.1 Country overview

Rwanda – landlocked between Uganda, Democratic Republic of the Congo, Tanzania and Burundi – has the highest population density in Africa with approximately ten million inhabitants living in an area half the size of Denmark. The population is mainly agrarian with some eighty percent of the population living outside the few major cities.\(^{36}\) Rwanda is also one of the poorest countries in the world; the Human Development Index puts the country at number 167 out of 182 countries, and the gross domestic product in 2008 was estimated to be a low 465 USD per capita.\(^{37}\) The economy is based almost exclusively on agriculture, with an estimated ninety percent of the workforce being active in this area. Virtually all major trade channels originate from the coffee and tea production. Although still very poor, there is a strong aim towards economic progress. In 2008 a GDP growth of 11.2 percent was achieved.\(^{38}\)

Kigali, with an estimated 900,000 inhabitants, is the capital as well as the main hub of Rwanda, with roads stretching to all areas of the country. It is by far the largest city in the country and also home to most companies and all governmental ministries.\(^{39}\)

Rwanda today is in many ways shaped by its history, and maybe most so by the 1994 genocide that killed at least half-a-million Rwandans in less than a hundred days.\(^{40}\) The genocide came to a halt when the Rwandan Patriotic Front, led by Paul Kagame – current president of Rwanda – ceased Kigali and gained military control of the country. After the genocide many measures have been taken to increase the pace of development. In July 2000, a

development plan called *Vision 2020* was presented, stating the explicit aim to evolve Rwanda into a middle-income, knowledge-based country by the year of 2020.41

### 3.2 ICT and education in Rwanda

The Vision 2020 takes into regard that Rwanda has no harbour and only a few natural resources, and concludes that ICT is the future tool of achieving economic growth. A successful “leapfrog” – to skip the traditional stages of industrialization and head directly into the knowledge society – is the ambition of many reforms currently taking place.42 A policy framework for the development of ICTs was created in 2001. This framework, called the *National Information and Communication Infrastructure policy and plan for 2001-2005* (NICI-2005), is the first in a planned series of four frameworks, each covering a five-year period up until 2020. When the plan was published, only one of Rwanda’s 2,300 primary schools had computers. This number was raised to 1,138 schools in 2006. But still, in 2006, the vast majority of the Rwandan schoolchildren had not used a computer in any way.43

The NICI-2005 was subsequently followed by the current NICI-2010, published in 2006. While the main goal of the first plan was to establish necessary institutions and expand the policy framework, the current one focuses on the implementation of different applications and systems, such as bringing ICT into education.44 The plan is divided into ten sub-plans. In the educational sub-plan a number of actions are presented, each with a specified set of policies, goals and prerequisites. The actions are mainly divided into three categories: Actions rolled over from the NICI-2005, actions to be completed within NICI-2010, and actions that will progress until 2020. In the last of the three categories a program called *Computers in schools – Operation ICT knowledge for the youth* is declared, thus clearly showing the ambition to long-term develop the computer skills among the students. The main objectives of the program are:45

- To introduce computers in primary, secondary, vocational and technical schools
- To make computer education an integral part of the educational system
- Improve student-computer ratio in the schools to ten-to-one (or better) by 2010

To enable the educational sub-plan, however, financing is needed. The budget from mid-2009 to mid-2010 has 139 million USD earmarked for the educational sector – 9.5 percent of Rwanda’s total budget for the same period. Among the planned activities in the educational part is the distribution of 100,000 OLPC laptops to primary schools and 217 desktop computers to secondary schools.46

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42 Interview at RDB-IT 2 October 2009.
3.3 The OLPC initiative

In order to understand the background of the Rwanda OLPC project, one also needs to understand the basic thinking behind the project. The first initiative behind it all was sprung out of Massachusetts Institute of Technology (MIT) in early 2005. It is based on an education philosophy called *constructionism*; a philosophy where children learn-by-doing in a public, guided and collaborative process. One important element in the process is feedback from fellow students as well as more traditional feedback from teachers. In enabling the constructionist approach, computers are considered a powerful and invaluable tool, especially in developing countries where lack of teachers has proven to be a common problem.

The OLPC organization was created as a mean to convey the constructionist approach through computer usage. By giving the children an opportunity to use a laptop, a window was believed to be opened where “large amount of information can be harvested.” In the end, this aims to enable well-educated – and consequently empowered – children. Five core principles are said to imbue the association: *Child Ownership*, the children should own the laptops themselves. *Low ages*, the laptop should be designed for children in the age of six to twelve years. *Saturation*, the project aims reach digital saturation in a given population. The population can be a whole country, a region, a municipality or a village. The purpose of this is to make the whole community feel responsible for the success of the project. *Connection*, through the computer network, children in the neighbourhood should be permanently connected to chat-sessions, information sharing on the web, videoconferencing and the joy of collaborative games online. *Free and Open Source*, the software, content, resources, and tools should be able to expand as the child grows older. This fifth principle states the need of project growth to be driven locally, in large part by the children themselves. There should be no inherent external dependency in being able to localize software into their language, fix the software to remove bugs, and repurpose the software to fit their needs.

Based on these principles a computer tool, the XO laptop, was presented by the OLPC association in 2006. The release was headed by OLPC president and MIT professor Nicholas Negroponte with special guest UN secretary Kofi Annan by his side. After the release, interest in computers for the developing world increased heavily, resulting in more IT companies becoming engrossed in both the market opportunities and the good-will that could be extracted from the initiative. Thus, at least two more companies began producing a laptop that was specifically developed for use in the developing world: The *Mobilia*, designed and manufactured by the Indian company Encore Software, and the *Classmate*, designed by the United states-based Intel. The Classmate is, as opposed to the OLPC laptop, in many cases built and rebranded by local companies in the recipient country. This is the case in for

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49 The One Laptop Per Child Wiki, *Core Principles*, wiki.laptop.org, 22 September 2009
50 The One Laptop Per Child Wiki, *Core Principles*, wiki.laptop.org, 22 September 2009
example Vietnam, where the local company Hacao is distributing a cheap educational laptop based on the Classmate technology.\(^{51}\)

The OLPC association has, according to our observations, been given the most media attention.\(^{52}\) However, of the two competitors, at least the Classmate should be seen as a serious contender with an expected sale of two million laptops in 2009.\(^{53}\) The Mobilia project on the other hand has been rather anonymous since the release in late 2006 and the only country that so far has ordered the laptops is Brazil.\(^{54}\) Total sales of the OLPC laptop is approaching two million units, with full-scale deployments in some twenty countries worldwide.\(^{55}\) Recently, however, the organization has faced financial difficulties. Roughly fifty percent of the staff and contractors were cut in January 2009, leaving the workforce at 32 people.\(^{56}\)

### 3.4 Characteristics of the OLPC technology

The OLPC technology consists of one main product, the XO-1 laptop (referred to simply as the laptop or the OLPC laptop in this study), and one side-product supporting its use, the XS school server. The laptop is a joint collaboration between academics and industry, based on “many decades of collective field experience.”\(^{57}\) It was created with the intention of being flexible, ultra low-cost, power-efficient, responsive and durable. This forced engineers to develop solutions, both hardware and software-wise, that is very specific for this computer (see figure 5). The company that is developing as well as manufacturing the laptop is Quanta in Taiwan.\(^{58}\)

The hardware includes a small flat-screen with two display modes, a full-colour mode and a monochrome high-resolution mode that is readable in direct sunlight. For connectivity, the network adapter has mesh functionality, meaning it automatically connects to other laptops within its area of reach. This also means that if one computer connects to the Internet the rest will also have access through the mesh network. All the hardware components are designed for low power consumption: The full-colour mode consumes a maximum of one watt and the reflective mode 0.2 watt with the mesh network enabled.\(^{59}\) Initially, the low

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\(^{52}\) In Sweden, for example, the project gained popular attention with an article in *Dagens Nyheter* (21 January 2009) telling the story of students who bring their laptops to the vicinity of Kigali airport for free wifi Internet access


\(^{55}\) The One Laptop per Child Website, *Vision*, wiki.laptop.org, 6 October 2009

\(^{56}\) The One Laptop per Child Blog, *Refocusing on our mission* blog.laptop.org 4 October 2009

\(^{57}\) The One Laptop Per Child Wiki, *XO*, wiki.laptop.org 3 September 2009

\(^{58}\) The One Laptop per Child Website, *Vision*, wiki.laptop.org, 3 September 2009

power consumption aimed to make the computer rechargeable using a crank or foot pedals. It was later discovered, however, that is was not humanly feasible for primary school children to act as a mechanical power source for the laptop. Instead solar panels have become the most popular alternative in rural areas. There is no official estimate on the life-time of the laptop; however, representatives calculate it to be on average around five years.

Software-wise the laptop is based on open-source products. Its operating system is a derivate of Linux called Sugar and all applications (usually referred to as activities in the context of OLPC) are based on content built in the open-source community. The Sugar interface is simple, with the purpose of being easy-to-use and easy-to-learn both for teachers and primary school students. OLPC also encourages localization – the adaption of the laptop to local conditions. The system supports adaption of fonts, script layout, input methods, speech synthesis, musical instrumentation, date formats and dictionaries. It should be noted that adaptation is not only about translation to a local language, but also about adapting content to other local requirements, whether of regulation, culture or custom.

The cost of the laptop was initially planned to be 100 USD. This price has not been achieved though, leaving the price in late 2009 at 181 USD per unit. The total cost of deployment, however, is a topic of debate. Several total cost of ownership models estimate a total cost of the laptop – all side-costs included (that is Internet connectivity, support, training and maintenance) – at around 900 USD per five years. This estimate was supported by an evaluation of the largest deployment to date, the Haiti deployment, which stated an approximate of 970 USD per laptop over five years.

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60 The One Laptop Per Child Wiki, Battery and Power, wiki.laptop.org 11 December 2009
61 Interview with One Laptop Per Child employee 2 October 2009
62 Open-source programming refers to coding in the “open”; meaning that anyone can read, view, modify and distribute the code as they see fit
63 Sugarlabs www.sugarlabs.org 9 December 2009
64 The One Laptop Per Child Wiki, Localization 9 December 2009
66 One Laptop Per Child News, Cost of OLPC in Haiti, olpcnews.org, 9 December 2009
The second product in the OLPC technology package is the XO school server (XS). The XS is only designed to complement the laptop, and is not a must-have for deployment. It runs a Linux-based operating system engineered to be installed on generic low-performance servers. The server hardware, however, is not supplied in the package and must be bought separately. The laptops are self-sufficient for most activities, although some services depend on the XS providing connectivity, shared resources and services.67

3.5 Project stakeholders

Due to the somewhat complicated relations within this project, this section aims to give a brief introduction to the stakeholders and their respective role. See figure 6 for a graphical representation of the project stakeholders followed by a run-through of their roles.

Figure 6. Stakeholder relations. This graphical representation should be understood as a process scheme starting from the left with OLPC (the technology supplier) who collaborates with two local stakeholders, RDB-IT and MinEduc, to deploy laptops in schools (the technology recipient) for the proposed benefit of teachers and students. (Diagram by the authors.)

67 The One Laptop Per Child Wiki, School Server, wiki.laptop.org 3 October 2009
Core Team
The core team, a group of 25 persons answering to the MinEduc, was first setup in connection with the OLPC trial beginning in 2007. Its primary mission is to train teachers in the use of the laptop as well as to act as a support function both during and after the deployment of laptops to a school. The 25 persons are split into two different teams, one with responsibility for maintenance and laptop repairs and one that is responsible for the training of the teachers. The repair section is the smaller one, consisting of two persons dealing with both hardware and software issues such as replacing broken parts or upgrading the systems. The learning team organizes teacher training sessions before and after the deployments.68

Ministry of Education (MinEduc)
MinEduc is the governmental body responsible for education in Rwanda. The goal of the agency is to reduce ignorance and illiteracy and to provide human resources useful for the socio-economic development of Rwanda through the education system. MinEduc is the current owner of the OLPC project, and has a coordinator working full time on the project.

One Laptop per Child (OLPC)
The One Laptop per Child (OLPC) association is a US non-profit organization set up to supervise the creation of an affordable educational device for use in the developing world. Its mission is stated as to “create educational opportunities for the world's poorest children by providing each child with a rugged, low-cost, low-power, connected laptop with content and software designed for collaborative, joyful, self-empowered learning.”69

Rwanda Information and Technology Authority (RITA)
The Rwanda Information Technology Authority (RITA) was created in 2002, by an act of the parliament, with a mission to “lead the process of creating the Rwanda information society and developing the economy in line with the aspirations of the Vision for Rwanda.”70 Its main function is to advise the government on matters relating to development and implementation of ICT policies, strategies and plans. RITA was the first owner of the OLPC project. In 2008, RITA was integrated into the Rwanda Development Board, section IT (RDB-IT).71

Rwanda Development Board (RDB)
The Rwanda Development Board (RDB) was modelled after similar agencies in other successful, recently developed countries, such as the “tiger economies” of Asia. It consists of eight governmental agencies, among them the agency formerly known as RITA. RDB’s main responsibility is to fast-track development activities by both the government and the private sector.72

68 Interview with Core team member 24 September 2009
69 The One Laptop per Child Website, Vision, wiki.laptop.org, 3 October 2009
70 Rwanda Information Technology Authority www.rita.gov.rw/ 17 September 2009
71 Interview with Project Manager at RDB-IT 10 October 2009
4 PROJECT PROCESS

This chapter will chronologically describe a sequence of key events that the OLPC project has gone through. The chronological approach is divided into three phases; initiation, expansion and continuance. The initiation phase will examine under which prerequisites the project was initiated and why the OLPC technology was selected; the expansion phase will discuss the enlargement of the project and who it reaches; and the continuance phase will discuss the maintenance, adoption and local acceptance of the project.

4.1 Phase 1: Initiation – Why, how and when?

What specific event initiated the discussion of an educational ICT project in Rwanda is not entirely obvious. We, however, argue that the long-term ICT development plan NICI-2010 (see section 3.2) was very important in making the OLPC Rwanda project a reality. In the plan the Rwandan government set up a goal to increase the number of computers in both primary and secondary school. Amongst other, a project named School Net was presented with an objective to increase the computer labs in secondary schools. For primary schools, however, it should be noted that no projects were in plan for introducing computers to the students.73

In early 2007, shortly after the NICI-report was published, the Rwandan president Paul Kagame met with the OLPC founder and president Nicolas Negroponte in Kigali. Negroponte summoned the meeting to discuss the possibility for Rwanda to join the OLPC project and thus agree to the distribution of laptops to all primary school students in the country. At the event, the OLPC association pledged to fundraise for a shipment of 10,000 laptops through an OLPC initiated program called give-one-get-one (G1G1).74 Kagame demonstrated interest, and a contract for an additional shipment of 110,000 laptops was signed shortly after.75 The Rwandan government was – while waiting for the shipment – offered to conduct trial on 106 laptops of an early experimental model, the XO-B2 laptop. Kagame accepted this and delegated the responsibility of testing to RITA (today called RBD-IT). At this stage, the project can be considered officially initiated, with RITA acting as the initial owner. RITA decided that the 106 laptops of the XO-B2 model were to be evaluated in a trial at one primary school.76

When the contract was signed there were at least two other competing products in the market, the Intel Classmate and the Mobilis laptop.77 They did not, however, approach RITA with an offer to conduct trials and therefore were not evaluated. Due to this lack of interest and evaluation, the government never considered them an alternative to OLPC.78 At

73 NICI-2010, p.22.
74 The G1G1 program was initiated in December 2007, offering the American public to buy two OLPC laptops for 399 USD where one was automatically donated to a developing country
75 Interview at RDB-IT 2 October 2009
76 Interview at RDB-IT 12 October 2009
77 Engadget, Encore’s Mobilis to Compete with OLPC XO, Classmate PC in Brazil, www.engadget.com 22 October 2009
78 Interview at RDB-IT 12 October 2009
approximately the same time, the government of Brazil used a different strategy. They started
an ICT project called Um Computador Por Alun (One Computer per Child) and selected five
schools for laptop trials. Two received OLPC laptops, two received Intel Classmates and one
received Mobilis laptops. After two years of testing and evaluation, the government
announced the purchase of 150,000 Mobilis laptops in January 2009. A similar strategy was
used by the government of Uruguay. They chose to be the first country to make a bulk order
of OLPC laptops, after a public bidding process also involving the Intel Classmate.79

The trial
The Rwanda OLPC trial began in October 2007. The main intention was to “test the device,
more than to learn how to deploy and use [it] in education.”80 A secondary aim was to
identify the requirements of the project before a large scale deployment was made to all
primary schools.81 The school selected for the trial was Rwamangana B primary school in the
eastern province of Rwanda. The trial involved 96 students in level five and four teachers. It
started with a training session that was conducted ten days before the deployment. The team
performing this training – consisting of three persons – sat down with the teachers and
students, focusing on basic functions such as “switching on, switch off, and go[ing] from one
[activity] to another, nothing deep.”82

The trial came to a halt on 22nd November 2007, after almost one month of testing. No
structured educational evaluation was performed, although it was noted that the teachers
needed a great deal of support in how to use the laptop in the classroom. It was also noted that
due to the lack of support, the kids were playing around with the laptops themselves; teachers
not being present to supervise the use. This can be contrasted with the teachers who did not
use the laptops at all. Also, in the maintenance section, a number of problems were registered:
Software that malfunctioned and froze, Internet bandwidth that was too low, “jumping”
mouse pointers (due to malfunction in the mouse pad) and break-downs in the mesh network.
This was, however, explained by OLPC as being due to the laptop model yet not being ready
for serial production.83 Later on in 2008, when the experiences were formally summarized,
RITA realized that the teachers would need ongoing support on all locations where the
laptops were being deployed. This need for long-term support was acknowledged and
formalized in the establishment of the core team, which was created to serve as a full-time
maintenance function.84 There had been a group composed for the deployment during the
trial, with the purpose to train the teachers in laptop usage before the initial deployment. However, with this formalization of the core team, their duties were extended. It now also
included post-deployment support; to go to schools and help teachers in person.

79 Nugroho and Lonsdale, p.15
80 Interview at Ministry of Education 14 October 2009
81 Ministry of Education Website www.mineduc.gov.rw 15 October 2009
82 Interview at RDB-IT 12 October 2009
83 Ibid.
84 Ibid.
4.2 Phase 2: Expansion – Who and where?

Once the initial testing phase was over things began to move fast. On the fifth of September 2008, the Minister of Education officially launched the OLPC program. In connection with this, the government of Rwanda decided that laptops would be distributed to all primary schools in the country. To evaluate which schools were suitable for the initial expansion of the project, a survey was conducted throughout all primary schools in Rwanda. For any school interested in receiving laptops, a basic criterion was the availability of electricity. With Rwanda’s electrical infrastructure reaching only six percent of the population this – it was revealed – severely prohibited the deployments to rural schools.85 The criterion of electricity as a must-have caused some controversy; complaints were heard that the project is too focused on urban Kigali, thus not reaching the intended general public of all primary schools.86 Internet coverage, however, has not been declared vital by MinEduc and does not prohibit deployment. As of now, only one public primary school is connected to the Internet.87

Deployment preparation

Once suitable schools had been selected, the deployments began. In late September 2009, when this field study was conducted, approximately 10,000 laptops had been deployed in 25 schools in or around Kigali. Since many teachers had never seen a computer before, much time was spent instructing the teachers in basic computer knowledge before the deployments. The project coordinator simply explains that “teachers in our schools must adapt to this new way of teaching.”88 To prepare for the adaption process, the core team conducts a three week long pre-deployment training with every teacher involved in the project. The training includes both general computer skills and guidance on how to use the software effectively in the classroom.89 A possible problem with the pre-deployment training is the delay between the training and the deployment. Training sessions are being held with teachers from many different schools simultaneously, where some of them will start using the laptops directly while others have to wait for several weeks until the deployment starts at their school. Once the deployment is done, the teachers are kept up-to-date on the laptops by continuous training. This training is performed during the semester as well as during some holidays.90

During the time of introductory training, one teacher is also selected and trained as a local technician for the school. His responsibilities include being a representative for the school in technical matters. Any teacher who has a problem with the laptop can get in contact with the representative to resolve the problem. However, if the problem not can be resolved locally, it will be escalated to the core team for further assistance.91

85 The World Bank, Rwanda Makes the Case for Nation-wide Access to Electricity, go.worldbank.org 3 October 2009
86 Interview at Ministry of Education 14 October 2009
87 E-mail conversation with member of One Laptop Per Child staff 20 October 2009
88 Interview at Ministry of Education 14 October 2009
89 Ibid.
90 Interview with Core Team member 22 October 2009
91 Ibid.
To help with the training of teachers, a hundred volunteers have also been recruited from computer science programs around Kigali. As part of their community attachment (obligatory community service), they are first taught in the basics of the laptop and then sent to schools in their area to help with training. In the future, there is also a plan for these volunteers to handle basic maintenance of the laptop since the current budget does not cover an enlargement of the core team. Depending on the current need of the school, a group of student specialized in either training or maintenance can help out. However, this initiative has also faced some problems; some of the volunteers have not attended training due to the school they are supposed to help being too far away, some never showed up at all and yet some said it is too expensive to get there.

*Local awareness and acceptance*

To inform the population in Rwanda about the OLPC project, a so called community awareness program is being held by the MinEduc. The purpose of the program is to inform parents about how their kids can benefit from using the laptop in school as well as to answer questions regarding content control, security and choice of operating system. The majority of these questions are raised in Kigali, where several of the students have access to computers in their homes or surroundings. The daily use of computers at home has made the parents more aware of the risks in misuse and also more sceptical to the use of another operating system than Microsoft Windows. In the rural areas there is less familiarity with computers, and the parents do therefore not pose as many questions and concerns.

The parents, however, are not the end-users of the OLPC technology. Therefore, to estimate the impact of OLPC among the proposed users, we distributed a survey to 91 students in three different areas of Kigali. The conduction of the survey was not entirely problem-free (as is also discussed in the methodology chapter, see section 1.3) but still useful for discussion. The three sectors – Nyamirambo, Kacyiru and Kagugu – have a largely different social structure. Nyamirambo is the oldest part of Kigali and dominated by low-income residents. Kacyiru, on the other hand, can be considered middle-income by Rwandan standards and is densely populated with embassies and hotels. Kagugu is the richest part, with large residential houses and extensive construction under way. *Table 1* presents the results of the survey question.

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<tr>
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<td>28 percent</td>
</tr>
</tbody>
</table>

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92 Interview at Ministry of Education 14 October 2009
93 Interview with Core Team member 22 October 2009
94 Interview at Ministry of Education 14 October 2009
Table 1. Summary of survey question "Have you heard about the One Laptop per Child project?" with results from three different sectors. (Source: Authors.)

In total, 28 percent of all the respondents answered yes on our survey question. A significant difference between the sectors can be seen. In the Kacyiru area, where no laptops have been distributed, twelve percent of the respondents answered yes. In the Nyamirambo area, where students neither have laptops, the same question rendered a low four percent of positive answers. The Kagugu sector is the recipient of approximately 3,000 laptops. In this area, as expected, 71 percent of the respondents said they have heard about the OLPC project. The low percentages outside of Kagugu reveal that acquaintance with the project is low where laptops have not been distributed. This might seem trivial, but seen in the light of President Kagame stating the initial plan of distributing laptops to all primary schools students of Rwanda (see 3.3), it would have been rational to see a larger interest among the students. Even if the Rwandan children have limited access to media such as newspapers and the Internet, we were surprised that the knowledge about OLPC was not more widespread and discussed between students.

A second purpose of the survey was to meet the students and engage them in discussion. Therefore we combined the survey question "Have you heard about the One Laptop per Child project?" with a follow-up conversation on the same subject. During these interviews, it was evident that the skill in spoken English among the primary school students is very low; this despite the fact that the primary educational language in Rwanda is English. When interviewed in-depth, one of the four students in Kacyiru who knew about the OLPC project explained that his mother told him about it. He also expresses frustration when saying that the laptops are distributed mainly to the ‘rich’ students in Kigali.\textsuperscript{95}

\textsuperscript{95} Interview with primary school student 25 October 2009
During these field excursions, and during the better part of our stay, we made several observations regarding the awareness and acceptance among persons from a multitude of social classes and ages. The impression given is that the project is well-known, and highly welcomed, by most of those in secondary school and upwards. A man in his thirties living in the southeast corner of Rwanda – close to the city of Cyangugu, far from the capital Kigali – explains that the project is an important part of the future of Rwanda. Similar observations have been made in and around Kigali, although with the distinction that they are more concerned about the actual consequences of the project.

### 4.3 Phase 3: Continuance – Supporting OLPC

Once the laptops have been delivered and set up, another phase starts; the continuance phase. Continuance is about maintaining the laptops and keeping the schools – including the teachers – up to date in how to use them. This responsibility falls under the core team, which MinEduc is financially responsible for. Plans to extend the workforce are under discussion, but financing is a problem and solutions where non-governmental organizations (NGOs) take a larger financial load are actively sought for.\(^{96}\)

The main objective of the core team, as discussed earlier, is to keep the laptops in working condition (in other words functioning in terms of both software and hardware). To achieve this, the core team conducts a technical survey every one to two months. The survey takes place country-wide and aims to grasp any problem the teachers may have encountered during the time of usage. Issues are registered and taken care of; they usually revolve around lack of training or broken laptops. If the laptop has a hardware failure it is taken back to the repair centre where spare parts from other broken laptops are used for substituting the malfunctioning part.\(^{97}\) Initially, a failure rate of four percent was set as a maximum and according to the core team coordinator, this goal been achieved with the fail rate being around one percent.\(^{98}\)

**The future of OLPC Rwanda**

Rwanda is one of the first countries to acquire the OLPC technology. This makes it difficult to learn from other deployment experiences in terms of how to expand and develop the project. Despite this lack of previous experiences, one can expect the project to have a long-term plan and/or specified goals and outcomes. However, this does not seem to be the case.

The policy document *Economic development and poverty reduction strategy 2008-2012* states a goal that by 2012, fifty percent of all primary school students will have access to OLPC laptops.\(^{99}\) However, an official at the MinEduc explains that the initial 100,000 laptops are budgeted for and will be distributed within the next year, but after this there exist no financial means to expand the project. When confronted with the issue regarding the future of

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\(^{96}\) Interview at the Ministry of Education 14 October 2009  
\(^{97}\) Interview with a core team member 22 October 2009  
\(^{98}\) Interview with a core team member 20 October 2009  
the project, the project coordinator simply states that “there is no such plan.” Instead, the answer we receive regarding the future expansion of the project is that it will rely on external organizations (such as non-profit NGOs) and parents being able to support their children financially. This attitude seems to imbue the technology supplier side of the project as well. During an interview with a member of the OLPC organization we asked questions regarding the future of the project and only received the answer; “who knows, come back in five years.” Despite these somewhat half-hearted remarks, all involved stakeholders do not seem to comprehend the financial shortcomings. In an interview at the RDB-IT, it appears like the aim of full saturation surely will be reached, and that the students and teachers are well aware that they will receive laptops at some point.

As seen above, the future development of the project seems to be impossible to predict. This, however, has not stopped the leaders of Rwanda from trying to “leapfrog into the future” and, supported by high-tech ICT, seriously attempt to leave the list of the least developed countries in the world. In the next chapter we will look closer on the arguments that support this ambition.

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100 Interview at the Ministry of Education 14 October 2009
101 Interview at the Ministry of Education 14 October 2009
102 Interview with One Laptop Per Child employee 3 October 2009
103 Interview at RDB-IT 28 October 2009
5 PROJECT EVALUATION

This chapter will initially analyze the project in perspective of our framework; that is, the phases presented in 2.2. Secondly, based on this initial analysis, we will identify a number of strengths and threats that – we argue – will have a significant impact on the durability of the project. The last part will discuss how, from our experiences, these threats and strengths can be minimized and maximized respectively.

5.1 What do the phases imply?

Based on the model presented in chapter two, the following section is an analysis of the project phase-by-phase. Each phase will begin with a short description of its fundamentals. After that a discussion will be carried on key events in the OLPC project; why they took place and what effect they may have had on the project.

Choice of technology

The choice of technology phase is fundamentally about choosing the most appropriate technology in order to fulfil a specific objective. To facilitate an identification of this objective, the organization needs to examine the need and benefit of the given technology in the actual context of implementation.

The implementation of the OLPC project is supported in policies that were ratified before the project was initiated. These policies – presented in the NICI-2005-plan – introduce the objective of deploying computers to primary schools, but not how or with what technology it should be implemented. It can therefore be argued that the objective of implementing ICT in education is firmly established in the current objectives. The use of the specific OLPC technology, however, is not included in the NICI-plan of 2005. It should therefore be crucial, as is also argued by Al-Mabrouk and Soar, to evaluate the candidate technologies and choose the one that is best suited to achieve the desired outcomes. In this project there was no evaluation of competing technologies. In fact there was not even a slight consideration given to alternative solutions, according to the project coordinator (see 4.1). This must be seen as somewhat surprising for a project of this scale and budget. In the long run, this decision may yield unforeseen and/or un-wanted results. If, for example, the laptop technology were to be exchanged for another technology in the next cycle, compatibility issues may arise due to the characteristics of the laptop (see 3.4). On the other hand, keeping the decision time short can be seen as strength when it comes to ICT acquisitions. The risk that the technology gets old or even obsolete during the time of evaluation is considerable (see 2.1). This, however, does not motivate an overall neglect of the market-evaluation phase.

But, one might argue, cannot the trial be seen as an evaluation period? One of the most effective ways to evaluate a candidate technology is to combine trials with evaluation; a try-out of equipment during a limited time-period where you measure the outcomes. In the OLPC project there is some confusion regarding the trial, whether or not it should be labelled an evaluation period at all (see the different opinions in 4.1). It is a fact in either case, however,
that not until the contract was signed did any testing of the laptops take place. In addition to this we have seen that

- the trial had no pre-defined goals or expected outcomes
- the actual laptop used in the trial was largely different from the one distributed
- no formal evaluation was performed to estimate the impact of the technology (see section 4.1)

Because of the above, we cannot consider the trial to have the characteristics of a proper evaluation period. All evidence of a successful implementation has been anecdotal and based on observation from a few project-related members.

It should be noted that there was feedback from the trial, but the information was only used to further manage the organization of the core team. It did for example have a valuable function in realizing the need for human resource development (in terms of training) and how important it was to gain acceptance for the project among the teachers. This approach should be compared to that of Brazil, where competing technologies were evaluated and a bidding-process was initiated to force prices down.

Acquisition

The acquisition phase refers to the circumstances under which the acquirement takes place. In the OLPC project, this phase started in connection with the trial. It is not completed as of November 2009; 120,000 laptops have yet to be delivered. This will most likely be done over a time-span of several years.

The significant acquisition time of the technology will have an impact on the project; the question is how. Due to the characteristics of ICT there is a risk of the technology becoming obsolete or dated before being distributed to the schools. We argue, however, that the risk is lower for the OLPC technology than the average ICT tool. This due to the software and hardware being integrated; applications will not work on a different operating system than Sugar, and Sugar itself is designed specifically for the OLPC laptop hardware. In other words, the system has very little compatibility with popular operating systems such as Microsoft’s Windows or Apple’s OSX. The applications, however, are not computationally demanding due to simple graphics and thus have a low need for hardware upgrades. There is, furthermore, no profit to be made and no competition to be battled when selling software. Therefore is it less likely that a software upgrade which require a more powerful hardware build will be released in the foreseeable future. However, we argue that as soon as the computer gets connected to the Internet, requirements might change. If the laptops aim to be used for internet access it will need to be upgraded more frequently due to the hardware requirements of Internet browsing steadily increasing.

Conversely, the system also has its advantages to traditional IT systems. It is designed with rough conditions in mind and will in all probability last longer than conventional laptops. Once it is distributed, however, the OLPC technology becomes very vulnerable to hardware breakdowns in terms of spare parts. All parts are manufactured by Quanta and cannot be easily substituted with general computer hardware found in electronics stores. This
dependency on OLPC and its partners may become a serious threat to the project. OLPCs financial situation is not overly stable; the organization is dependent on donations and the non-profit sales of the laptop. If interests in the project shallows and a lesser amount of laptops are sold, the organization may very well get into similar financial problems as it did in the beginning of January 2009 (see 3.3). The manufacturing of spare parts as well as development of software would then be severely impaired, if not entirely shut down. If this were to happen, OLPC in Rwanda would most likely not survive for long. Lack of new software would not be a critical problem, but the lack of maintenance would make it impossible to renovate broken laptops, thus quickly lessen their use in the classroom.

Adaptation

Adaptation is about the adjustment of the technology hardware and software to local conditions. As we saw in 2.1, developing countries cannot be seen as one and may be largely different in a number of aspects. What unites most developing countries, however, is a rough physical environment with many extremes in terms of heat, dust and water. For these issues, the OLPC laptop is very well prepared, which also has been proven by the low breakdown rate of one percent in the schools. Maintenance must therefore be considered successful.

The laptop is also adjusted to the primary users, the children, in terms of keyboard size and ease of use. The screen carries a graphical user interface that is based on icons and, to a smaller extent, text. Because of such, it is less dependent on the students being able to read. From our observations though, it was revealed that the students were weak in reading English. At several occasions, both in the OLPC workshop and when distributing the survey (see 4.2), we noticed the need of extensive help from elder instructors or translators to interpret the language on the laptop.

Adaptation is also about improving the human resource assets. In terms of this project, that would mean extensive training in using the OLPC technology. We argue that this part has been successful so far. The training has been well-performed by the core team at least in terms of organization; all teachers have gone through the training and to some extent they are also exposed to continuous training. The actual quality of the schooling, however, we cannot evaluate, but at least the core team has realized the importance of training in making the laptop effectively used.

Assimilation and use

The assimilation and use phase includes analyzing the acceptance of the project as well as estimating the level of know-how among the population to use the technology properly. Here, proper use should be understood as the ability to perform basic maintenance and troubleshooting.

The survey distributed to 91 primary school students in three different parts of Kigali (see 4.3) revealed that the awareness of the project is very low among the proposed users. There can be both advantages and problems associated with the low awareness level. When new deployments are to be done, the work with introducing and explaining the technology to the students can be decreased if the students already heard about the laptops from their friends. On the other hand, a more widespread knowledge about the fact that only certain schools are
receiving laptops might be an underpinning for conflicts. It could cause questions such as why their school has no laptops and when, if at all, they will receive them. With the lack of a long-term plan and obvious obstacles such as electricity (see section 4.2), these kind of questions seems inevitable and might be difficult for the government to tackle satisfyingly. Also, if the project is too concentrated around Kigali and thus does not reach a reasonable saturation, it might be viewed as an upper class project which the majority of the population never will enjoy the benefits of.

Another aspect that may affect the acceptance is the inconsistency between stakeholders regarding the future expansion of the project. While the coordinator of the project declare that the country will not have financial means to cover more than 120,000 laptops, officials from RDB-IT states that laptops will be delivered to all of the 2.5 million primary school students in the country (which is also the intent of president Kagame, as seen in 4.3). From a more general standpoint, these somewhat contradictory statements also well symbolize the lack of long-term planning in the project (as is further discussed under the development phase).

A second important factor of the assimilation and use phase is the ability to support the technology locally. The local support can be seen as one of the main features that have to work properly for the project to be self-sufficient, independent and thereby sustainable. The core team plays an important role as they are responsible for the maintenance and repairs of the laptops as well as teacher training. We consider the work of the core team effective at a time when 10,000 laptops have been deployed, but challenges will grow exponentially as the remaining 110,000 arrives. Two factors are especially imperative in this:

- **Logistics**, distances has already been a problem for volunteers (see 4.3) and will likely increase as the project becomes more widespread. This because most of the ICT competence is clustered around Kigali and a few major cities
- **Financial**, the OLPC project coordinator mentions that there is no budget for extending the core team, and that volunteers and external organizations must be the solutions for future financing

There is definitely a substantial risk arising from the level of uncertainty in this planning. Using volunteers as a considerable part of the support team rises several questions. For instance, what happens when the volunteers graduate and their professional career starts? Can motivation be upheld in a longer perspective, as they don’t get paid for the work? Who will train the new volunteers? There are no obvious answers to questions such as these, but instead of seeing them as threats, ideas how to turn them into potent solutions should be discussed. ICT-students with experiences from voluntary work certainly posses’ unique knowledge about laptops in general and the OLPC technology in particular. He or she can therefore be a valuable resource in the future of the OLPC project or other similar initiatives. This could be a strong incentive for students to work voluntarily during the time at university.

**Development**

The last phase of the continuous ICT transfer model, *development*, involves the capacity of the recipient country to develop new technologies based on the one transferred. A
comprehensive evaluation of this capacity at the time of writing – when the project has been ongoing for less than three years – is not practically possible. We can, however, point on certain factors that will influence the possibilities for Rwanda to develop and improve the OLPC technology themselves.

The dependence on the technology supplier, the OLPC organization, in terms of hardware/software must be seen as very strong and can therefore prevent the local development in Rwanda. In contrast to the locally produced Intel Classmate, the OLPC laptop is produced in Taiwan by hardware company Qantas, and then shipped to the recipient countries. With a local assembly of the laptop, knowledge of the technology as well as opportunities to develop it might rise. Local production, however, cannot be regarded probable in this case due to the low price of the laptop partly depending on large-scale, efficient production facilities. In any case, questions regarding the production of the hardware must be dealt with by OLPC, and not by Rwanda.

It can also be argued that development is not a vital part in the transfer of OLPC technology – it might even be superfluous. The reasons for this are threefold: Firstly, the product is non-commercial and therefore there is few incentives found for local companies to develop improvements of the technology; secondly, the goal for Rwanda has never been to develop the technology themselves; and thirdly, the OLPC association is non-profit organization, which means that none or few financial gains can be made in comparison to the purchase from a market-oriented company. The conclusion from above discussion is that the development phase does not necessarily have to be fulfilled to reach the goal of sustainability. This at least as long as the OLPC association is present.

5.2 Limitations to the model

The continuous ICT transfer model is derived to cover the whole process of technology transfer and to consider the major factors in sustaining a transfer project. However, during our work, we have perceived a number of limitations to the model.

A project, in reality, is never entirely chronological; it does not end each phase before beginning the next and a cycle does not necessarily come to an end before a new one starts. For example the acquisition phase in this project, which is, as this paper is being written, still ongoing (112,000 laptops are still to be delivered). This at the same time as some aspects of others phases already has been initiated. Also, depending on the technology transferred, we consider some phases more central than others. The most significant discrepancy between the model and the OLPC project in Rwanda is the development phase. While the model implies that all phases are important to make a project sustainable, we draw the conclusion that the development phase is not vital in the case of the OLPC project.

A second weakness of the model is the lack of financial perspectives. OLPC Rwanda is highly dependent on, and affected by, the economical situation in the country. We have seen that prospects of backing up goals, policies and decisions by financial means not always have been realistic. The financial aspect should be added to at least two stages of the model. Firstly, in choice of technology, defining goals and expected outcomes is mentioned as important factors, but with no consideration taken to the economic situation. In addition to the proposed steering documents – which contain expected outcomes and goals – also financial planning
should be emphasized, preferably including detailed calculations on how to support all phases of the project, not only the acquisition of equipment. Secondly, financial aspects should also be added to the assimilation and use phase. One of the pillars under this stage is the ability to support the technology, which in the continuous ICT transfer model might be seen only as the support in terms of repairs and training. We argue that support in terms of economical means need to be added to the phase. This is clearly shown by the lack of financial plans to support the expansion from 10,000 to 120,000 laptops.

5.3 The impact on sustainability

The following section is a summarization of what we argue is the greatest strengths of, as well as greatest threats to, the sustainability of the project. The conclusions have been sorted in accordance with two themes: Strengths and Threats. However, it is first necessary to recall what the elements of sustainability depend on. If the OLPC Rwanda project is to sustain, then it will need to find the needed resources on an ongoing basis. This means that financing, competence and technology infrastructure must be available in all phases of the process. In addition to resources, the project must also meet the needs of at least some stakeholders to remain active. Finally, to sustain in the long-run, the project must be institutionalised – in other words – embedded in the rules and norms, culture and values of its setting. If all these prerequisites are fulfilled, then the local use of the technology is strongly supported. This would give the project a good chance to survive over time. So how does the OLPC Rwanda project perform in terms of these aspects? We summarize what we argue are the strengths of this project as follows:

- The project has a strong support in policies; all governmental stakeholders (as well as the president) is set on seeing the project through
- Well-structured and agile support organization; the core team is streamlined and effective in its current setup, it is also quick to adjust when the conditions change
- The awareness of the project among users as well as proposed users is relatively low; however, our impression, based on observations, is that the project has gained a high acceptance among the general public

It has become evident to us, however, that there are several threats to project as well. Some may even be severe in the long-run. The major threats, according to us, are:

- Scalability of the core team; this is a problem due to lack of financing as well as lack of IT competence in rural areas. Different solutions has been proposed (for example NGOs) but none seems realistic as of now
- Very strong technological dependency on OLPC and the voluntary community surrounding it; the laptops are not likely to breakdown immediately, but when they do there will be no spare-parts readily available unless OLPC decide to sell them. There is, furthermore, no in-house development or understanding of the system, rendering it very difficult to produce software locally
- The low saturation; because the project does not reach very far outside of Kigali there is a substantial risk that the population may become upset over unfulfilled promises such as distribution of laptops to all children in primary school
- The lack of a long-term plan; despite few practical cases to learn from, a stronger effort to plan for outcomes and expansions is expected from a project of this scale
- Insufficient financial needs; it has been clear that the limited budget is a threat in many aspects (this threat correlates with many of the above, if not all)

An especially tough stage for the project will be when the shift to a new technology generation occurs, that is, in our model, when the cycle ends and new technology generation has to be evaluated. If the OLPC Rwanda project survives the first five years (which is the estimated life-time of an OLPC laptop) then the choice of technology – the evaluation of all candidate technologies – must be done all over again. At this point, there might be several superior alternatives to OLPC (if the organization then exists at all). If a shift to an entirely different technology system occurs, for example to Microsoft Windows or Apple’s OSX, the whole organization in terms of competences, spare parts and way of teaching will have to adjust to this new technology. To a large extent, that would make the current organization inadequate, thus force it to reshape. This would be another financial burden to an already strained project.

5.4 Discussion - How to find the durable solution?

It is easy to criticise a developing country’s efforts; there are so many ways in which it can fall short. The threats to this project, mainly financing and lack of skills, is most likely shared by many other developing efforts around the world. Therefore, in discussing these elements of sustainability, you must take into consideration the economic power of the country and put this in context with the project. Rwanda is one of the poorest countries in the world. Consequently it would be unfair just to scream for more funds; this would draw money from other efforts currently taking place in the country and thus have a negative impact on the economy as a whole. The reduction of ordered laptops from the initial almost two million units to today’s 120,000 must, in this context, seen as something positive. Instead of using a substantial part of the budget to acquire a large number of laptops, bigger effort can be put into supporting and maintaining the ones ordered, as well as to keep the teachers up-to-date by continuous training.

It is still uncertain, however, if the money will suffice for the kind of challenges that the project currently is exposed to. The proposed solution, with great dependency on NGOs and volunteers, is risky. The curiosity from especially volunteers will decrease as the project loses public interest, and due to the intensive debate on the benefits of laptop-oriented education, NGOs will not be overly attracted to share their money on a project that is not in line with what their donors appreciate. However, if the laptops could be proven to have the impact that the OLPC organization wishes; that is, a radical effect (the effect must be significant in order to motivate the buy-in price of the laptop) on the learning curve, interest among NGOs would most likely increase. An evaluation of such would quickly become very complex if all
variables were to be taken into consideration though. Therefore it does not seem probable (maybe not even feasible) that such an evaluation is undertaken any time soon.

The other main threat to this project, the lack of skills, can be seen as somewhat similar in character to the financing dilemma. Rwanda’s educational system is still under reconstruction from the devastating genocide of 1994 and has not yet produced the number of skilled personnel that the country is in need of. The available IT competence has increased though and when discussing these aspects with local university students from Kigali Institute of Technology it is obvious that both quality and quantity of the ICT graduates will grow rapidly the forthcoming years.

So, financing and skills are valuable, but to what use are they if the project lacks organizational goals and planning? The stage of long-term planning must not be forgotten. What we have seen is that things run along very fast for Rwanda today – maybe too fast. In the quest to fast-track development, planning has gotten second priority. If the project turns out to be a failure, the lack of long-term planning will be a key factor in this, we argue. To some extent, the lack of planning is also due to the character of the project itself; the president of OLPC, Nicholas Negroponte, has put a large amount of prestige into this and works hard to see it through as soon as possible. At full-speed, things become difficult to plan.

What persists though, and speaks on Rwanda’s behalf, is a strong will to pursue the objectives. At all levels in the organization are we met with deep conviction that the project can sustain. Sometimes the conviction almost seems a bit naive; more than a few times were we told that the laptops will be distributed to all primary school students, so often that it almost became a truth for us too.
6 CONCLUSIONS

So, to what extent is the OLPC project sustainable? We cannot give any definite answer to this. What we can do, however, is to point at a few things that we argue will be highly decisive in setting the outcome of the project. First and foremost is the importance of financing; it must find additional funding and it must do so quickly. As of now, the project is very dependent on a steady flow of governmental financing. If funding were to cease, maintenance, training and support would hastily go down and the project would “die out” in a short time. Furthermore, the reliance on OLPC must be lowered. If OLPC were to withdraw then the entire project is in risk of being halted. Lastly, the organization is agile enough, but it does have difficulties in planning ahead. We argue that the project would benefit from ceasing the expansion and instead putting more emphasis on the current deployments. If the financing, skills and acceptance can be found to do this then the project may very well keep going well into the future.

6.1 Suggestions for further studies

The OLPC project is, globally, one of the largest implementations of ICT tools for developing countries conducted to date. Therefore, a number of aspects would be interesting to evaluate in relation to OLPC deployments, not just in Rwanda, but also in other deployments around the world. Firstly, it would very interesting to see an evaluation of the actual learning benefit from using the laptop. As improved learning is the whole idea of the OLPC initiative, a study revealing none or few educational benefits would be a hard back-slash for the project as a whole. The opposite would even more exciting; if computer usage can have a significant effect on the empowerment of children, well, then maybe more funds should be put into expanding this area. However interesting, a study of this amplitude would be a highly complex and immersive effort. A more realistic study would be to follow-up on the impact of OLPC on its surroundings. How are parents of children using a laptop affected? Can the laptop be used commercially? To what extent is the laptop usable after, say, three years of its estimated life-time of five years? There are numerous interesting aspects to be studied in connection with the OLPC project, studies that would be very helpful in understanding the role of ICT technology in developing work.
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Core Team

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Interview with Core Team member, 24 September 2009
APPENDIX A – INTERVIEW GUIDES

Outline of topics for interviews with the core team

Background
- Tell us a little about your organization
- Tell us a little about your background as a IT professional

The core team
- What is the mission of the core team?
- Why was the core team created?
  Who are the members and what are their respective roles in the team?
- What happens with the core team when the deployments are finished?
- Is the core team supposed to serve all schools in Rwanda?
- Is the team growing as more schools get involved?
- How does your collaboration with OLPC work? With RITA?

Deployment
- Have the teachers had any previous experience with computers? Had the children? If so: What did you consider the general computers skills to be within the teacher group?
- To what extent will you be on the schools after deployment? What happens when a student encounter a problem with the hardware of their XO? How is the software upgrades organized? Who will be responsible for reinstalls, updates, software issues etc?

Outline of topics for interviews with RDB-IT

OLPC related
- How did RITA get involved in the project?
- Was any alternative technology considered?
- What was RITAs role in the beginning?
- Did RITAs role change over time?
- Can you tell us about the process when choosing to take part in OLPC project?
- Totally 120,000 laptops, in what time frame?

Rwanda related
- In the rural parts of Rwanda
  o Internet access?
  o Power / electricity?
  o Future plans?
- Is the expansion of Internet and computer usage affected by OLPC?
- How many Universities / technical schools is there in Rwanda?

Statistics
- computer usage
Outline of topics for interview with MinEduc

Background
- For how long have you been working with OLPC?
- Was the MinEduc involved in the OLPC project from the start?
- Did you pick up on difficulties/possibilities in other countries?
- How was the difficulties recognized?
- How do you collaborate with the Learning Team?
- How do you collaborate with the Core Team?
- Future OLPC deployments: When, where and how?
- How will the core team expand over time?
- There was an initial work group for handling the contact with OLPC?
- Tell us about the work preceeding the pilot project.

Initial phase / trial
- How was the 2007 pilot project evaluated?
- What results have you seen of the pilot project?
- Was there any evaluation made of technical issues? Where Possibilities/problems in practice considered?
- When was the decision made to continue with OLPC after the pilot? Was the pilot to be considered as a test, before buying the 100,000 laptops?
- We heard that it was many problems with the laptops during the pilot, crashes, brakedowns etc. What assurances did you get from OLPC that the final version would be better?

General
- How will the work be divided between MinEduc and RDB-IT in the future? Will the core team still operate under MinEduc?
- There is a document called Deployment Workbook provided by OLPC, is this something you are using for budgeting?
APPENDIX B – QUESTION SURVEY

Murakoze kuzuza uju gipapuro. Buri munti afite kuzuza urupapuro rumwe gusa.

*Thank you for filling out this form. ‘please only submit one paper per person.*

1. **Wiga murihe shuri**
   *Which school do you go to?*
   - Kaciru □
   - Nonko □
   - Rwamangana □
   - Kagugu □
   - Niba wiga murindi shuri, ryandike hano ___________________________
   *Other, please specify*

2. **Uri mumwaka wakanghe mu ishuri?**
   *In which grade are you?*
   - P1 □
   - P2 □
   - P3 □
   - P4 □
   - P5 □
   - P6 □

3. **Wari wakoresha computer?**
   *Have you ever used a computer?*
   - Yes / Yego □
   - No / Oya □

4. **Hari icyo uzi ku mushinga was One Laptop Per Child?**
   *Have you heard about the One Laptop Per Child Project?*
   - Yes / Yego □
   - No / Oya □

5. **Mufite za computer ku ishuri?**
   *Do you have computers at your school?*
   - Yes / Yego □
   - Yes OLPC laptops / Yego, computer za One Laptop Per Child □
   - No / Oya □

6. **Mufite computer murugo?**
   *Do you have a computer in your home?*
   - Yes / Yego □
   - No / Oya □