One Laptop Per Child

Technology, Education and Development in Rwanda

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ABSTRACT

This thesis critically examines the One Laptop Per Child (OLPC) organization in the context of Rwanda's socioeconomic development plans for the year 2020. OLPC is a relatively new, large-scale development organization dedicated to the improvement of education in the world's poorest countries through the distribution of laptops specially designed for children. Rwanda is one of the poorest countries to have signed on the program since its founding in 2005, and ranks in the top five subscribers, having purchased 110,000 laptops for distribution among primary school students. The Government of Rwanda is committed to establishing a middle-income economy on the basis of an information economy, and has adopted OLPC to suit this agenda, while OLPC seeks to focus on the educational aspects of the program. This thesis, in the tradition of the anthropology of development, analyzes the motivations and ideals that guide both OLPC and the Government of Rwanda, and proposes that evaluating the program is better done by understanding it in its local context. This research is based on three months of ethnographic fieldwork in four grade five classrooms in urban Rwanda, along with interviews with key members of OLPC.

Cette thèse examine l'organisation, « One Laptop Per Child (OLPC)» dans le contexte des plans de développement socioéconomique du Rwanda pour l'année 2020. Fondé en 2005, OLPC est relativement grande et récente comme organisation. Cette fondation cherche à améliorer la qualité de l'éducation dans les pays les plus pauvres en distribuant des laptops conçus spécialement pour les enfants. Le Rwanda est un des pays les plus pauvres ayant souscrit à OLPC, mais, ayant aussi acquis 110,000 laptops, se trouve à être dans les cinq premiers pays souscrivant. Le gouvernement Rwandais cherche à établir une économie de taille moyenne basé sur l'informatique, et a adopté le projet OLPC pour servir cet agenda, alors qu'OLPC cherche plutôt à promouvoir l'amélioration de la qualité de l'éducation. Cette thèse, suivant la tradition de l'anthropologie du développement, analyse les motivations et les idées qui guident OLPC et le gouvernement Rwandais, en proposant qu'il vaille mieux évaluer le programme en contexte des valeurs locales. Cette recherche est basée sur trois mois d'étude ethnographique dans quatre écoles primaires Rwandaises, supplémentée d'interviews avec les chefs d'équipe et volontaires d'OLPC.

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CONTENTS

INTRODUCTION

This is not a thesis about laptops, but about the ideas and meanings that have traveled with a specific kind of laptop designed for children, from its conceptual birth place at the Massachusetts Institute for Technology (MIT) in the 1960s to the classrooms of Rwandan primary schools in 2010. The XO laptop, as it was named by One Laptop Per Child (OLPC), the non-profit which designed it, has recently become the focus of a large-scale development program in Rwanda. In 2008, 10,000 XO computers entered the Rwandan primary education system for an OLPC pilot program in which 18 schools participated across the country, providing most of these students and teachers with their own computer. The winter of 2010-2011 saw the distribution of approximately 50,000 more laptops throughout the country, while the Government of Rwanda (GoR) seeks to deploy a total of 110,000 laptops by the end of 2011. This thesis critically examines both One Laptop Per Child, a global non-profit that seeks to improve the quality of education in the world's poorest countries by providing each child with their own laptop, and the Government of Rwanda's (GoR) short-term development objectives which are based on building access to Information and Communication Technologies (ICTs). I will argue throughout this thesis that while OLPC and the GoR share in the modernization ideology that technology is the solution to the problem of socioeconomic underdevelopment, the facet of the program that each party prioritizes significantly diverges. In applying the critical lens of the anthropology of development to the abstract and practical implications of the OLPC program in Rwanda, I hope to employ a framework for understanding how the underlying values and principles which guide this particular variant of development program affect its particularities on the ground.

OLPC takes the view that the best way to prepare children to participate as fully developed citizens, in a rapidly and unpredictably changing world, is to "develop the passion for learning and the ability to learn how to learn" (laptop.org). Members of the organization contend that access to connected computers breaks down limits to children's learning as it provides them with the opportunity to engage with other people around the world while interacting with modern technology to which they would otherwise not have access. In short, the organization's name – One Laptop Per Child - summarizes its mission:

> We aim to provide each child with a rugged, low-cost, low-power, connected laptop. To this end, we have designed hardware, content and software for

> collaborative, joyful, and self-empowered learning. With access to this type of tool, children are engaged in their own education, and learn, share, and create together. They become connected to each other, to the world and to a brighter future (www.laptop.org/about/mission).

With such an explicit focus on the provision of laptops for the achievement of social well-being, OLPC has inadvertently become an exemplar of the Information and Communications Technology for Development (ICT4D) movement, which consists of the loose networks of interdisciplinary researchers and advocates for the application of Information and Communications Technologies (ICTs), technologies such as computers and computer networks, radio, and cellular telephony which facilitate communication, to the fields of international and socioeconomic development. Operating on the premise that digital technologies aid in the attainment of specific development goals (such as the ones set out by the Millennium Development Goals (MDGs)) by increasing efficiencies in the gathering and transmission of information crucial to the goal in question, advocates of such an approach seek to bridge the arguably growing divide between those who have and those who lack access to information and the ICTs through which it is obtained. More than that, however, OLPC's mandate emphasizes not just the application or distribution of technology to the underprivileged, but the dissemination of a particular theoretical approach to education based on the use of laptops designed for that purpose.

The theoretical approach in question has been labeled constructionism by its foremost thinker, Seymour Papert, who pioneered the use of computers in the 1960s for the purpose of improving the quality of children's education. Briefly, constructionism is presented as a solution to the domination of instructionist teaching techniques in primary schools (especially in developing countries). Papert (1980) has argued that instructionism, which favours dictation or lecture-style teaching and rote learning, is not conducive to the development of critical thinking and creativity among students, who emerge from the educational system unprepared for the rigors of problem-solving in the "real" world. The real world in which OLPC – which is the theory's greatest proponent – operated in 2010 was the global information economy based on neoliberal capitalism.

In Rwanda, this reality is the basis for the Government's development objectives for the year 2020. In a country that is very densely populated and lacking in natural resources, the

government has decided that its priority is to prepare its population for success in the information economy – which it intends to master by the third decade of the millennium (Government of Rwanda 2000). Based on this motivation, President Paul Kagame signed onto the OLPC program in 2007, demonstrating his confidence in the concepts of ICT4D in the process. Rather than focusing strictly on the educational aspects of the program, however, as most members of OLPC tend to favour, the GoR has sought to foreground the technological dimension, pegging the program as an ICT endeavour more than a scholastic one,[1] as a way to bring OLPC in line with its general program of development based on ICT4D.

While more than thirty developing countries have signed up for the OLPC program since its founding in 2005, I have opted to study the case of OLPC in Rwanda for two main reasons. In the first instance, Rwanda is one of the poorest countries to have signed on to the ambitious program, with the additional fact of having pledged to eventually distribute laptops to all of the 2.2 million school children in the country. As it is, Rwanda is the poorest country in the top five subscribers to the program, having purchased 110,000 laptops (laptop.org). Whereas other countries like Uruguay have already succeeded in saturating their school aged populations with laptops (Hourcade 2008), effectively offering one laptop for each child in their respective countries, their political and economic conditions were more conducive to reaching this objective. Second, Rwanda has asserted its dedication to becoming the ICT hub of the East Africa Community (EAC) in an effort to distinguish itself among its competitive neighbours, such as Kenya, Uganda, and the Sudan, who each boast higher mobile telephony subscription rates and internet users (Government of Rwanda 2000). This objective complements Rwanda's aspiration to reach middle income status by the year 2020 and reflects the current government's adherence to the principles of ICT4D.

The recent global influx of development strategies motivated by the premises of ICT4D, including for instance the proliferation of telecenters, e-government and e-medicine initiatives in much of the developing world, speak to a growing confidence in the emancipatory powers (Morello 2007:55) of digital technologies, especially the internet, in development circles. I have

[1] This is not to say that OLPC completely ignores that technology plays a hugely significant role in its organization, nor that the GoR has no intention of using ICT to help improve the quality of primary school education in Rwanda. I merely hope to show that either party tends to focus more on one or the other dimension of the program, which has a significant impact on the way it plays out in the classrooms.

sought to understand OLPC in the Rwandan context since it is the tenets of ICT4D that drive the program in this country, and Rwanda is most uniquely positioned as one of the poorest yet most dedicated countries to OLPC. This research, then, pays particular attention to the interchanges between the expectations and the practices of the program on the ground.

From a methodological and theoretical point of view, this research is particular in its simultaneous appraisal of the ideological origins of the object, which are rooted in Enlightenment concepts of social progress assisted by technological advancement (Ferguson 1999), and the observable interactions of people with the object, which reflect the meanings attributed to it (Prown 1982). Appadurai (1986:5) explains that even though objects have no value outside of that which is socially attributed to them, in order to fully understand the social place of an object in the world, it is necessary

> to follow the things themselves, for their meanings are inscribed in their forms, their uses, their trajectories. It is only through the analysis of these trajectories that we can interpret the human transactions and calculations that enliven things. Thus, even though from a theoretical point of view human actors encode things with significance, from a methodological point of view it is the things-in-motion that illuminate their human and social context. No social analysis of things … can avoid a minimum level of what might be called methodological fetishism, returning our attention to the things themselves.

Reflecting these concerns, this study is two things. At an abstract level it is an ethnography of a development organization, an analysis of the historical and theoretical trajectories that have evolved to take shape in a contemporary large-scale development program. From this broad perspective, the ideas that drive the organization can be isolated and analyzed, adding insight into the motivations for the program. The purpose of doing this is to make room for a critical analysis of the program. This is necessary because part of my argument is that OLPC is a development organization couched in the ideas and principles of 20th century large-scale development programs which have failed to produce any long lasting or expected results. James Ferguson (1990:4) has argued that many development programs since the fall of Modernization Theory have continued to adhere to the same principles of linear and teleological progress toward a specific formula of modernity, despite their efforts to develop innovative ideas or techniques to achieve that modernity. Bringing these particularities to light may help to point out

some of the deficiencies in a program which seeks to be innovative in its approach to international development.

At a narrow and experiential level this is a particularistic study of the program's instantiation in one specific location; Rwanda. OLPC does not operate in a vacuum, but must apply its educational and technological principles to the real-life scenarios of the developing world. The Government of Rwanda (GoR) has signed onto the OLPC program for specific reasons, which coincide with the objective to turn Rwanda into ICT-based economy, and the interactions between these two parties reveals the social processes which make up OLPC Rwanda. The data gathered for this level of inquiry emerges from three months of ethnographic fieldwork in Rwandan primary schools that have been assigned by the government to participate in the OLPC pilot program, and have received XO laptops for their students and teachers. The fieldwork in question has enabled me to "follow the things themselves" – the laptops – in their forms, uses and trajectories, and to establish through observation, patterns of interaction with the laptops that reflect the meanings and concerns of individuals vis-à-vis the object. In this manner, I have managed to observe the tension that has arisen between the development objectives of OLPC and the GoR. Although both parties adhere to the modernization metanarrative (Ferguson 1999), they each have their own ideas about the best way to use the laptops in order to achieve this. In short, and this will be explored in greater detail throughout the thesis, while OLPC members emphasize the educational aspects of the program, the GoR tends to favor the technological attributes of the program.

Thus, where OLPC's critics tend to focus their questions on the effectiveness of the program, and even the legitimacy of offering computers as a solution to poverty in the developing world, my own intention in this work is not so much to evaluate, but to offer a critical investigation of the trajectory of intellectual orientations that motivates the program. By intellectual orientations I refer to the combination of explicit theories and implicit premises that guide the development program of interest: OLPC. Much like Tania Li, "[i]n the classic tradition of anthropology, my approach…is to make improvement[2] strange, the better to explore its peculiarities and its effects" (2007:3).

[2] Development.

Methods

As mentioned above, this thesis is based on three months of ethnographic research in Rwanda, the majority of which was spent in Rwamagana, a medium-sized town an hour outside Kigali. In an effort to gain a general understanding of OLPC's functioning in Rwanda, I opted to divide my research time between four different schools that were participating in the program. This approach exposed me to a reasonable degree of variation in terms of administrative approaches and attitudes to the program (from the standpoint of the headmaster/mistress and head teachers), the attitudes and concerns of the teachers, and the configuration of the student body at each school. Because each school was located in a socioeconomically different area and each had particular usage patterns, comparing the schools was useful for gaining a more comprehensive understanding of the functioning of the program in Rwanda.

The Schools

Of the four OLPC schools that I visited, three were located in and around Kigali; these were Nonko Primary,[3] ESCAF Primary, and Kagugu Primary. The other school was located an hour away from Kigali (by bus) in Rwamagana. I decided to work in these particular schools because they were the four main schools where the OLPC deployment team, which consisted of local and foreign employees, interns, and volunteers regularly conducted training sessions with the teachers and students to familiarize them with classroom uses for the laptops. Having first made contact with this team, they graciously offered to introduce me to each school and allowed me to attend their trainings. The number of students per school ranged from approximately 800 to 1000 with a student to teacher ratio that I estimated at 75 to 1.

a. Rwamagana B Primary School

In Rwamagana, next to the road that leads in from Kigali, stands a simple blue and white sign that indicates the words "*Ecole Primaire Rwamagana B*" [Rwamagana B Primary School] with an arrow pointing to its destination. Rwamagana B is one of the oldest primary schools in Rwanda, built in 1919 and run by the adjacent Catholic Church since its inauguration, and is located in its namesake town – approximately one hour away from Kigali city center by public

[3] Pronounced *Nung-ho*.

transportation. The school is nestled only steps away from a major thoroughfare leading into the city from Kigali, where a number of other primary schools punctuate the landscape.

According to the OLPC Learning Team's website (2009) Rwamagana B Primary is the first school in Rwanda to have received laptops and training from the OLPC program in 2007 – obtaining 750 laptops for 822 students (Primary level 1 (P1) classes do not have laptops), and 12 teachers. Students were given full ownership of their laptop and were expected keep it with them at school and take it home at the end of the school day at 5pm. The school is equipped with a large satellite dish in the front yard, which is intended for the provision of internet connectivity to the OLPC program. However, by May 2010, the internet connection had been dysfunctional for several months due to hardware issues, which were only corrected by technicians approximately two weeks before the end of the school year in August 2010.

In the meantime, the teachers received regular training sessions from OLPC staff and volunteers, approximately once a week for two or three hours at a time. These sessions were geared toward helping the teachers improve their familiarity with the software, and encouraged them to think of and develop creative ways to integrate the laptops into regular classroom activities.

b. ESCAF Primary School

Children in green and white school uniforms are often seen playing energetically in the vast dirt driveway of ESCAF primary school (*École des Sciences, Anglais et Français)* located in the Nyamirambo district of Kigali, fifteen minutes from Kigali city center. The school, a modest two story brick building which overlooks green hills speckled with homes, and is one of the only private schools in Kigali to have taken part in the OLPC pilot program between 2007 and 2010.

Because ESCAF primary is a private school, it participates in the OLPC program with the condition that students and their parents pay for the laptops, as per a government policy which stipulates that only students of public schools can obtain government sponsored laptops. Though this policy ignores one of the key principles of OLPC, which is to ensure free and equal distribution of laptops to all children the project needed financial support in order to keep afloat for the first distribution of 10,000 laptops, so a decision was hastily made to sell the laptops to private schools as a way to help subsidize the program. The headmaster of ESCAF explained that

only about 45% of the students from grades 4-6 at this school were able to obtain laptops, since most parents could not afford the nearly 200USD price tag of the laptops which were sold at the Ministry of Education. To make up for the unavailability of laptops for each child at ESCAF, the administration approved a plan proposed by OLPC, in consultation with teachers and parents, that children share the laptops for lessons that were scheduled to be taught with their use. These lessons would take place approximately twice per week for one hour each.[4]

In an effort to maximize the use of the laptops among students who owned them, the OLPC team suggested to implement a "clubs" system, where laptop owners were invited to join volunteers on Monday afternoons for an hour or so to participate in an activity of their choice: "Journalism," where students learned how to write their own articles, take pictures, and assemble them using software similar to other "Word" programs; "Game Programming," where students learned to design their own computer games using a simple programming software called "Scratch"; and "Stories," where children read and wrote their own stories, incorporating images that they either drew, gathered from photographs they had taken, or collected from the internet. The internet connection at this school was not functional during the summer of my visit, but students often located their own sources of access (often stealing internet from cafes and other wireless networks).

Of course, the major concern with this approach, which was expressed by teachers and OLPC members almost immediately, was that the segregation of the school into laptop owners and non-owners ran the risk of causing conflict and neglecting the overall purpose of the program, which was to offer computer access to all students. But working within the framework that they were given, they did their best to accommodate as many needs as possible by making sure the students who did own laptops felt that their investment was warranted, and encouraging these same students to share the things they had learned during Monday afternoon clubs with their peers during a scheduled one hour lesson during class time on Tuesdays.

c. Nonko Primary

[4] This pattern took place for approximately a one month adjustment period during which the teachers were more passive while OLPC trainers led sessions with students. Following this, in June 2010, the trainers encouraged the teachers to take a more active role while they assisted when needed, so that the teachers could become accustomed to designing and delivering their own lessons with the laptops.

Only a five minute motorcycle ride away from my home, and even closer to Kigali International Airport is located Nonko Primary school (pronounced *Nung-ho*). Because of its proximity to the airport, which is host to one of the country's better wireless internet connections, the school made headlines when it became apparent that students would whisk away to the airport after school with their new laptops to take advantage of the free internet (Melanson 2009). Nonko had been promised an internet connection from the beginning of the project, but was still awaiting a server in the summer of 2010.[5]

By 2010, most laptops were locked in a storage room inside the headmistress' office as a theft-prevention tactic. The government had instilled regulations preventing students from taking the laptops home at many of the OLPC schools in order to reduce the number of thefts.[6] The headmistress expressed her desire to allow students to bring them home during an interview, but was restricted until the government issued a letter to participating schools stipulating that students could begin to take them home.[7] In the meantime, a classroom had been reserved as a laptop room, equivalent to a computer lab, which permitted teachers to offer a laptop lesson once a day (or once a week, depending on which teacher I talked to) for the duration of a regular class, which lasted for about forty minutes.

d. Kagugu Primary

Kagugu Primary school was the largest and most orderly of the primary schools to which I gained access for this research. Gleaming white buildings topped with blue zinc roofing encompassed two or three courtyards covered in shining white sand, and the reading hall and library were beautifully decorated with Safari themed murals. What seemed to distinguish the school from the others more than its appearance was the socioeconomic makeup of the neighbourhood, which directly affected the laptop program at the school. I had learned from Richard Niyonkuru at the Ministry of Education that Kagugu was a special case for OLPC

[5] The specific reason for the lack of internet connection at Nonko is unclear, but following the general patterns from other schools, the likelihood is that there were either a lack of funds for setup and maintenance or there was a bureaucratic lag at the Ministry of Education.

[6] Conversations with OLPC staff and volunteers hinted that the number of thefts was not great, but had a major impact on community confidence in the program when parents, who could not afford to pay for the laptops, were held responsible for replacing them if lost or stolen.

[7] OLPC staff and primary school teachers had been waiting for weeks for this letter but had heard no news from the government in some time. The bureaucratic process seemed to be a hindrance in this case.

because although it serviced a poorer segment of the population, the school was located in the middle of a rapidly gentrifying area. A local OLPC intern explained that the neighbourhood was once quite poor and not considered part of Kigali, but with the encroachment of mansions and more expensive homes had become a suburb of the capital. Richard explained to me that unlike Rwamagana B, Kagugu students are not permitted to take the laptops home because of the fear of theft. Government officials fear that the risk of having children bring the laptops into the lesser developed part of town is too great for the program, so Kagugu's laptops remain locked in the classroom closets overnight.

Participant-Observation and Interviews

In-classroom observation was one of the key techniques that permitted me to first familiarize myself with the routines of primary school education in Rwanda, and second, to discern the specific patterns of laptop use in the classroom setting. It allowed me to determine what kind of software was being used with the computers, how often it was being used, and how it was being used to enrich the lessons, if at all. Participant-observation took place on a number of occasions, where I was able to observe the OLPC training teams as they instructed children and teachers on how to use the computers, while at the same time, learning with the students and assisting them minimally in small tasks such as navigating with the mouse, adjusting the sound, or installing simple programs with a USB key.

Participant-observation would serve as a platform for conducting formal and informal interviews with OLPC stakeholders, which included MIT-based Chief Learning Officer, David Cavallo, Learning Development Specialists Michael Alvarez and Virginia Dias, OLPC employees who were charged with training teachers and students in the use of the laptops, foreign volunteers who assisted in this process, and local interns who were trained by OLPC to assist in the functioning of the program in classrooms. In addition to communicating with OLPC stakeholders, I sought to interview members of the Rwandan primary education system, including school headmasters and headmistresses, and teachers and students of Primary level 5 (P5) classrooms to get a balanced set of voices from both the non-profit and from the school

system.[8] Complementing these interviews were brief contacts made with some of the Ministers involved in the implementation of OLPC from above, such as Richard Niyonkuru, who had previously been the coordinator of OLPC in the Ministry of Education and who had recently been replaced by Nkubito Bakuramutsa, along with publicly available information on the roles of President Paul Kagame and Nicholas Negroponte (the founder of OLPC). The combined information from participant-observation, interviews, and archival data thus provide a good sense of the structure of OLPC as it plays out in Rwanda.

Outline of the Thesis

This thesis is divided into two sections and four chapters. In Part I, which consists of three chapters, I introduce—from a bird's eye view—the objectives made explicit first by the One Laptop Per Child (OLPC) and then, by the Government of Rwanda (GoR). Chapter 1 outlines the current role of OLPC as a global development organization, with a specific focus on its structure and organization in Rwanda from 2007 to 2010. This more abstract approach is complemented with up-close examples of the ways in which the laptop is used, and not used in the ways intended by their designers and theorists. Highlighted in Chapter 2 is Seymour Papert's educational theory of constructionism which guides and motivates the tasks of OLPC in Rwanda as elsewhere, as well as the practical approach to its implementation in the Rwandan school system. Chapter 3 outlines the historical and ideological context of Rwanda's decision to adopt the OLPC program as a means for bolstering the government's development goals for the year 2020. The purpose of juxtaposing these chapters is to describe the background that has led to the marriage of OLPC with the GoR, while exposing the divergences in the theoretical and practical orientations of both parties toward the laptop program.

Part II, consists of the Chapter 4, which traces the material and social life of the laptop to demonstrate the erroneousness of the "Western" belief that objects, commodities, or technologies will necessarily carry with them the ideas of their inventors to their recipients.

[8] I chose to conduct research in Primary level 5 (P5) classrooms for reasons of consistency and convenience. OLPC is directed mostly toward students in Primary level 4-6 (P4-P6) classes. P4 students generally have not yet begun to grasp the English language, while P6 students were often off-limits due to their intensive examination preparation period. P5 students had a reasonable grasp of English and were generally available for conversations and in-class observation.

PART I: CONSTRUCTING A VISION

CHAPTER 1

A NON-PROFIT'S MANDATE

An Overview of One Laptop Per Child and its Applicability to Rwanda

The Laptop

"This is very exciting! I've never had a chance to see the XO laptop in person." I blurt out, with a sheepish grin. It's midday and I'm sitting in a padded, dark brown, faux-leather chair at Bourbon coffee shop, the favourite hang-out for many expats and middle class Rwandans, located in the Western-style Union Trade Centre mall in Kigali. Two tables have been hastily pushed together to make room for the eight chairs that now seat the core members of the One Laptop Per Child (OLPC) Rwanda team.

David Cavallo, who's just ordered an espresso from the waiter, sits across from me, the signature of his untamed grizzled hair and beard complimenting his youthful demeanour. He's that "other guy" frequently featured next to OLPC's founder, Nicholas Negroponte, in press photographs. But he's more than that; he's the Project Director and Learning Expert for OLPC, and is now leading the program's development in Rwanda. I am lucky to have made this contact, which I managed through internet networking prior to my arrival in Rwanda. In this way I came across a blog featuring the name of Virginia Dias, the Learning Development Specialist at OLPC, who had been involved in a weeklong training session in Kigali. I contacted her on Facebook, having no email address, and she kindly connected me with the rest of the team through David's partner, Joy Ventura Riach, who coordinates the team members on the ground. They too are both present. Virginia's partner, Michael Alvarez, is also a Learning Development Specialist and he is seated next to Stephanie, a contractual trainer, and Samuel Dusengiyumva, the OLPC Rwanda Country Manager. My supervisor from the National University of Rwanda, Professor Evode Mukama, has also made the two hour journey from Huye[9] to take part in this first meeting, where I am to introduce myself to the team as a researcher, and discuss the direction of my project.

[9] Formerly known as Butare.

Everyone is smiling at me, and David invites me to "attach" myself to the team, to tag along with the interns and volunteers, and observe as much as possible. He welcomes the opportunity to receive feedback from an outsider unconstrained by a training schedule, and who can observe classroom progress in the absence of volunteers. Many of the other members agree.

At this moment I'm aware of the amount of work and anticipation that has preceded this meeting. I've been researching OLPC for close on two years, yet I've never actually seen the famous laptop; only in photos. And so out comes the uncomfortable truth before I can stop myself. "I've never had a chance to see the XO laptop in person."

And all of a sudden it's in my lap. Stephanie has expediently unzipped her backpack and handed me the green and white icon, before I've even had the opportunity to feel the flush of embarrassment about my too-honest revelation. I hold on with both hands for the first few seconds, unsure how to handle it under the gaze of so many experts. I test the weight by gingerly bouncing it against my fingers – I'd say about 3 pounds, the same as my netbook. The laptop is closed, and looks like a white square with rounded corners, with a lime-green plastic moulding on the edges. The top of the laptop features a built-in handle, which is cut out of the frame in the shape of an oblong hole, with one circular hole at each end for a thumb or a finger, which facilitates different holding options, depending on whether the laptop is open or closed. The configuration of holes reminds me of Morse Code: dot dash dot (• ─ •). The white section of the laptop is textured, and I run my fingers over it, and along with the "XO" logo (which, featuring a coloured circle above an "X," looks like the schema of a person), as I start considering the mechanism for opening the laptop. This isn't immediately obvious, and I realize I need to be strategic since so many people are observing me. The laptop is sealed at all the edges, and there is no visible opening or tab with which to pry it open. No one offers any assistance, and I begin to feel as though I'm being tested.

And then I remember the pictures. I've seen so many pictures of the open XO with its tell-tale pair of moveable, green antennae to facilitate connectivity to either a mesh or internet network. I turn the laptop on its side. Bingo. There is a diagonal slit running the thickness of the laptop in the green trim, about a third of the way down the side. I push with my thumb on this section of the moulding, and it gives way, turning on its fulcrum to point away from the computer. That's

one antenna. I do the same with the other, and I have two green bunny ears on a closed laptop. The locking mechanism is now out of the way, and the laptop opens, to the satisfaction of my observers. They congratulate me and I laugh away the nervousness.

Then someone says something to the effect of: "The most embarrassing thing is when you have a politician being filmed while he's trying to open the laptop, and no one's told him how to do it beforehand." Followed by laughter, and: "The children have no problem figuring it out for themselves…it's the adults who have a hard time".[10]

Relieved to have passed the test, I unfold the laptop to reveal the 6 x 4 inch screen and bright green key board. The keys are surprisingly small, made up of a single sheet of rubbery green material with raised squares for each letter – from what I've read I already know that this is to prevent dust and moisture from getting into the computer. I touch the keys to see how they feel; they're soft and springy. But I don't turn on the laptop, as I know we have much to discuss before I head to the grade five classrooms to observe the laptop in action. I close it and return it to its owner, a little sad to let it go, but eager to see how it is used in the classroom.

The Organization

The XO laptop was designed by and for One Laptop Per Child (OLPC), which according to the official website, is a global not for profit foundation dedicated to the improvement of the quality of education in the world's poorest countries by providing one low-cost laptop for each of the world's poorest and most isolated children (www.laptop.org, www.wiki.laptop.org). The non-profit's mission, says the website, is to "empower" children who otherwise have limited educational opportunities. XO enthusiasts such as David Pogue, who describes the laptop on the OLPC website, have characterized the machine as a model for the triumph of technology and education over poverty: "the idea behind this is to make it so inexpensive that poor countries can afford to buy them for their students – their education deprived students – in the hundreds of thousands, or the millions" he explains. As a complement to the United Nations Millennium Development Goal (MDG) to increase primary enrolment in developing countries, OLPC aims to improve the quality of that education.

[10] Jimmy Lee Shreeve noted in a *The Independent* article on November 23rd 2005 (Luyt 2008) that the UN Secretary General at the time, Kofi Annan, broke the model prototype while unveiling it at the World Summit on the Information Society held at Tunis in November 2005.

In 2005, Nicholas Negroponte, the founder of OLPC, announced the launch of the XO to the World Economic Forum (WEF) (Luyt 2008:*n.p.).* Shortly thereafter OLPC began selling the laptops directly to governments, who would distribute them to primary school students with the help of their national deployment teams (Luyt 2008:*n.p.*), with Rwanda joining in 2007. At the beginning, Negroponte sought to have OLPC manufacture and distribute 100 million laptops at 100USD[11] apiece to the world's poorest children. In reality, by 2010 the website announced that approximately two million laptops had been distributed to more than thirty countries (at about 188USD each), the five largest deployments being in Uruguay, Peru, Argentina, Mexico and Rwanda. For countries signing on to the program, the appeal of OLPC rests mainly in two things: the cost of the laptop, which although is greater than the anticipated 100USD price tag is much more affordable than most other laptops on the market, and the potential for the laptop to aid in the improvement of childhood education in poor countries.

As a development organization, OLPC oscillates uncomfortably between two categories – one imposed from outside, and one self-imposed. On the one hand, technology enthusiasts tend to pigeonhole OLPC as an Information and Communications Technology for Development (ICT4D) non-profit, that category of organizations that seeks to apply Information and Communications Technologies (ICTs) such as cellular phones, internet, and computers to the improvement of socioeconomic development in poor countries. On the other hand, the founder of OLPC, Nicholas Negroponte, insists on the website that "It's not a laptop project. It's an education project." From his point of view, the technological aspects of the organization, though foundational to its mandate, are secondary to the desire to improve the quality of education in developing countries.

Technological enthusiasts tend to praise the XO for being lightweight, robust, and sealed against the elements – features that distinguish it from regular laptops as a learning tool for children in difficult developing country conditions, where often classes take place outdoors. For example, the publicity around the Sugar interface developed for the XO, which is the first "truly new" interface to emerge in three decades (Thornburg 2008), has also created buzz related to the

[11] The laptops ended up costing more than 100USD, selling for approximately 188USD each, but were still significantly less expensive than "normal" laptops, which encouraged many countries to sign on to OLPC. The innovation of the smaller, less expensive laptop has also inspired the development of netbooks, which are smaller, more compact, and less expensive versions of traditional laptops and have taken a large share of the global laptop market since 2007.

technology. And David Pogue's brief video description of these features on the website offers a laundry list of other attributes, such as its durability, exceptionally long lasting and easily replaceable battery, adjustable screen lighting settings which permit reading in direct sunlight, hyper-efficient power consumption, and the open source software environment which permits children to reprogram the computer.

But the laptop, according to the members of OLPC, is more than just an object or technological curiosity. More importantly, it is pregnant with both the idea and the plan to change the socioeconomic configuration of poor countries. The laptop wiki, which outlines the organization's objectives, describes the laptop as a "machine with which nations of the emerging world can *leapfrog* decades of development" [emphasis added]. The educational section of the website states that the hope is to provoke a global revolution in primary education in order to eventually boost socioeconomic development in the most marginal countries. In this manner, both OLPC and the Government of Rwanda (GoR) adhere to the notion that Rwanda must progress beyond its current state of 'underdevelopment' and poverty to become a 'developed' nation, sharing in the benefits of the modern world.

This approach to development shares the linear teleological element of progress made explicit in 1950s Modernization Theory (Ferguson 1999), which theorized that nations must follow specific stages of development from simple and backward to complex and advanced, usually through the process of industrialization (Rostow 1960). According to Nils Gilman (2003:2-9), a range of modernization theorists from the period, such as Gabriel Almond, Lucian Pye, David Apter, Cyril Black, Bert Hoselitz, Myron Weiner, Karl Deutsch, and David Lerner, sought consistently to rectify the gap between "traditional" and "modern" societies (the latter of which resembled the social and political configuration of liberal industrialized American society, while the former rested in conservative and simple social organization), although they often diverged in their preferred methods for modernizing them. I would like to posit, similar to James Ferguson (1990:4), that despite the discrediting of Modernization theory in the 1970s (Gilman 2003:3) because of its homogenizing paradigm and inability to bring about the intended socioeconomic reformation in so-called traditional societies, many contemporary development practitioners and governments continue to adhere, perhaps "pretheoretically" (Appadurai 1996:1) to many of the same scripted development ideals as modernization theorists. The element of continuity with

modernization theory in OLPC's approach to development is the assumption that poor countries like Rwanda can and should make and institute plans to transform them from traditional to modern societies. Though this continuity may be disguised by the apparent novelty of applying "new" technologies like the XO laptop to the development enterprise, some of the central tenets of Modernization Theory in fact remain an important factor in the program. Ferguson (1990:4) explains that

> development discourse has changed throughout the decades – from its emphasis on economic growth and industrialization of the 1950's to the focus on sustainable development of the 1990's – managing nonetheless, to maintain a certain core of elements and relations intact. As the apparatus incorporated new domains into its scope, it certainly changed, yet its basic orientation went on unchallenged. Whatever the modifier that was attached to it, the fact of development itself was not placed under radical questioning.

Recently, then, the focus of some development programs like One Laptop Per Child has shifted from that of industrializing nations as a method to boost economic growth and social well-being, to one of leapfrogging, or skipping over, those stages through the use of new technology[12] – the modifier to the old development paradigms - to achieve a faster rate of development. For OLPC, this manifests itself as the objective to develop competitive critical thinking and adaptability skills in the citizens of countries that sign on to the program to ensure their compatibility with the new global information economy, such that they may more quickly attain the status of modern nations.

Paradoxically, OLPC's attempt to distinguish itself as an innovative approach to development seems to rehash some of the same premises as modernization theorists. Where originally, modernization theorists sought to "accelerat[e] change almost in the manner of a *jump*, omitting as impractical some of the historic stages of transition" (Gilman 2003:6, emphasis added) that European and North American nations had to go through to achieve their current stages of development, OLPC seeks to leapfrog the stages of development laid out by modernization theorists to achieve an even more accelerated path to modernity. These stages generally were

[12] It is difficult to pinpoint the definition of new technology, since any technology that has emerged in recent history may be considered to fall within that category. Here, I would like to specify that new technology(ies) refers to the plethora of digital or electronic technologies that have been developed and marketed for commercial or consumer use in recent decades, and especially since the 1990s, from cellular telephones, internet search engines, social networking sites, to laptop computers.

thought to include "technological advancement, urbanization, rising income, increased literacy, and the amplification of mass media" (Gilman 2003:5). For OLPC, the best way to jump over these steps (especially industrialization) is to educate children so that they may be prepared to participate in the modern information economy – the XO laptop is the best tool, according to this perspective, for achieving this leap. For Rwanda, this means developing an ICT-based economy out of the currently dominant agricultural economy without having to go through the extra step of industrializing the country first.

OLPC is complex in its indirect approach to achieving development, which foregrounds the use of technology as a means to changing the education system, which in-turn is expected to improve the social well-being of the upcoming generation. In this thesis, I argue that OLPC and the Government of Rwanda (GoR) emphasize different elements in this approach of combining technology and education to improve the well-being and increase the income of Rwandan citizens. The combination of this tension between OLPC and the GoR, with the overarching fact of the adherence of both parties to a "top-down, technology and capital-intensive intervention," a type of approach which historically has achieved "poor results" (Escobar 1997:3), manifests itself in the weakening of the outcome of the organization's efforts.[13]

OLPC and the GoR silently disagree on the best way to achieve the desired result of a modern Rwanda with the help of the XO program. Gilman (2003:9) argued, that "[d]espite their shared belief that modernization would bring American-style health, wealth, and democracy to traditional nations, modernization theorists disagreed about how this goal would be achieved," and although OLPC and the GoR are not run by modernization theorists per se, the leaders of both tend to struggle with the same dilemma. It appears that OLPC and the GoR share a common ideological orientation and objective, which is modeled upon the myth of modernization, where the idea that Rwanda is "destined to move ahead to join the ranks of modern nations" (Ferguson 1999:14) acts as a catalyst for action plans to achieve that objective. To clarify, I borrow James Ferguson's (1999:13-14) analytical distinction between myth in the popular sense, which is taken to be "a false or factually inaccurate version of things that has come to be widely believed," and in the anthropological sense, "which focuses on the story's social function: a myth in this sense is not just a mistaken account but a cosmological blueprint that lays down fundamental categories

[13] This will be discussed especially in Chapter 4.

and meanings for the organization and interpretation of experience." In the latter sense of the term, therefore, OLPC and the GoR, share in the common myth of modernity, which organizes their plans for making Rwanda modern with the help of the XO laptop, but diverge in their plans for achieving it.

OLPC seeks the use of the laptop as a means to the end of radically transforming the education system to improve the critical thinking and learning skills of children. In order to achieve this, OLPC stresses the implementation of five basic principles (described below) to achieve the spread of a subculture that promotes learning *through* computers. By contrast, the GoR, while paying lip service to OLPC's abovementioned objective, sees the use of the XO laptop in the education system as an end in itself. This end reflects Rwanda's short-term development objective, which is to achieve ICT-based economy by the year 2020 (Government of Rwanda 2000). In this way the GoR tends to prioritize the distribution of laptops as a way to promote learning *about* computers, in order to fulfill its desired vision for its country. The two approaches, it will be shown, are incompatible as they require different approaches to implementation. The following section outlines the five principles that drive OLPC and the way they have worked out in Rwanda.

The Five Principles of OLPC

The "Invisible" Boy

"I want to be a pilot!" exclaims a young boy after a burst of playful of energy. It's mid-afternoon and I am waiting patiently in the shade of a church next to Nonko Primary School for the arrival of the Headmistress so that I can interview her. With the help of my translator, Mirene, I am having a casual conversation with him and his friends as they play in the church yard just behind their school.

"My favourite subjects are Maths and Kinyarwanda" he adds, followed by an unexpected spectacle of a handstand; blue foam sandals dangling mischievously above his head as he substitutes his hands for feet on the cool concrete of the church's landing.

"Have you had a chance to play with the laptops?" I ask, wondering whether the older students have shared with the younger students. At Nonko, only students from grades four to six have

been granted access to the laptops, and this boy is only in grade three. He shakes his head – "No."

The boy sprints away, running earnestly back and forth over nearby hedges, trailing his opened green and white checkered uniform shirt like a cape in the wind. Two or three other boys – all about ten years old – chase each other about, and all follow our protagonist when he returns to tell me something. Through Mirene, he explains to me that he and his friends have discovered a boy from another school playing with a laptop that (presumably) does not belong to him (since Nonko is the only school in the area that participates in the OLPC pilot).

"Where did he get the laptop?" I ask. The boys respond that they do not know. Wondering whether this is possibly a case of a stolen laptop, I open my mouth to ask about it, but they have already begun to tell me that he is sitting behind the church, just a few meters away from us. The boys run together to show me where he is, and lead me to the side of the church, into a narrow alley bordered on the right by a raised outcropping of dirt, grass, and shrubs, enclosed by a rusty barbed wire fence.

As we turn the corner and walk a little ways down the side of the church, I see a horde of boys in green and white, hunched over a concealed figure, their heads vying for a comfortable vantage point over their object of interest. They are so concentrated that they are oblivious to our approach, until we are close enough to see above their heads.

"*Muraho*" I say, ("hello"). With surprise, the boys' heads whirl about to see the source of the foreign accent. Some of them immediately leave the circle, parting ways to reveal the object of their infatuation: the invisible figure from just a moment ago reveals itself to be a boy holding the tell-tale green and white laptop. He is bigger and has a deeper voice than the other boys - he tells me later that he is fifteen years old. The half dozen or so boys around him are closer to eight years of age. I peer over his shoulder and observe that he is playing a game on the laptop, and it quickly becomes apparent, from the first-person shooter on the screen that is dispatching a horde of zombies in the background, that the game he is playing is "Doom."[14]

[14] According to wiki.laptop.org, the wiki for OLPC, "Doom is a first person shooter game with content that is probably not suitable for young children, but is great fun for older ones."

Intrigued by the game and the hubbub around it, I move closer to ask the boy some questions, but he avoids looking me in the eye despite my attempt to make friendly conversation. I ask him about the laptop, to which he responds – still avoiding eye contact - that his friend and neighbour, who is a student at Nonko, has lent him the laptop to play with, and in less than one day he has managed to learn how to play "Doom" and other games, take photos and videos, and navigate Write Activity, on his own.

Immediately having answered my questions, he proceeds to pack up the computer into his sky-blue shoulder bag and prepares to leave. It is obvious that I've made him uncomfortable, so I ask Mirene to find out why. After discussing with him briefly, she turns to me and explains that he was scared, thinking that we had come to take the laptop away. I suppose we had an air of authority about us and he may have felt uneasy playing with a computer that did not belong to him. He stands around for the next few minutes while we talk to the others, but he soon disappears and I do not see him again after that.

The remaining boys tell us more about the laptops at Nonko. They explain that when they first received the laptops at the beginning of the second trimester (a few months before) they had access to them and could take them home for the first week, but have not been permitted to take them home since. This week is an exception since a training session has been scheduled at the school, and children have been permitted to take them home for its duration. (I learn later during my interview with the headmistress that the laptops were kept in storage for safekeeping, to prevent theft, and that one room is reserved for laptops to be used once a day by each class, for one period. Another teacher tells me later it is actually only once a week per class, for 40 minutes). I ask the students what they had liked to do with the laptops when they had them. Much like the older boy, they like to play games, take photos and search for their favourite celebrities on the internet.

* * *

a. Child Ownership of Laptops

According to the One Laptop Per Child (OLPC) official website, the five principles that guide the non-profit are child ownership, low ages, saturation, connection, and free and open source

software. But like the case described above, the obstacles to fulfilling these principles are many. In the case of Nonko Primary School, as with many of the other schools involved in the OLPC pilot program (where 10,000 laptops were distributed to select schools), the first principle, child ownership, has been compromised.

Members of the organization, such as Michael Alvarez, the Learning Specialist for Rwanda's laptop deployment team, and David Cavallo, the Project Director and Learning Expert for OLPC, argue that child ownership of the laptop offers greater opportunity for exploration and learning than the traditional computer lab approach, as ownership increases the child's exposure to the technology in an open, flexible, and interactive manner. Michael poignantly expressed his distaste for computer labs, and his concern with ensuring that each Rwandan child should be provided with a laptop:

> Seymour [Papert][15] in 1990 wrote a book called "The Children's Machine" and in the introduction of the book he said that computer labs is the defense mechanism that schools used to assimilate computers into the previous existing [school] system. So it's a defense mechanism. Our big fight last year [2009] was to push …the [Rwandan] government; kids need to be provided with one laptop per child, and you need to allow kids to take the laptops home. If you guarantee that - that is still our big push, it's a continuous fight - if you guarantee that, the project has a chance to succeed and overcome the defense mechanism of the schools. If this does not happen, you know that laptops will wind up in the lab, that kids will have access once a month, 45 minutes. That's it (Michael Alvarez, July 23, 2010).

Child ownership, according to the organization's wiki, means that "a laptop can be transformed into a mobile school: a portable learning and teaching environment. A connected laptop is more than a tool. It is a new human environment of a digital kind." But at Nonko, the children were only permitted to take the laptops home for the first week of the program, after which a computer lab was designated in order to prevent thefts. The Ministry of Education (MINEDUC) had sent out a decree to the school disallowing the laptops from leaving the school because some thefts had been reported and parents could not afford to pay for their replacement. As a result, nearly 800 laptops remained in storage there, preventing the establishment of that "mobile school" described by the organization. As a result, only fleeting moments of the vision to offer child

[15] Seymour Papert is one of the most important figures to have influenced the development of the One Laptop Per Child non-profit. He pioneered the educational philosophy of constructionism, which encourages the creative use of computers and robotics among children to improve the quality of learning. Papert and his ideas will be explored in greater detail in Chapter 2.

ownership and expanded access to information were experienced by the children of Nonko, such as when the older boy managed to gain access to a friend's computer, and shared his experiences with his younger friends.

In another rare instance of laptop exploration beyond the confines of the Nonko computer lab, the students at Nonko, which as mentioned earlier is located minutes from Kigali International Airport, demonstrated the benefits of permitting children to take their laptops home. In conversations with a group of young students and a teacher, I discovered how they went about acquiring access to the wireless internet connection at the airport in the first week of the program, since connectivity had not yet been made available at the school. The teacher informed me that he himself had taken a group of five students to the airport to teach them how to access internet and search for information about the animals that lived in Akagera National Park.[16] He had asked permission from the guards at the airport, who generously allowed them a few minutes to search the internet for free. The teacher's eyes lit up as he recounted the lesson he had given about wild animals with the use of the Google search engine, which had hitherto been unavailable to him as a teaching tool. Unfortunately, because the government did not yet permit children to take the laptops home on a permanent basis, this experience was only an exception. From the point of view of OLPC, then, the simple fact that Nonko had received the laptops was not enough, since the fulfilment of first principle of child ownership was not attained. For the GoR, the priority was to preserve the laptops and to avoid damage, loss or theft of the laptops.

b. Low Ages

The second principle listed on the OLPC wiki states that targeting low ages is important, owing to the belief that "playing is the basis of human learning" and young children do that best. The laptop is designed especially for children between the ages of six and twelve, with software designed to encourage play. I observed, on a number of occasions, the passionate excitement of young children as they played the "English for Fun" game on their XO laptops. At the end of a laptop training session one day at ESCAF Primary school in Nyamirambo district of Kigali, one of the volunteers offered to upload this game onto the laptops of students who had finished their work early. She was immediately met with a rush of students holding laptops up to her so that

[16] A National Park and game reserve popular among tourists to Rwanda.

they could be first in line to receive the much desired game. The refrain, "Me teacher! Me teacher!" was urgently repeated in the hopes of catching her attention, as there were only two USB keys to do the job for two dozen students. One at a time, she uploaded the game onto their laptops, after which each child quickly returned to their seat to test it out.

"English for Fun" is a simple interactive game that helps children learn English vocabulary. A voice offers the player instructions, which must be followed correctly in order to be rewarded. "Paint the banana yellow" for example, prompts the player to click on the yellow paint icon, followed by the banana. If this is done correctly, the player may move on to the next task, while in the case of an error, a loud buzzer sounds indicating the fault. There are scores of levels and activities to be completed, and the children revel in the game. I also watched a group of six children ranging in age from four to ten play this game for more than six hours on a laptop I had lent them. I had been invited to stay at an acquaintance's home in Rwamagana, and thought that the children, who did not have access to laptops because they were not students at Nonko, would enjoy playing with it. The children learned very quickly and only left the laptop reluctantly when their parents called them in for dinner (see Figure 1, Appendix).

c. Open Source Software

One Laptop Per Child, being in the tradition of a non-profit that hopes to improve children's access to technology to improve learning conditions, has opted to offer free and open source software[17] on the laptop. The software section of the website explains that XO software was developed in such a way as to allow children and other participants to exercise their creativity in adapting the software to suit their learning needs or curiosities without the restrictions of prohibitively priced or controlled applications. According to Andy Greenberg (2008:*n.p.*), "[e]very element of the XO's software is open-source and malleable: Its creators hope that kids in Mongolia and Peru will someday program their own applications for the devices and even modify its source code to improve its operating system." This emphasis on open source software stems from OLPC's insistence, stated in the software segment of the website, on ensuring children "learn far more than Word, Excel, and PowerPoint." "It's really about teaching other skills" says Michael Alvarez, Learning Specialist for OLPC Rwanda (July 23, 2010). However, I

[17] The software will be described in more detail in Chapter 2.

never had the opportunity to witness children or OLPC volunteers alter any of the software to suit their needs.

d. Internet Connection

Likewise, OLPC members laud the capacity of the computer to connect wirelessly to the internet – a capacity that I rarely saw exercised during my time in Rwanda due to faulty or non-existent internet connections – because it encourages free communication and access to a wealth of information. The embedded mesh network (which does not require an internet connection but only a local server in the school) also allows children to chat, share information, edit works or play games together. In this manner, I observed children at Rwamagana B Primary school sharing notes they had copied from the blackboard during English class, so that they could save time.

The few times that I witnessed the fruits of children's internet searches usually involved the downloading of songs or photographs of their favourite celebrities. Speaking with students at Rwamagana B one day, a student explained to me the benefits of having access to internet: "if you want to look for [the] president of Rwanda, then you browse the picture and information. And you can communicate with others." Another student, during a mathematics lesson in the same classroom, smiled proudly at me while he swivelled his screen around to show me a series of images of Jackie Chan, a Chinese actor famous in the United States for his martial arts. Having been informed that the internet connection at the school had been non-functional for some time, I asked where they could access the internet since the school's satellite was broken. The students informed me that they often went to the local police station in order to download images of their favourite stars. The Primary level 5 (P5) teacher confirmed this with me, but also informed me that this behaviour was considered as stealing internet, and that they could be beaten for it.

Other students at ESCAF Primary expressed their love of downloading photos of their favourite stars as well, including Shakira, Beyoncé, Meddy and The Ben (the latter two being famous Rwandan singers). But they also expressed the usefulness of having access to an offline version of Wikipedia, which they explained permitted them to do research for completing their homework. Thus, even though they only had sporadic access to internet at ESCAF, they still

benefited from learning how to search for useful information, which they could later apply to internet searches.

Apart from the positive aspects of even sporadic internet access, the teachers often complained about the detrimental effects. Teachers at most of the schools complained about the tendency of the children to get distracted during class time if they had the laptops open, since even if they did not have access to internet they could still look up the photos or music they had downloaded earlier. Often pressing in the teacher's complaints about the internet was their concern with children's access to pornography, which several times was expressed to me as a problem among the OLPC schools. The teachers repeatedly articulated to me a desire to block or remove access to these kinds of websites, though I myself never observed children using the internet for these purposes.

Overall, though ensuring connectivity is one of the central principles of OLPC, infrequent access to it was a common concern among teachers and students, as well as OLPC volunteers, while informal access often caused distractions for students in the classroom, despite the benefits of the opportunity for class-related research.

e. Saturation

By promoting the additional principle of reaching "digital saturation" whereby each child and teacher in every country, region, municipality or village (depending on the scale to which the government commits) owns a laptop, OLPC proposes to develop "a new kind of school, an "expanded school" which grows beyond the walls of the classroom" by giving children access to information and avenues for learning which transcend the traditional confines of the classroom (wiki.laptop.org).

David Cavallo expressed several times during the summer of 2010 his belief in the importance of spreading a sort of laptop culture by saturating communities with access. His reasoning, and that of OLPC, is that children, teachers, and community members are more likely to work together to solve problems or to trade information regarding laptop hardware or software if everyone has access to them. In 2010, however, OLPC Rwanda was still in the pilot phase, having only distributed 10,000 laptops in a country with 2.2 million primary school students, so this level of

saturation had not yet been reached, although this was in the plans for the future. There was, then, a continual reliance upon the OLPC deployment team, which consisted mostly of foreign volunteers, for training and maintenance.

Michael Alvarez and Virginia Dias contrasted the Rwandan experience with OLPC with the Uruguayan experience, highlighting how the Uruguayan government had managed to distribute laptops to all of the 400,000 school children in the country by saturating each of its provinces, one by one, over a two year period. The result of this rapid roll out of computers, they claim, is that students and community members often congregate in public spaces such as parks to hold informal laptop meetings, where they can exchange ideas and tips – thus spreading a laptop culture. The Rwandan case, they explained to me, was not conducive to this approach since the number of students in Rwanda is much greater than in Uruguay, where educational resources and quality are of a higher calibre, and where economic resources permitted for the distribution of laptops to all students. In Rwanda, unfortunately, the economic resources do not permit such a rapid distribution, and it is considered politically unwise, according to Michael and Virginia, to favour only some provinces while neglecting others. The favoured approach has been to distribute laptops to five schools in every Rwandan province until there are enough resources to offer them to everyone.

All of these principles lay at the foundation of OLPC's mandate and vision to improve the quality of education for marginalized children all over the world – however local conditions and the specific agendas of the government and OLPC have had major impacts on the achievement of these ideals. By contrast to OLPC, which heavily weighs the importance of the five principles to ensure the success of their educationally oriented program, the GoR has sought, rather, to focus on simply distributing the laptops to the schools to ensure access.

The Structure and Implementation of OLPC

The difficulty in fulfilling the five principles of One Laptop Per Child (OLPC) has much to do with the tension between the organization and the Government of Rwanda (GoR) in the implementation of the program. OLPC is adamant about meeting its educational agenda, while the GoR focuses on managing the practical aspects of the program. The source of this tension partly stems, I would argue, from the divergence in approaches to the implementation of

"improvement" to the Rwandan state. While the OLPC deployment team in Rwanda, composed largely of foreign volunteers or employees, has opted to apply an indirect and non-coercive approach to improving Rwandan education, the GoR has preferred to take a more authoritarian attitude. In a context where the GoR practices a greater degree of authority over the actualization of OLPC on the ground, the advice of OLPC volunteers like Michael Alvarez, who wish to promote the educational aspects of the program over the technological, often fall to the wayside. As James C. Scott (1998:4) would argue, the application of OLPC as a development plan to Rwanda tends to follow the "high-modernist ideology" espoused by the GoR, which is "best conceived as a strong, one might even say muscle-bound, version of the self-confidence about scientific and technical progress." Chapter 3 will discuss in more detail the reasons for the government's "faith" in the "legitimacy of science and technology" (Scott 1998:4), but in summary, it is linked to the President's agenda to push Rwanda into middle-income status by transforming the economy from its agricultural base to a decidedly more "modern" information base.

During a June 2010 volunteer meeting at the OLPC headquarters in Rwanda, at the Kigali Institute for Technology (KIST), Michael Alvarez, Learning Specialist, explained that OLPC is careful not to impose its views on governments: "We never go to countries; countries come to us. We don't want to be neo-imperialists, saying 'this is the way you should do things!' Even if I have deep ideas and beliefs about something, I cannot enforce them. I have to work with the country" (June 23, 2010). Despite this assertion, the fact remains that OLPC is an international non-profit with its roots in the United States, and a team of volunteers stationed in the country works hard to influence the outcome of the project. Both the ideas that drive the organization, which will be discussed in Chapter 2, and the team itself, are influenced by 20th century modernist ideals of progress and change that came directly from the United States and specifically the Massachusetts Institute for Technology (MIT), where OLPC was born.[18] At the same time, the GoR has its own agenda to manage, which is to spread technology to its youngest citizens in order to fuel an economic revolution within the decade. Because of this, the GoR seeks to mould the OLPC program to its own needs.

[18] The origins of OLPC will be discussed in further detail in Chapters 2 and 4.

James C. Scott (1998:6) argued that the failures of many 20th century large-scale, high-modernist development schemes to achieve their objective of improving human well-being were mostly the result of the inability of these centralized, authoritarian or imperialist plans to recognize "the necessary role of local knowledge and know-how." David Cavallo, who was in charge of advising the GoR on the implementation of the program in 2009-2010, wrote an article entitled "Emergent Design and Learning Environments: Building on Indigenous Knowledge" (2000) which echoes this argument. In it he argues that the traditional blueprint approach to identifying and targeting technical problems in education systems, such as low math or science scores, and addressing them with technical solutions such as a change in the curriculum (Cavallo 2000:769) has consistently failed because the predesigned programs which are forced into action do not account for possible changes in the context. He proposes, instead, "emergent design" as an alternative to pre-planned and authoritatively implemented solutions, which entails a more flexible approach that takes into account the expertise of locals who thoroughly understand the existing system. In the context of the implementation of OLPC, this implies the desire to implement a gradual, open, and flexible approach to change which readjusts according to the conditions of each school.

But in Rwanda there is a constant tension between the need to plan the OLPC program and the need to respect the needs of the government and the local schools. OLPC members like Michael Alvarez, who was deeply involved in the running of the deployment team, were reflexive about their role as outsiders in Rwanda, and their desire to avoid imposing their plans, but the GoR's diverging priorities often strained the relationship between the two parties.

One foreign volunteer expressed her own discomfort with this dynamic. She explained to me, over lunch with the rest of the team, that there are contradictions in OLPC in that the leaders of the organization continuously state that the goal is to radically change the education system, yet OLPC refuses to impose its methods and objectives onto the Rwandan government. This volunteer voiced a strong desire to have more influence on the Rwandan government, claiming: "if we are to have the impact OLPC wants, we need to push the government harder," alluding to the drawbacks of the unwillingness of members to "impose their views" on another country. Thus, despite the explicit denial of some OLPC members regarding their "neo-imperialist" tendencies, the structure of the organization and even the internal dialogues of some individuals

involved in the program reflect the inherent tension between the desire to help without enforcing, and the desire to achieve specific results. The power dynamic which favours the knowledge and influence of American and foreign development workers over those of the locals becomes apparent in this struggle.

The OLPC team in Rwanda consists of an international group of volunteers that supports and advises the Rwandan Ministry of Education (MINEDUC) to help them achieve their education and development objectives. One American OLPC volunteer, who was in Rwanda for ten days in May 2010, described the structure of OLPC concisely: "OLPC is weird. [It's] really, really huge but informal; everyone does a small part." Usually, OLPC hires paid trainers on contract for approximately six months to work with students and teachers in different schools on a regular basis. Additionally, there is a regular flow of unpaid international interns and volunteers who are either recruited by OLPC at their university campuses, or selected through a general application and interview process. The vast majority of the foreign interns and volunteers are from the United States, but there were also two from Kenya in the summer of 2010. These workers, interns, or volunteers are assigned one or several schools to visit as a team on a regular basis, where they have scheduled training sessions with either students or teachers, and sometimes both. Occasionally they enter a regular classroom and teach and interact with the students and teachers at the same time. At other times, they train only the students, while the teacher occupies him or herself with other tasks, and often they have private training sessions with only the teachers after school. The reason for hiring volunteers, explains Michael Alvarez, is to ensure that the quality of the training remains high. The resources necessary to train all Rwandan teachers would be too great, according to Michael, and too time consuming to yield the same results provided by teams of volunteers who interact directly with the children. The additional drawback of attempting to train teachers who may be under educated, he explained during an OLPC meeting in Kigali, is too much of a burden to risk OLPC's resources (June 23, 2010).

The attitude of trusteeship, which was so common in colonial attitudes to development in Africa are unwittingly reflected in this sentiment, and is demonstrated in the interactions between the international and the local volunteers. The contract workers are supported by a number of Rwandan interns selected from a pool of undergraduate students at the Kigali Institute for

Technology (KIST), where the offices for OLPC Rwanda are based, the attitude being that these local interns act as a support network for the team.

Though I was told many times that these locals were in place to ensure the sustainability of the program over time, there were hints of disquiet among some of the foreign volunteers regarding their treatment. The same worker who complained about the lack of influence among OLPC leaders towards Rwandan officials thought it strange that there were "colonialist" attitudes among some of the foreign workers. Michael had recently explained to the volunteers that the teaching style in Rwanda dates back to colonial times, where the system was designed to benefit the colonial powers[19] rather than to help educate the people and turn them into citizens. In response to some comments made by Michael during the OLPC meeting at KIST about the quality of Rwandan education, where he outlined the history and purpose of the program for the newly arrived volunteers, she asked me: "did you find it weird that [Michael] mentioned the colonialism in schools in front of the locals?" She felt it condescending for him to talk in this manner in front of Rwandans.

She also described a situation of favouritism toward American volunteers in Rwanda. When a new set of American volunteers had arrived in Rwanda to train students in the use of the laptops, the local volunteers, who had been working with OLPC for some time, were told by Michael and the other leaders to watch and learn from the Americans (since it was understood they had more education). This volunteer explained that she interjected at this point and said "No! You [the Americans] will learn from them [the locals]!" She felt – reminiscent of Scott's and Cavallo's support of indigenous or local knowledge - that the locals were more equipped to deal with the laptops in the local setting since they had been working with them for over a year. To her, this revealed a contradiction in the attitude of OLPC workers who profess a desire to avoid imperialism, yet continue to discuss the local country and its education system with language couched in superiority and imperialist discourse.

This tension does not dissipate in the higher ranks of the organization, where decisions about OLPC are made. David Cavallo, Project Director and Learning Expert for OLPC, was during the summer of 2010, the key figure in charge of the program as it unfolded in Rwanda, and shared

[19] See Chapter 2

the top tier of the organization's pyramid with the Minister of Education. Like Nicholas Negroponte who founded the organization, he was formerly a Research Scientist at the MIT Media lab where the educational theories (discussed below) that drove the project developed in the 1960s-1980s. It was his job to work with the government, and to advise them where possible, on the best ways to integrate the educational philosophy of OLPC into the classrooms of Rwanda.

Complicit with Cavallo in the implementation of the program, was the Government of Rwanda headed by President Paul Kagame, who has been praised by the international community for his recent efforts to promote peace and economic growth through the implementation of Information and Communications Technology (ICT) infrastructure. His government was in charge of all aspects of this program, from the purchase of the laptops to their distribution and maintenance, though it called upon the expertise of Cavallo and his team to consult regarding best practices.

Michael Alvarez and Virginia Dias worked very closely with Cavallo in these endeavours, and were often engaged in dialogues, conversations, and meetings meant to clarify and promote the principles of OLPC. Being a highly publicized organization with a strong public interest directed toward the laptop itself, the senior members of OLPC were often concerned with making sure that the educational aspects of the project not be overlooked. Part of their job was to ensure that Rwanda adhere to the five essential principles professed by the foundation.[20]

But in February 2011, the Ministry of Education in Rwanda (MINEDUC) reported that they had deployed 56,607 laptops that had been purchased from OLPC, and planned to distribute the remainder of the 100,000 laptops they had purchased by June of 2011, without any assistance from the deployment team. By this time, David Cavallo had left OLPC and was teaching in the United States, while Michael and Virginia, along with the rest of the team, had engagements back home and could no longer pursue their work in Rwanda. Michael expressed his dismay about the government's decision to distribute the laptops without them in a personal email to me on January 5th, 2011:

[20] Countries which profess an interest in purchasing laptops but have no interest in adhering to these principles may be rejected by OLPC. For instance, a country that wishes to sell the laptops to the general population rather than distribute them to primary school students will likely be refused by OLPC, according to Michael Alvarez.

> In Rwanda, unfortunately, things are moving way out of hand. With David [Cavallo] and us away, some people in the government deployed the laptops as they [saw] fit, what meant no great plan[n]ing and no teacher training, moving ahead just for political reasons.[21] As you might imagine, this year things should be tough. But sometimes working with governments is like this, they need to learn some lessons by themselves. What we need to do now is try to help them to learn the right lessons.

The "right lessons," from Michael's point of view, would be the application of the educational premises which guide OLPC to the laptop program in Rwanda, as opposed to the naked distribution of laptops without any sort of plan to change the education system, which is what happened in the winter of 2010-2011.

The road to modernization, from Michael's perspective, and by extension from OLPC's perspective, is paved with the radical overhaul of the education system in the developing world. It is no longer considered enough, as it was in the 1960s, to rely on the transplantation of the industrial revolution to Africa in order for the continent to emerge from "backwardness" and into modernity, urbanization and prosperity (Ferguson 1999:14). The attempt to modernize in this way has been attempted and has failed, as in the case of the Zambian Copperbelt, where the signs and symbols of modernity, such as wealth and material goods like cars and European style suits, were precipitously obtained after the Copper boom of the 1980s and lost after the bust of the 1990s (Ferguson 1999:13-14). Yet the persistence among scholars and development practitioners of the myth of modernization, despite the decline of Modernization Theory (Ferguson 1990:15) continues to influence and shape their schemes for pushing Rwanda into the current version of modernity which is shaped by the 21st century information economy. For OLPC, the "signs and symbols of modernity" (Ferguson 1999:13) will be attained through the improvement of education, so that children may be prepared to participate in the information economy. For the GoR, the symbol of modernity par excellence *is* the laptop. The possession of the laptop both represents and motivates the attainment of modernity. The following chapter will outline the

[21] Michael did not go into details about his comment about the "political reasons" for this rapid rollout of laptops – but based on previous conversations with him in the summer of 2010, the likelihood is that he was referring to the pressure that MINEDUC faces to ensure that the laptops are evenly and rapidly distributed. Teachers, parents, students, and political figures all over Rwanda are aware of the OLPC program and await their turn to receive the laptops with anticipation (according to Michael). Distributing the laptops makes MINEDUC politically appealing to them.

educational premises which guide OLPC, while Chapter 3 will describe the motivations of the GoR for signing onto the OLPC program.

CHAPTER 2

AT PLAY IN THE CLASSROOM

Implanting New Educational Philosophy in Rwandan Education

For members of One Laptop Per Child (OLPC), education which prepares young people for the rigors and unpredictability of "modern life" today requires fluency in digital technology. They argue that there is a "need to prepare new generations for the new world" (Michael Alvarez, June 23, 2010). This new world, for OLPC, has outgrown the education system of the 19th century, which they argue persists in the school system in Rwanda (among other developing countries). For this reason, they argue, the education system in Rwanda needs to be brought up to speed with the needs of the 21st century – and this requires both new tools (the laptop) and new teaching and learning methods:

> Some argue children need books, not laptops. Kids here [in Rwanda] are competing with kids…who learned to read and write by MSN[22]… Being fluent with technology and learning to channel creativity through technology is what will enable children and their countries to prosper. We think sometimes that being fluent is solving problems with technology, so the point is to develop *fluency* with technology among children; not just *literacy* which is equal to teaching office tools only (Michael Alvarez, June 23, 2010, emphasis added).

Michael explained to me that technology, and computers especially, help in the advancement of children's education now, not because computers provide the answers, but because they offer the opportunity for children to approach problems in a different manner (June 23, 2010). By spreading computer culture throughout Rwanda in both formal and informal sectors, such as the school and the community, he and the rest of OLPC hope that children will gain the opportunity to participate and communicate in the modern world. But from the OLPC perspective, it is not enough to promote simply the learning of basic computer skills like Microsoft Word or navigating the internet. What is more crucial is the establishment of an approach to learning in the education system which emphasizes problem solving, critical thinking, and independence, much like in the following example.

[22] MSN is a messenger service which allows users to type messages and communicate instantly through the internet.

This chapter will lay out the types of teaching and learning approaches that OLPC seeks to implement in the Rwandan education system, based on the theoretical and philosophical orientation of the founding members of the organization. These will be contrasted with the educational tendencies that I observed in the classrooms of grade five students in several Rwandan schools, which generally go against or resist the educational model promoted by OLPC.

QWERTY Xylophones: Injecting "Fun" into Learning

"He's already doing it himself! You've got "Tam-Tam Edit" open and you're already playing it." Rebecca's pleasure does not conceal her surprise at her student's progress. She has come all the way from the United States to participate in "Project Rwanda," a week of scheduled laptop activities run by a group of ten international college students from Carnegie Mellon University (CMU), renowned for its computer science, business and engineering degrees, among others. They have received permission from OLPC to use the XO in their lessons and to teach grade five students how to compose music using the "Tam-Tam" activity on the XO, among other activities. This is her first day, and sometimes her nerves reveal themselves as a slight tremor in her soft voice as she announces instructions, but she pushes through with a genuine smile and continues with the lesson. She congratulates the young boy, who preens with pride as she continues her rounds of the desks to make sure the students are on task. The accolades are directed at the boy's initiative – he has managed to open and begin to navigate the software without any instruction. For several minutes, he has been pushing the small, green keys to his XO keyboard, mimicking the phalangeal strokes of an amateur pianist, as the quarter-sized configuration of pin-holes on each side of the screen emits the percussive ring of an electronic xylophone. Each key plays a different note, and the keyboard has become a musical instrument.

In the hour or so leading up to this moment, the boy has experienced the excitement of arriving at Nonko Primary School with the knowledge that he will have the opportunity to play with his laptop every day for the rest of week. It has been several months since the last time the laptops were taken out of the storage room in the back of the Headmistress' office, which is situated several classrooms away, across the central courtyard of the school. After the first week of training with OLPC volunteers several months prior, which was meant to introduce the students

and teachers to the capabilities of the laptops, the school and government administration opted – as a theft prevention strategy - to restrict the movement of the laptops, so that children were no longer permitted to take them home. “Project Rwanda” is the first opportunity the Nonko students have had to enjoy the laptops on a daily basis since the arrival of OLPC at their school. Normally the majority of the laptops are kept in storage, while a few dozen are kept in one classroom, which serves as a computer lab for students to access for formal computer lessons, so that they cannot take them home.

The usually compacted sandy earth in the yard has become heavy and sticky with the memory of yesterday’s rain, probably the last of the season. The air is cool and breezy and the sky is overcast, and the promise of a cool day adds to the tangible energy that infuses the running feet of excited children. The heavy mud, which cakes the bottoms of bright yellow, pink, or blue foam or rubber sandals, bare feet, or fashionable plastic flats, does nothing to slow them down as they dash to catch their seats in the dim morning light. The boy does his best to scrape the mud off of his flip flops before entering the room, by running the soles against the edge of the concrete landing, but gives up when he hears his friends calling for him from inside. He runs in to greet them.

No one fusses about the mud cakes accumulating on the usually pristinely swept concrete floor of the classroom. The twenty or so children in this room, clad in their green and white checkered uniform shirts and green shorts or skirts, are preoccupied with preparing their laptops for the lesson. Some of them are already seated quietly at the wooden desk-benches that line the walls, while they power up their XO’s. Others are digging into the various open cardboard boxes at the front of the classroom, where green power chords or XO laptops await pillaging. Picking up their chargers and laptops, they head back to their seats to plug into the four or five grey power bars sneaking out between the desks like placid snakes. The children’s efficiency reveals their familiarity with the laptops. Those who have finished smile and giggle as they toss a colourful beach ball back and forth with one of the CMU students in the open area in the center of the room. All the while, a psychedelic electronic beat filters through the open spaces between the laughter, seemingly following the erratic bounces of the beach ball. The music is emanating from speakers attached to an XO at the front of the room; it is the product of musical composition

produced entirely by the hands of a grade five student with the use of the "Tam-Tam" activity on the XO.

This is the first lesson of the "Project Rwanda" series, and things are slow to start, but the spirits are kept high with the music, the ball, and the curiosity of the children who play with their laptops. Some take pictures of their friends with the built-in camera; others play games, or explore the laptops by clicking on the various icons on their screens.

The laptop runs with "Sugar," the operating system designed by Linux. By contrast to the Windows configuration of "folders" and "windows," the Sugar system operates with simpler icons that require only one click, runs only one application at a time in full-screen, and automatically saves data for later retrieval. Being open-source allows greater flexibility for the altering of the software by its users. But at this beginning stage, just before the start of the "Tam-Tam" lesson, the children are unconcerned with these capabilities and simply click where their curiosity takes them.

The desktop features a white background with a black border at the top of the screen, the center of which is occupied by the XO logo, a circle floating above an "X." The various program icons usually encircle the logo in the shape of a perfect circle, but like the icons on a Windows desktop, it is possible to drag and drop them into different locations. Programs are added for free by USB key, taking only a few minutes to upload and removal is just as simple, sometimes detrimentally so, as this requires only to right click the mouse pad and to select "erase." Sometimes the children become overzealous and can be seen tugging at the instructor's sleeve to show the carnage on their screen, the attrition of trial-and-error having reduced the number of icons on the screen to three or four. The icons typically take the shape of the theme of the activity or program. A turtle serves as the icon for the "Turtle Art" activity, for example, while a set of drums and drum-sticks serves as the "Tam-Tam" icon for making music. There are currently hundreds of activities available for upload onto the XO, and usually one or two dozen will adorn any given laptop. The first lesson of the day is centered on the "Tam-Tam" activity.

Chimes, Drums, and "Tam-Tam Jam"

"Muraho! Amakuro?" says Rebecca, as she waves and greets the classroom in faulty Kinyarwanda:[23] "Hello! How are you?" The shuffle of students finding their seats fills the vacuum left by the newly extinguished musical din previously emanating from speakers at the front of the room. When the students are seated quietly and paying attention to Rebecca, she explains, in English, that the first lesson is going to introduce them to the "Tam-Tam" activity, but first, they will warm up with an "ice-breaker." Peter, the Rwandan translator, repeats this in Kinyarwanda, as the students are still new to English. At Rebecca's instructions, everyone in the room gathers into the center of the room to form a circle. One of the CMU students starts the music again, and the beach ball begins to pass laterally from hand to hand, like a "hot potato." The children giggle as they speedily pass the ball to their neighbour, fearful that the music will stop while it is in their possession, as this would result in their obligation to sing a song or tell a story in the center of the circle. The music stops. A small girl shakes her head and laughs at her misfortune – she is still holding the ball and must now step into the circle. It seems for a moment that she is too shy to engage, as she stands silently in the middle of the room, but within a few moments she takes a deep breath and begins to quietly sing the Rwandan National Anthem. She stops after a few verses and runs back to her place in the circle, while the others applaud. Rebecca seems pleased, and the game continues until everyone is laughing and smiling – clearly at ease and ready to interact.

Rebecca segues from the musically themed ice-breaker into a musical-instrument building activity. The classroom of twenty or so students is broken up into three groups, one for each CMU student, so that each group can craft their own instrument from materials provided by the volunteers. One group makes wind chimes by taping together sections of larger wind chimes made of blue metal cylinders and blue plastic dolphins, which they have cut apart for redistribution to the students. The other makes drums with colored plastic cups and chop sticks, and the last group makes rattles with bells placed in plastic cylindrical containers. One of the volunteers, Matthew, sees me watching the construction of the instruments and comes to apologize "they're not great," he says, "but the idea is to let them know that music can be made from anything." When all of the children have made their own instrument, Rebecca asks them to

[23] *Muraho, amakuru?* is the correct term for "Hello, how are you?"

play them aloud and share their music with the room. Shaking, drumming, and chiming with gusto, the children smile at each other as the cacophony of plastic, wood, and metal fills the room.

"What did you learn from making your own instruments? What is music, or what does music mean to you?" Rebecca asks the students. "Joy!" responds one student. "How does music make you feel and why do you listen to music?" asks Rebecca. "Because we just like it…" replies another student. "Those are great answers, we can hear and play music, but how do we *visualize* music?"

With this, Rebecca gives the instruction for the students to open their laptops for the "Tam-Tam" lesson to begin, but Alfred, the Project Rwanda leader, pops his head into the doorway and announces "Five minutes!" The hour has nearly passed and there is almost no time left for the lesson. But the students, eager to get their hands on the laptops, click on the little "drum" icon and start up the "Tam-Tam" activity. When open, the full screen features a grid of square buttons featuring images of various familiar animate and inanimate objects; a horse, a xylophone, chicken, and a child feature among the dozens of noise-making objects. I walk around the room, observing the way in which the students play with the sounds. Most of them click randomly on the different squares, listening to the sounds associated with the images, and testing which sound combinations are most pleasing to their ears. A series of options for makings beats, tempos, and changing volume and complexity are located on the left hand margin, requiring only for the child to click with the mouse button to make adjustments to his tune.

Their small index fingers work slowly and diligently, sliding along the three inch by two inch mouse pad just below the keyboard to send the white arrow on their screen to the desired square, but the arrow, more often than not, refuses to comply. A white crescent shows through the top of the fingernail of the navigating finger, as the child applies more pressure to subdue the erratic cursor, which often jumps to the corner of the screen, or skips a few inches just as it nears its target. The children inhale briskly through clenched teeth and shake the stiffness from their hand before trying again, concentrating intensely on the screen as they patiently work through the problem. Many of the students can be seen leaning forward and tilting their heads to bring their ears closer to the speakers, straining to hear the music above the agglomerating hubbub of

sounds, music, and chatter in the classroom. Some of the speakers are faulty, and do not work at all, and other students are having difficulty keeping their laptops powered up, as their batteries are failing. Still others have accidentally erased the "Tam-Tam" activity from their desktops, and filter to the front of the room to request the help of the volunteers. But the general atmosphere in the room remains one of enjoyment and pleasure, as the students are given the opportunity to explore the program independently, and test their musical skills without the threat of an impending examination to test these newly acquired skills. As the session comes to an end, the volunteers thank the students and wave, and shuffle amidst the dispersing students and drying mud as they head to their next class, where they will repeat the same lesson.

Project Rwanda

"Project Rwanda" was a week-long interactive project that took place at Nonko Primary School in the summer of 2010, initiated by a group of undergraduate students from Carnegie Mellon University (CMU) campuses in the United States and Qatar. Though not directly affiliated with OLPC, this independent student group headed by an entrepreneurial Electrical and Computer Engineering student named Alfred sought to deepen the familiarity of Nonko students with technology through interactive educational lessons on how to use some of the laptops' programs.

"Project Rwanda" was an atypical approach to training for OLPC. Where, as mentioned before, OLPC typically hires a handful of contract workers and periodically hires teams of unpaid interns to sustain the training of teachers and students in the use of the laptops during the first stages of their integration into the schools, Project Rwanda was a semi-independent project run by a group of students with a passion for technology and children. Their affiliation with OLPC was mostly mediated by their use of the XO laptop.

The dedication expressed by these students was made evident in their delivery of the program and lesson plans throughout the week of activities. I met the CMU students on the first morning of their program, when I was invited into one of the three classrooms participating in the activities. The leader of the operation coordinated the ten volunteers and three translators as they conducted their lessons. Three teams of volunteers were distributed among three Primary level 5 (P5) classrooms, where they would teach a lesson for a period of an hour, after which they would

rotate to the next classroom to reproduce the same lesson. In this way, each classroom of students would benefit from three different lessons in only three hours.

The lessons were incredibly dynamic, filled not only with energy, excitement, and pleasure, but with substantive lessons that would introduce the students to some often complex computer activities. Of the hundreds of programs available on the XO, the team had selected three as their platforms for each lesson. The first program, called "Tam-Tams," was designed as a tool for children to play and compose music using rhythm, melody, beat, harmony and so on. "Record," was the eponymous program that allowed the children to use the built-in still and video camera to record anything from everyday activities, to elaborately composed theatrical plays using masks and props. The third program, "Scratch," was named after the mischievous-looking cartoon feline that animates the screen of the programming activity, which allows children to click and drag commands onto a screen in order to program the desired effect, such as moving an image across the screen.

Each lesson began with an "ice-breaker" activity animated by the CMU volunteers, and translated into Kinyarwanda for the students by local interns. Then the lesson would ensue, either with a hands-on activity, such as building simple musical instruments with basic materials like chimes, cups, and chopsticks, or by cutting and gluing the animal masks that would be used in the filming of a short skit later in the lesson. Following a brief description of the activity and instructions, the students would complete the activity and then share the results with the rest of the class, before starting the next lesson.

Most remarkable about the Project Rwanda approach to teaching students how to use new technology was not the technology itself, but their dynamic and interactive methods. The volunteers always actively engaged the students in the demonstrations, and allowed them to work independently or in groups to complete the assigned tasks. Most importantly, creativity was always encouraged and applauded. One of the activities, for example, required the students to film each other with the laptops while they improvised skits about animals. Each group of students had constructed paper masks of various animals, such as monkeys and elephants, and had to produce a short play that featured behaviours typical to the animals represented by their

masks. Both the creativity of the masks and the skits were generously applauded by the volunteers and the classmates – to the pleasure of all.

One of the volunteers explained to me his motivation for applying this teaching approach, as opposed to a more traditional method where lessons are written on the board and students complete exercises in their notebooks:

> I like to imagine if I were a kid, what would I like? "Scratch" [the programming activity on the XO laptop] is boring… more classroom-like, but we try to make it more dynamic. Kids don't want to be told commands; that's why we have icebreakers, it pumps us up too. Maybe it's not the most fun thing but we try to make it fun… It's not about clicking, it's about concepts. We just want them to relate programming to the real world. I wish *I* would have learned [programming] with lots of examples, not so much theory (CMU student, age 20).
>
> I learn best when I can act it out and relate it back to something. [We try to] explain in a way as simple as possible and build on that, especially with kids. With kids, it's very important to act it out. My mom is a nursery school teacher. I have been a Resident Assistant at CMU for 2 years, [where I] lead activities, meetings, contests, [and] build a sense of community - CMU is very dynamic and hands on, [and] has a great orientation week. That's where the icebreakers come from, it's a showcase of what the student program and life [at CMU] is like (CMU student, age 19).
>
> For me, I've been exposed to such a teaching style. In Germany children are taught to focus on being creative rather than just facts. The things I valued as a child...I think of my inner child. I know the issues in developing countries, how students don't have the time to do homework so I thought that this was important (CMU student, age 22).

At the heart of OLPC's mission is the objective to spread a dynamic and interactionist learning approach that emphasizes creativity and critical thinking among Rwandan teachers and students.[24] The teaching methods applied by the CMU students, who as mentioned before, are not directly affiliated with OLPC, were exemplars of the teaching and learning methods espoused by the founders of the organization (discussed in detail below). Rebecca, and the other volunteers from CMU were dedicated to the idea of producing a fun learning environment for the children, and opening the door for them to experience new computer software through avenues that would make sense to them, such as through the making of tangible musical instruments and

[24] And of course, among teachers and students in all participating OLPC countries.

animal masks that represent the local fauna. With the use of other objects like the beach ball, the music speakers, and with social technologies like "ice-breakers" which lightened the mood, the classroom was transformed from a space of rigidity, control and conservatism, to one of dynamism and possibilities. The energy levels expressed by the children, and their diligence in working with the laptops despite the technical drawbacks, were indications of their appreciation for this learning atmosphere.

It appears, however, based on the above confessions of the CMU students, that they applied these methods more because of their personal experience with dynamic learning conditions in American and European school settings, rather than from the explicit teachings of OLPC members, who themselves profess (at least at the upper levels of the organization), a much more theoretical and historically rooted understanding of their educational philosophy.

This philosophy is known as constructionism in educational circles, the origins and particularities of which form the basis of the next section. I hope to contrast the theoretically grounded intentions of upper-level OLPC members such as David Cavallo, Michael Alvarez and Virginia Dias, with the lived experience of laptop use in Rwandan primary schools in the summer of 2010. The juxtaposition of the theoretical and practical dimensions of the project will highlight the gap between the expectations associated with the laptop as an object that arrives already pregnant with an idea, versus the laptop as an object that must navigate the particularities of the educational context in Rwanda.

The Theoretical Foundations of OLPC

a. "Instructionism vs. Constructionism"

During an impromptu conversation with my "brother," Robert, the son of my hostess in Kigali, I learned of his perception of the typical teaching style in Rwanda. Being in the process of completing his honour's thesis in economics, he had been in the Rwandan education system from primary school to university:

> From primary school to university it's always lecture-style, the professor enters and starts talking - *bla bla bla* – and you must follow [understand]. The professor

> starts by writing [on the blackboard] and explains afterwards… in university, it's only lecture style. They explain and demonstrate on the board.[25]

Following this I inquired whether the teaching style had changed at all during his experiences in the system: *"Ah, c'est le même"* [Ah, it's the same], he responded.

The teaching style described by Robert in this passage corresponds to the instructionist teaching method, characterized by a traditional approach to teaching the "school curriculum based on verbally-expressed formal knowledge" (Papert 1991a:11). My own observations in Rwandan primary schools, especially Rwamagana B, pointed to the prevalence of the instructionist mode of teaching. This *teaching* mode is often made most manifest by its corollary *learning* method: rote-learning – or learning my memorization.

Instructionism, which favours direct teacher transmission and little student participation, may be contrasted with constructionism, the "learning-by-making" (Papert 1991a:6-7; Papert 1993:137-156) method that promotes hands-on engagement with learning materials, and the student's direct participation in the building of their knowledge (rather than passive absorption). Those who advocate constructionism position this method as the optimal solution to the inadequacies of instructionism, which include the passive and uncritical absorption of information. OLPC adheres to the philosophy of constructionism, which strongly advocates the use of computers as a tool through which to apply these concepts.

The founders and leaders of OLPC have been deeply influenced by the father of constructionism, Seymour Papert, who is a mathematician, computer scientist and educator who has been working from the Massachusetts Institute of Technology (MIT) since the 1960s. The author of several books on the subject of children's learning with computers, including "Constructionism" (1991), "The Children's Machine: Rethinking School in the Age of the Computer (1993), and "Mindstorms: Children, Computers, and Powerful Ideas" (1980), Papert's ideas for revolutionizing education with computers have formed the philosophical foundation of the One Laptop Per Child Organization and its mandate. Nicholas Negroponte, the founder of OLPC, founded the MIT Media Lab in 1985, which Papert used to explore the interactions between

[25] « *De l'école primaire à l'université c'est toujours la conférence[25], le professeur entre et commence à parler - bla bla bla - et tu dois suivre. Le professeur commence par écrire [sur le tableau] et il explique par après... à l'université, c'est seulement la conférence. Ils donnent les explications et font des démonstrations au tableau ».*

children and computers (Papert 1993:xii). Papert acted as David Cavallo's doctoral thesis supervisor in the 1990s, in which the latter wrote: "Seymour has had the most formative influence on my adult life. I truly think, look at, and act in the world differently due to Seymour's influence. Among other things, Seymour is famous for saying 'You can't think about thinking without thinking about thinking about something.' I cannot think about thinking or learning without Seymour's influence" (Cavallo 1996:9). Michael Alvarez, who worked closely with Cavallo on managing the program in Rwanda in 2009-2010, is a trained Computer Scientist, while Virginia Dias, who also works with Cavallo, is a pedagogue – and both have conducted research at a "community studies lab" in Brazil, headed by a researcher with strong connections to Seymour Papert and MIT.

The motivation for promoting constructionism in primary schools (and by extension, the motivation for OLPC) according to Papert (1993:3) is to overhaul education systems that he argues have remained virtually unaltered in their prioritization of instructionism since the 19th century. He offers an analogy to emphasize the lack of change in most systems of formal education:

> I like to imagine a party of time-travelers from, it doesn't matter when, 1800 let's say, who had the opportunity to travel in the time machine to 1990 to see how people nowadays do things. Among them is a surgeon, who finds himself suddenly projected into an operating room 1990 style. Imagine his bewilderment with what's going on there. The flashing screens, beeping electronics. Even anesthesia is something totally new to him... Indeed, I think it's reasonable to say that nothing that's going on there makes any sense to him. Certainly, if the 1990 surgeon were to have to leave the room for a moment, the 1880 surgeon would not be in a position to take over.
>
> Now imagine another member of the time-traveling party. A school teacher, who projected into a classroom of 1990. Some things are puzzling, such as the funny little box with a window looking into another place, or maybe it's a magic mirror. But most of what's going on in that classroom is easily understood. And if the host teacher had to leave the room, the visitor wouldn't have the slightest trouble taking over and teaching the multiplication tables or spelling - unusual ideas about a few words would not make a big difference (Papert 1991b:16-17).

The urgency that Papert, and by extension OLPC, attach to changing education relates to the assumption that "learning is the basis for full human, social, economic and democratic development" (http://one.laptop.org/about/education). On the OLPC website, the reason for

wishing to change the quality of education in developing countries is connected to the desire to prepare children for the rapidly changing and digitizing world:

> As the pace of change in the world increases dramatically, the urgency to prepare all children to be full citizens of the emerging world also increases dramatically. No one can predict the world our children will inherit. The best preparation for children is to develop the passion for learning and the ability to learn how to learn (http://one.laptop.org/about/education).

By extension, the traditional memorization approach to learning the basic subjects in primary education are no longer adequate for preparing children for the complexities of participating in a highly digitized modern world. OLPC offers, then, that "the root cause of the rapid change, digital technology, also provides a solution" (http://one.laptop.org/about/education). The XO laptop and the educational philosophy that accompanies are intended to make up for the inadequacies of out-dated colonial style education to produce critical thinking citizens who can compete in a post-industrial, information economy.

Papert argues that traditionally, changes to the education system have tended toward superficiality. For example, adjusting the curriculum, or injecting computers into an otherwise unchanged school system, are common attempts to improve the quality of education, but do nothing to deeply change the fundamental problems that inhibit the school system from fully reaching its potential (Papert 1993a:20). The most egregious lack of change, he proposes, lies in the continued assumption that learning occurs best in the act of being taught. He does not deny the importance of teaching in the development of a child's learning, but proposes a realignment of its centrality in the structure of the school (Papert 1991a:7). Papert's theory is heavily influenced by Jean Piaget's theory of constructivism, which approaches learning among children as an act of "inventing rather than discovering" what already exists out in the world (Gruber and Voneche 1977:xxxvii). Constructivism posits that children do not simply absorb knowledge but mentally construct and reconstruct (Papert 1993:142) the information presented to them as a mechanism for understanding. Papert takes this concept further in his theory of constructionism, claiming his philosophy "attaches special importance to the role of constructions in the world as a support for those in the head, thereby becoming less of a purely mentalist doctrine" (1993:143). Papert privileges the physical acts of manipulating and interacting with objects that exist "out there" (1993:142) in the world as a way for children to effectively learn. In short, Papert's

version of constructionism is essentially the application of computers to Piaget's theory of constructivism.

Papert (1991, 1993) emphasizes that children need to learn how they learn, more than they need to learn or memorize curriculum so that they can adapt and problem solve. Theoretically, OLPC takes up this view by encouraging children to learn independently through the use of computers, rather than simply teaching them how to use computers. Constructionism, therefore, falls within the tradition of progressive education which follows the subversive ideas of thinkers like Paulo Freire, Lev Vygotsky, and John Dewey who questioned educational tenets that viewed "the child's mind as a "vessel to be filled," (Papert 1993:14-15) and that traditional teaching was necessarily the best way to fill it. Progressive educationalists believe that passive absorption of knowledge robs the child of the crucial role of participation and interaction in the development of deep understanding, critical thought, and problem-solving abilities (Papert 1993:14). Papert agrees with this perspective, yet argues that he takes things further than his predecessors, who he admits have failed in achieving any real lasting results (1993:14). He proposes that though their ideas were correct, the availability of the proper tools for achieving real change was limited and thus hindered success (1993:14). Michael Alvarez, the Learning Specialist for OLPC Rwanda, expressed this vacuum between existing theories of progressive change and actual plans for implementing such change: "There are many theories about how to do this, but no massive plan, no such thing as professionals in this field, it was never done! (June 23rd, 2010)." One Laptop Per Child, however, is the organizational embodiment of both the *ideas* (constructionism) and the *tools* (XO laptops) that are seen as necessary (Papert 1993; Alvarez 2010) to achieve change.

For the purposes of this thesis, there are two key aspects to the theory of constructionism that may be contrasted with instructionism.[26] First, whereas instructionism advocates the improvement of *teaching*, constructionism emphasizes the achievement of improvements in children's *learning* (Papert 1993:139). And the second is the importance of choosing the right tools to encourage effective learning. The importance, for constructionists, of focusing on learning is more than just a methodological concern:

[26] There are many more comparisons that can be made, but for the purposes of brevity, only two are highlighted here.

> The word instructionism is intended to mean something rather different from *pedagogy*, or the art of teaching. It is to be read on a more ideological or programmatic level as expressing the belief that the route to better learning must be the improvement of instruction – if School is less than perfect, why then, you know what to do: Teach better. Constructionism is one of a family of educational philosophies that denies this "obvious truth" (Papert 1993:139).

In other words, the constructionist philosophy seeks to improve children's ability to learn effectively, but does away with the assumption that the best way to do so is to make sure teachers teach better. The instructor is still important for the constructionist, but their centrality is shifted to one of facilitator so that children can define and address problems in ways that seem natural to them; the most natural way for children to learn, according to Piaget, is play (Wilensky 1991:202).

In the second place, constructionism proposes the use of *tools* that favour independent and effective learning. Taking as evident Piaget's argument that children do not simply absorb pre-packaged information transmitted by the teacher, but rather reconstruct it (in ways that are relevant to them) in their minds, Papert (1993:139-142) proposes that the manipulation of "concrete" objects in the real world can aid the child in this process. According to Yasmin B. Kafai and Mitchel Resnick (1996):

> Constructionism suggests that learners are particularly likely to make new ideas when they are actively engaged in making some type of external artifact—be it a robot, a poem, a sand castle or a computer program—which they can reflect upon and share with others. Thus, constructionism involves two intertwined types of construction: the construction of knowledge in the context of building personally meaningful artifacts (Thornburg 2008:5).

Therefore, though a variety of tools or objects like the ones mentioned above may well serve the process of mental reconstruction (Papert 1993:142), Papert's theory of constructionism emphasizes the use of computers and computer languages as the most adaptable tool for the purposes of learning, offering a veritable "bag of assorted tools" for learning (Papert 1993:144).

As mentioned above, OLPC struggles to use the XO laptop as a tool to replace instructionist and rote teaching and learning in Rwanda to chiefly constructionist and dynamic approaches to education.

b. Rote Learning at Rwamagana B Primary

"Go into the CD of your mind," Sebastian a teacher in the Primary level 5 (P5) classroom of Rwamagana B Primary school implores his students as he points to his temple with his index finger. It is 10 am and Sebastian is asking his students to dig into their memories to retrieve the stored information from the previous day's lesson on carnivorous, herbivorous, and omnivorous animals. "Give an example of an omnivorous animal," he asks, and this is followed by the clamber of feet shuffling to stand up and the crackling sound of snapping fingers aimed at catching the teacher's attention. Over and over, the students repeat the refrain, "Me teacher! Me teacher!" until Sebastian calls on one to answer: "People!" responds a young boy, and "Pigs!" calls out another, correctly. "What do people feed on?" No answer. The students flip frantically through their small notebooks covered protectively with newspaper, looking for the correct answer. The silence prompts the teacher to ask another question. "What does a carnivorous [animal] eat?" to which the students erroneously reply "cat" and "grass." Sebastian encourages them to find the correct answers, and he rewards those who succeed with a cheerful "yes!" and moves on. When asked to provide an example of a carnivorous animal, one student proposes "sheep."

Sebastian's use of the CD/mind metaphor, which he employed in the sense of selective retrieval of information from safe storage for application to a specific question-context, may be indicative of two things. First, that he has taken for granted the children's grasp of the reference to the CD suggests that high technology has entered popular vocabulary in this part of Rwanda, to the extent that Sebastian feels comfortable applying it to ways of thinking about teaching and learning. Second, and more importantly, the metaphor evokes the image of hardware on which information can be written and subsequently played back repeatedly and exactly the same way each time. When this imagery is applied to the learning context, it conjures the picture of rote-style repetition and regurgitation of information.

Here, the key element made conspicuous by its absence is critical thinking. In this case, the children have "stored," if imperfectly, the information about the feeding habits of animals in their minds through *memorization*, but in the context of the classroom, the retrieval system has become constrained by a lack of contextualization. Much like in the "shuffle" setting of a disc

player, the children select words at random rather than for their appropriateness in an effort to answer the questions in a timely fashion. From the point of view of someone who adheres to constructionism, the fact that the children have wrongly answered some of the questions (Wilensky 1991:202) is likely due to the children's inability to make meaningful connections with the objects of knowledge. This lack of connection, they would argue, is closely related to the way in which knowledge is acquired in the classroom.[27] If this instructionist tendency is contrasted with the "Project Rwanda" experience, where the Carnegie Mellon University (CMU) students acted as facilitators, aiding children to explore the new technology and to create new things with that technology, such as video skits and music, the difference between what OLPC wants to achieve, and what actually happens in the classroom becomes apparent.

To illustrate further, Sebastian demonstrated the instructionist method in another P5 Science class in which students were required to copy notes from the blackboard, which they would later study. Although the teacher was absent for the first part of the lesson,[28] the students sat quietly inscribing the notes in their notebooks:

> -Rodents feed on leaves, roots, tubers, and even barks of trees
> -Their teeth are characterized by the presence of long and sharp incisors with continuing growth, absence of a tube, a long intestine, and voluminous caecum (made of large part of the large intestine).
> -Ex of rodents: rabbit, mouse, mole.

When the teacher finally arrived a few minutes later, he engaged the classroom with the lecture portion of the lesson, reviewing the contents of the passage on the chalkboard. Reading aloud each section of the passage, the teacher stopped periodically to call on students to repeat certain

[27] Of course other factors could be at play, such as the language barrier, as the classes are taught mostly in English while the children have only been learning the language for a short time. In 2009, the official language of instruction was changed from French to English. The transition took place within a two week vacation period, where teachers took intensive language courses, while students recuperated from their examinations. Classes resumed exclusively in English after this period, except for Kinyarwanda lessons, which are taught in Kinyarwanda. The students appear to have a grasp of basic vocabulary in English, but having only received a few months of training in the language, are having difficulty mastering the meanings of the questions in the amount of time required to answer them orally. This is made evident by the frequent referral to their notes as they hurry to find the correct answer before their peers. It is also common for children lack the extra time necessary to study in the evenings, owing to their chores or lack of electricity for lighting. However, from the constructionist point of view, and based on OLPC's mandate, the main concern is the type of teaching and learning that takes place in the classroom.

[28] It is not uncommon for teachers to step out of the classroom for extended periods of time, for many reasons, including unexpected meetings with the headmaster/mistress, discussions with visiting parents, bathroom breaks, or socialization. Some teachers justify their absence, or the absence of other teachers, with the lack of regular and adequate pay, which is a major demotivation for regular attendance.

words. He would ask, for example, what rodents feed on, and students would chime in with responses at his request. When asked to give examples of rodents during the review, students repeated exactly the examples that were written on the board, finding no additional examples of their own. Also noteworthy was the absence of in-depth explanation of the more challenging or opaque segments of the passage, such as the section describing the "absence of a tube" or the function of the "caecum." He also improvised a statement about how some animals are ruminant, while others are not ruminant, but stopped short of any clarification. I wondered about the absence of these explanations, as I myself was not familiar with the digestive systems and eating habits of rodents, ruminants and non-ruminants, and did not fully understand the function of each item on the board. Later that afternoon I discovered the teacher's guide to the P5 Science curriculum on the desk. Waiting for the lesson to begin, I browsed through it quickly and discovered the page describing rodents, which revealed to be the exact word-for-word transcription of the passage on the chalk board. Hoping to find more explanatory details about the rodent digestive system, I was disappointed to find that there were none. Perhaps the absence of clarifications from the teacher were the result of his discomfort with the material, not having any resources beyond the teacher's guide to find these answers for himself.

More alarming was the discovery of the introductory passage in the teacher's guide, which outlines the objectives of the science curriculum for P5 students:

> The book uses learner centered methodology – children learn better while observing, manipulating, analyzing and making conclusions from what they have observed. They acquire knowledge through activities…
>
> The role of the teacher is not to transmit knowledge and skills to learners; instead he/she takes the role of a facilitator in the learning activity. He/she must be able to check on discipline, explain, organize and encourage the pupils to learn (Bakundukize et. al. 2007:4).

This passage echoes the mission statement of OLPC, resting on the idea of constructionism, which states that teachers are not responsible for distributing knowledge, but should rather act as learning "facilitators," (Han and Bhattacharya 2001:5,7) and that children benefit most from learning by doing. Clearly, however, what is written in the preface of the teacher's guide is not necessarily typical classroom practice, as the passages are copied word for word onto the board, and the students simply copy them into their notebooks to memorize. Learning by rote, in this

context, appears to dominate over the student-centered approach, even in an OLPC pioneering school.

The existence of the rote learning model in Rwandan primary schools may be attributed to the legacy of colonial educational policies from the turn of the twentieth century. Uworwabayeho (2009:315) argues that a "striking similarity of practices" with colonial Catholic missionary schools can sometimes be observed in contemporary Rwandan mathematics classrooms: "mathematics teachers explain concepts while writing notes on the chalkboard and learners copy notes into their notebooks. For the last 5 to 10 min of a lesson learners practise taught techniques through working on prescribed exercise questions." Uworwabayeho (2009:315) also proposes that this "chalk and talk" pedagogical method is at odds with the Government of Rwanda's contemporary national mathematics curriculum, which is designed to emphasize and develop critical thinking among students.

But, while the teacher-centered formal education system has its roots in colonialism, the origin of this teaching pattern is not sufficient to explain its persistence in Rwanda. This may rather be attributed to the lack of training and resources for student-centered learning. Uworwabayeho (2009:317) explains that even though nearly all teachers are qualified at the primary school level, rote learning continues to be the preferred pedagogical method for reasons such as "class size, content-laden curriculum, lack of continuing education and overloaded working hours per teacher." With insufficient resources and overpopulated classrooms, teachers resort to the most efficient method for completing the curriculum according to Ministry standards, often at the expense of quality. Moreover, according to Obura (2003:82) the challenges of changing teaching methods in a post-conflict transitional society may be too burdensome for some:

> Schools know formal schooling, they are familiar with their old curriculum and, whatever forward-thinking internationals think of the perhaps classical and maybe dull pre-war schools and curricula, teachers prefer to go into class and start teaching what they know best, especially after the unsettling experience of war. They do not want to be distracted or stressed with innovation (Salmon 2004:83).

Such innovation, which OLPC seeks to apply to the education system in Rwanda, may not always be applied according to plan. The XO laptop, which theoretically operates as a medium through which to apply constructionism to the formal and informal learning experiences of

children, sometimes actually serves as a medium for instructionism. Maddux and others (2001:96) distinguish between two types of computing applications which correspond respectively to traditional rote or constructivist teaching methods. Whereas the first type aims to use computer software as a means to make traditional teaching methods more efficient, the second type promotes the development of higher order thinking skills and seeks to revolutionize styles of teaching. My observations in Rwandan classrooms pointed toward the adoption of the laptop as a tool through which to apply traditional teaching methods.

Three Cases of Rote Learning with Computers in Rwanda

a. "Because in the Laptop You Have a Calculator" – Laptop Use at Rwamagana B Primary School

"A radio is sold at 5200F[29] and a 600F profit is made. What was the (cost) price of the radio?" reads out Henri, the P5 mathematics teacher at Rwamagana B Primary School. The students who have their laptops with them proceed to open the calculator application and punch in the numbers to reveal the answers. One student punches in the sequence: "5200f – 600f" and pushes the "Enter" button, only to have an error message appear. After a moment of perplexity, she deletes the "f's" from the sequence and presses "Enter" again. The answer appears on her screen, and she is pleased to discover that it is the correct one. Her answer is logged onto the screen, visible for the teacher who walks around the room to check the students' answers. One student has punched in 600-5200, and obtained an erroneous answer of -4600, which even the teacher did not notice. It appears the child was entering numbers into the formula for cost price and sale price without really thinking about the variables.

It does not take very long for Henri, the mathematics teacher, to check the computer screens, for there are only 11 of them open on the desks in a room occupied with 38 P5 students. "Where are the other laptops?" I ask, confused since I know that all students at Rwamagana have been given laptops except for the Primary level 1 (P1) students. "Some of them have forgotten or just left them at home" he responds. "They are children. Some forget, some are running [in the morning],

[29] F = Francs.

and some can't take the computer with them when the bag is full and they need to run to school" he explains.

The students who have not brought their laptops today follow along with the lesson in their newspaper-covered notebooks, inscribing the questions with ink and the answers with pencil. It takes them longer to finish their work than those with laptops, but they arrive at the same answers nonetheless. "Do you prefer to do math with or without the laptops?" I ask a group of three or four girls at the side of the class (one of whom has a laptop). "With the laptops!" she exclaims, "because in the laptop you have a calculator. There is no calculator in your notebook" she adds.

b. "Speak Activity" – An English Lesson at Rwamagana B Primary School

When I enter the Primary level 5 (P5) classroom at Rwamagana B Primary school after a short break, Gilles, the English teacher, has written a series of words on the blackboard: "knock, knee, know, like, live, leave, and write, right." He has asked the students who have laptops to open "Speak Activity" the application which he explained to me was a tool to help students write and speak in English. The program is simple; a talking face, with large eyes and a slit for a mouth, repeats words – in an eerily Stephen Hawking-like voice – which the student has typed into a word bar at the bottom of the screen. And so Gilles instructs the students to enter the words written on the blackboard into their laptops, listen to the pronunciations, and repeat them aloud to practice their English, which they do with alacrity. Though there are only a few laptops in the room, the space rapidly fills with the monotone robotic repetitions of the words on the blackboard. The students who do not have laptops however, seem bored and dejected. Some of them lean over and listen with their friends, but others sit idly waiting for the lesson to end.

After a few minutes of this, Gilles approaches me and asks if I understand how the laptops are used for teaching English. I thank him for showing me, and express to him that he should not feel obligated to change his lesson plan owing to my presence; that he should feel free to move along with the lesson he has already prepared. Immediately he moves to the front of the classroom and directs the students' attention toward the lesson on the blackboard "Rwandans drink tea = a tea is

drunk by us." He asks the students to read the sentence aloud together so that they may correct them on the board afterward, according to the rules of passive and active voice.

c. "Write Activity"- Learning about Alcoholism at ESCAF Primary School

"Ok, children you close your laptops," orders Jeanne, the P5 teacher at ESCAF Primary, the private school in Kigali's Nyamirambo district in Kigali, where only the students of parents who can afford the laptops have received one. There are 15 laptops for 34 students in Jeanne's P5 classroom. The green computers are scattered about the classroom, with two or three students huddled about each one, as they watch their owners play games or fiddle about before the lesson starts.

When the children have obeyed and closed their laptops, she walks to the blackboard and explains to them that it is time to review last week's lesson about alcoholism. "We go to see alcoholism" she announces, and writes the subject in capital letters with white chalk on blackboard. "There are two types of alcoholism," she adds. "What are they?" The students, standing up from behind their wooden desks and leaning forward on them with their hands, answer in unison: "Chronic-and-drunkenness!" reply the students. "Correct," responds Jeanne, and she writes the answers on the board. They move on to review the causes of alcoholism. This time, she draws on individual students to answer the questions. A boy answers "bad company," while a girl offers "the parents who accustom their children to alcoholic beverages." Another boy responds "to have a habit of drinking alcoholic beverages," and the teacher writes these on the board as well. But the answers sound rehearsed, as though the children are reading bullet points directly from a text book, but all of their laptops are closed, and no books are open on their desks. The teacher explains to me later that the children were asked to review the lesson for today and that they have studied.

Jeanne looks at her laptop and mutters to herself "But I don't know. See, my laptop don't have power, it's a problem." Then to the class "I want to show you a photo of the person who are drinking, but my laptop don't have power." It's clear that she has prepared her lesson plan, hoping to use the laptop to offer the children some didactic materials, but is unable to since her laptop has run out of power. Rather than wasting time attempting to recharge her laptop in the middle of a lesson, she opts to continue without the photo.

The teacher and children continue to review the lesson in the same fashion for some minutes until they have gone through the signs, symptoms and bad effects of alcoholism and then Jeanne gives them an assignment.

"Show you understand, make a project. Put in your own words how you understand alcoholism. Quickly! You must use 'Write activity.' I give you ten minutes, then you present." "Write Activity" is the XO program that permits users to enter and edit text. The students go to work immediately and cooperate in teams comprised of one student with a laptop and one or two students without, to make up for the dearth of laptops in the classroom. All have entered the title "Alcoholism" and have proceeded to start typing. Some reproduce exactly the notes that are written on the blackboard. Others write, word for word, the answers that were repeated earlier but were not committed to the board; "alcoholism is a serious social scourge..." All are reproducing the information they have learned from the lesson.

To offer some amount of creativity, however, the students have taken pictures related to the module with the camera that is built into the laptop, of some of the aspects of alcoholism, such as fighting and drunkenness. One student has taken a picture of a published picture of vodka from a book, another of a Primus beer bottle, and one of a student pretending to drink beer. These are pasted into their word documents to add visual appeal to their assignments.

As the students work, Jeanne turns to me and explains what is happening: "What they are doing helps them to memorize what they learned about alcoholism. The computers are important for that because they [the laptops] put the information in their heads. To remember what is alcoholism is easy because they repeat and they remember what they did with the laptops. It helps them to memorize, it's like studying.[30]

For the final part of the assignment, the students take turns presenting their work by standing before the class, reading directly from their laptop and showing their pictures. They repeat what they have already once been taught, and once reviewed.

[30] *« Ce qu'ils font ça les aide à mémoriser ce qu'ils ont appris sur l'alcoolisme. Les ordinateurs sont importants pour ça parce qu'ils mettent l'information dans leurs têtes. Pour se rappeler quel est l'alcoolisme c'est facile parce qu'ils répètent et ils se rappellent ce qu'ils ont fait avec les laptops. Ca les aide à mémoriser, c'est comme de l'étude ».*

The three cases above illustrate the tendency, among the teachers and students in some of the OLPC pilot schools to revert to the traditional instructionist method of using the XO laptops during class time. In the first case, the math teacher encouraged the students to use the calculator to speed up their ability to get the correct answer, which is not in itself a "wrong" way to use the computer, but which limits the possibilities for creative or constructionist learning. The XO comes equipped with a number of other software applications which encourage constructionist learning for mathematics, such as the "Scratch" program, which teaches children to program using simple commands and animations. The purpose of the Scratch Activity is to show students that different actions, or commands can be given to images on their screen, such as turning the image of a cat 90 degrees and making it advance 15 "cyber" steps. It teaches them math skills because they need to understand how to change the angle or direction of an image to achieve the desired effect. At Nonko primary one day, the Project Rwanda team taught the students to use Scratch by assigning them the task of programming a game. After four days of learning the basics of how to use the program's commands, the children were able to design a game that enabled them to move the image of a bowl of fruit laterally on the screen, so that they could capture a falling bunch of bananas. The act of "constructing" the game required that they learn how manipulate the software and work out kinks in the game, such as shrinking or enlarging the images to fit the game. This contrasts heavily with the way the math teacher at Rwamagana used the XO laptop to teach math, in which he only made use of the calculator without making any changes to the way the lesson was taught.

In the second case, where the teacher gets the children to use "Speak Activity" to habituate the children to English word pronunciations does nothing to accommodate constructionism, as the children simply listen and repeat the words. Of course the software was designed specifically for that purpose, to get children to explore language, but the teaching style does not stray from instructionism in any sense. The OLPC volunteers at ESCAF primary, who used "Write Activity" and "EToys" to encourage students to write their own stories or articles, did more to exemplify the constructionist technique than this particular English teacher.

Finally, in the case of the lesson on alcoholism, the teacher made explicit her intentions to use the laptop as a memory aid to encourage the students to memorize the lesson that they had already reviewed. The laptop, in this case, simply turned into an electronic version of a

notebook, with the added advantage of digital photographs, rather than enriching the capacity of the students to construct their own knowledge.

These cases demonstrate to some degree a resistance to the use of the laptop as a tool through which to apply constructionism to the daily lessons in the classroom. The reasons for which this occurs will be explored in the next section and chapter.

Resistance in the School System

The use of the XO laptop in Rwandan classrooms, as mentioned before, resembles the first type of use described by Maddux et. al. (2001), whereby rote learning is reproduced rather than eradicated. OLPC seeks explicitly to do away with these old teaching methods, yet the arrival of the program in Rwanda has so far made little impact in the overall quality of education in the participating schools. This comes as no surprise to the leaders of the program, including Michael Alvarez, who underlined the difficulty of changing such a conservative system as the school, no matter in which country:

> What we really want to accomplish, what we really know is that changing schools is the hardest mission, it's harder than conquering a country. It would be cheaper to conquer through war than change a school. Everyone has concrete ideas about education, and think they are experts about education. They have understandings of what a class should look like (Michael Alvarez, June 23rd 2010).

OLPC constructionists like Michael attribute the failure of schools to adapt the use of computers to constructionist techniques to an innate conservatism of formal education institutions. Seymour Papert described this phenomenon eloquently in "The Children's Machine" (1993:39-40):

> The shift from a radically subversive instrument in the classroom to a blunted conservative instrument in the computer lab came neither from a lack of knowledge nor from a lack of software. I explain it by an innate intelligence of School, which acted like any living organism in defending itself against a foreign body. It put into motion an immune reaction whose end result would be to digest and assimilate the intruder...School knew very well how to nip this subversion in the bud.

As previously mentioned, the most obvious sign, according to Seymour Papert (1993), of the assimilation of the laptop into the existing formal school system is the computer laboratory. Rather than changing the rhythm of the school to accommodate constructionism and the five

principles of OLPC, which includes child ownership of the laptop, the primary schools in Rwanda have opted (consciously or unconsciously), to avoid changing the system and to simply integrate the laptop into their regular routine.

Each of the four schools I have studied, including Rwamagana B, Nonko, Kagugu, and ESCAF, appears to be assimilating the laptops in such a way as to maintain the current equilibrium in the school. Michael Alvarez, OLPC Rwanda's project coordinator, has described the primary school as a functioning system, with class time tables, rules, and policies to follow. In introducing the XO laptop, OLPC is trying to design a new approach to learning that will disrupt the current equilibrium as much as possible in order to make room for constructionism. Most crucial in this approach is to have the laptops integrated into the classroom so that students have access to them at all times and teachers use them regularly in delivering their lessons.

Yet my observations and interviews with teachers, students, and headmasters reveal a certain resistance to change. At Nonko, as mentioned before, the headmistress was prompted by the Government of Rwanda (GoR) to keep most of the 800 or so laptops in storage and reserved one 40 minute period per week per class for "laptop time," in an effort to prevent in-home thefts. Students were thus not yet permitted to take the laptops home in June and July of 2010. ESCAF primary, a private school, had a similar system, where even though the children who had purchased laptops were able to take them home, only one or two lessons per week were officially set aside for students to learn about computers. The rest of the time, classes continued in the traditional manner without reference to the laptops, while once a week volunteers would come after school to train those who owned laptops, and two periods per week were reserved for revision of these lessons. Kagugu followed again with a similar approach – with specific training sessions reserved for the volunteers to help students learn how to use the laptops, while teachers sat on the sidelines. Rwamagana B seemed to be applying the policy desired by OLPC by giving teachers freedom to use the laptops at their leisure, and students were permitted to take laptops home. Yet the teachers often seemed to simply ignore the laptops and continued teaching with textbooks and chalk.

These patterns were not surprising to Michael Alvarez, nor would they have been to Seymour Papert (1993), who predicted that schools would resist change to the system. Computer labs

provided a space for students to use computers without disrupting the normal functioning of the school. Where OLPC's mission was to move beyond the computer lab or "laptop time" to achieve true integration of technology in the class and in the culture of the community, the teachers and headmasters of the schools were consistently defending the old school system.

From this perspective, it seems that the failure of schools to change their orientation toward new teaching approaches rests with the schools themselves. The "innate intelligence of School" (Papert 1993:39-40), which Papert describes offers some degree of independence to the school, as though it has a mind of its own which it can control, and which can decide the outcome of the educational system. Yet the school system is clearly a state institution, which is run by individuals who seek to fulfil a specific (political) agenda. Educating Rwanda's population is currently one of the state's priorities, without which the GoR will not be able to achieve its desired objective of middle-income status by the year 2020.

I argue that the failure of the school system to adjust to the demands of constructionism and OLPC rests more with the specific objectives of the GoR than with an "innate intelligence" (Papert 1993:39-40) of the school. The government has certain ideas of what the school is for and what it should achieve, and based on these objectives, the Ministry of Education (MINEDUC) decides what educational reforms to prioritize. For example, MINEDUC's refusal to allow the children of Nonko and Kagugu to bring their laptops home after school rests with the government, and is based on the fear of losing its investment. Moreover, as mentioned at the beginning of this chapter, OLPC must submit to some degree to the government's desires since it cannot directly enforce its educational agenda. Because of this there is a constant tension between OLPC and MINEDUC, who seek to push Rwanda toward the same modern information based economy and society, though through different means. The next chapter describes the GoR's reasons for adopting OLPC, and the specific things it wishes to do with the program, which actually diverge to some degree (though not totally) from the goals of OLPC.

CHAPTER 3

MOTIVATIONS FOR CHANGE

History and Context of Rwanda's Commitment to OLPC

James C. Scott (1998:5) argued against the "imperialism of high-modernist, planned social order," making "a case against an imperial or hegemonic planning mentality that excludes the necessary role of local knowledge and know-how" in the context of schemes meant to improve the living standards of poor countries. As mentioned in Chapter 1, David Cavallo (2000), who was in charge of the OLPC deployment team in Rwanda in 2009-2010, proposed to implement OLPC's educational improvement scheme in a flexible and adaptable manner that made use of "indigenous knowledge." Michael Alvarez, who directed the OLPC volunteers, interns, and workers in their training tasks, also proposed an indirect approach to implementing OLPC's objectives, by advising the government rather than through "neo-imperialist" coercion. But the Government of Rwanda (GoR) sought to apply a more direct and forceful method to the implementation of the program, in an effort to ensure the rapid development of the country from a poor, agricultural-based economy to a globally competitive one based on high technology and ICTs. My position, borrowing from Scott's (2008) critique of authoritarian high-modernism, that variant of development scheme that favours the application of centralized state power to the management of top-down social-improvement blueprints, is that the GoR sought to take this more direct and controlled approach to the implementation of OLPC owing to its troubled past.

Scott (1998:5) claimed that the most dangerous element in an authoritarian high-modernist state is the forcible element, in which the state

> is willing to use the full weight of its coercive power to bring these high-modernist designs into being. The most fertile soil for this element has typically been times of war, revolution, depression, and struggle for national liberation. In such situations, emergency conditions foster the seizure of emergency powers and frequently delegitimize the previous regime. They also tend to give rise to elites who *repudiate the past* and who have revolutionary designs for their people (emphasis added).

In the wake of the explosive ethnic conflict which ravaged the country in 1994, the Rwandese Patriotic Front (RPF), and President Paul Kagame, who has been in power since 2003 and was

recently re-elected in August 2010, have sought to implement an "enlightened authoritarianism" to their rule of the country (Stearns 2010:2). That is, President Kagame, according to Jason Stearns (2010:2) has often expressed "his doubts about the wisdom of imparting democracy to Rwanda," preferring instead to employ a style of government similar to that of South Korea, Taiwan and Singapore, where periods of high economic growth were overseen by authoritarian governments, fearing that "democracy could lead to conflict." Kagame's plan to boost economic growth by replacing the agricultural economy with a service or information economy, requires, from this perspective, "top-down management and lack of opposition [which] can allow them to push through difficult reforms" (Stearns 2010:2).

The "logic of improvement" (Scott 2008:224) based on the building of an ICT-based economy that President Kagame follows, therefore, is closely connected with an authoritarian approach to government, which limits any opposition or even the involvement of local or "indigenous knowledge" (Cavallo 2000) – in this case the teachers' knowledge of the education system. It appears that the GoR seeks to avoid a democratic and fluid adoption of the OLPC program based on the concept of David Cavallo's (2000) concept of emergent design, in which unpredictable applications of the program can be given room to flourish. The desire to maintain control over the program which has the potential to have a major impact on the Government's plans to revolutionize the economy, seems to take precedence over the more democratic approach proposed by OLPC. This chapter will describe the historical and political motivations for the current Government's decision to sign onto the OLPC program, as well as the reasons for the authoritarian approach to its implementation.

One Laptop, One Nation

During a speech at the opening ceremony of a massive laptop training week for 300 Rwandan teachers in June 2010, Samuel Dusengiyumva, the OLPC Rwanda Country Manager, told a "story of a white man who had come to MINEDUC[31] and criticized them [the government and OLPC], saying, "why are you having laptops? Your population is poor with nothing to eat. Are they going to eat laptops?" In response, he "explained to the white man that giving laptops to children is like giving a child hope that in the future that child will be able to do anything else in

[31] The Ministry of Education in Rwanda.

order to get food," meaning that access to technology will make him competitive in the market so that he can find a good paying job to feed himself and his family. He continued, explaining that for "the knowledge of the 21st century they [the children] need to have critical thinking skills. The importance of the laptop is that everything the child received [learned] in the classroom, the child can make his own research and make anything from his research." That is, in a sophisticated version of the "teach a man to fish" proverb (Papert 1993:139), the laptop is a tool that is to be used by children in Rwanda to improve their critical thinking skills, which are crucial for success in the new information economy. Proponents of this program envisage that the information economy will replace the primarily agricultural economy in Rwanda by the year 2020 (Government of Rwanda 2010:3).

OLPC's approach to technology, education and development is deeply influenced by the tradition of educational philosophy from which the non-profit emerged. But the ideas that drive OLPC differ to some degree from those which motivate the Government of Rwanda (GoR) to seek out computers as the "answer" to development in that country. The tensions that arise from these differences affect the way the project is implemented in Rwanda. For this reason, understanding the origins of the idea to boost educational performance (and by extension economic growth) with technology can provide insight into the lived experiences of the program in Rwanda.

After the 1994 genocide that took the lives of nearly one million ethnic Tutsis and moderate Hutus Rwanda's name became synonymous, in the West with this tragedy. President Paul Kagame, re-elected in 2010 for a second seven year term, has sought to push for social and economic reform that he hopes will rectify the structural inequalities believed to be at the root of Rwanda's past ethnic conflict. Where the colonial and post-colonial legacies of poor governance, ethnic division and unequal resource distribution have been cited as causal factors in this small, landlocked, Central African country's inability to unify its population and to rise out of poverty (e.g., Mamdani 2001; Uvin 2003; Uvin 1998), Kagame has initiated an economic development policy geared toward addressing these key obstacles to Rwanda's development.

"Vision 20/20," a document drafted in the year 2000 by Rwanda's Ministry of Finance and Economic Planning, outlines the government's plan for a transition from one of the world's

poorest countries to reach middle-income status by 2020 "based on an information-rich, knowledge-based society and economy, achieved by modernizing its key sectors using [Information and Communications Technology] ICT" (Farrell 2007:4).[32] Achieving this, according to the Vision 2020 document produced by the Government of Rwanda, "will require achieving annual per capita income of US$ 900 (US$ 290 today), a poverty rate of 30% (64% today) and an average life expectanc[y] of 55 years (49 years today)." Kagame's vision for development encompasses the unification of a once deeply divided and unequal society through the establishment of an entrepreneurial middle-class that cross-cuts ethnic divisions. In order to accomplish this, he envisions investing in what he considers to be Rwanda's most valuable asset: its people (Government of Rwanda 2000:14). By educating Rwandans, providing necessary infrastructure, and opening up the economy, Kagame and his government hope that Rwanda will emerge as an information economy within the next decade, boosting growth and reducing economic pressures that they attribute to the fuelling or exacerbation of ethnic tensions.

In addition to encouraging the development of a middle class he hopes will contribute to the suppression of ethnic divisions, Kagame has both outlawed any reference to ethnicity (Beswick 2011:2) and has made an effort to unite his 11 million citizens by promoting an ideology of "unity" (Waldorf 2009:103) among his people. During his electoral campaign in 2010 and in giving public talks, I often saw Kagame, in the media, raising his fist in solidarity with his supporters and with the nation as a whole, as a symbol of the new era of a race-free Rwanda. The reality of continuing tensions between the two major ethnic groups means that this objective remains to be attained, but many consider that the government has made significant inroads toward peace in the past decade (despite Kagame's strong handed tactics) (Fagotto 2010). According to The New Times, Kagame has even received a peace award on behalf of Dr. Vincent Biruta, the head of State by Senate President, who stated that "[t]he Award is in recognition of his achievement as a leader who has championed justice, reconciliation and unity of the Rwandan people." According to King (2005:904) the educational system has played a significant role in spreading genocide ideology throughout the twentieth century, for example by segregating students based on ethnicity, and through pre-1994 textbooks that portray strong negative stereotypes between Tutsi and Hutu students (Mamdani 2001:89-90). But Kagame is

[32] ICT stands for Information and Communications Technology.

pushing to use education, the same medium which previously encouraged ethnic division, to promote peace and tolerance.

According to The New Times, Rwanda, one of Africa's smallest, poorest, and most densely populated nations, is making plans and investments to become the East African hub of Information and Communications Technology (ICT). Despite ranking 67 out of 102 countries on the Human Poverty Index, and 158 out of 177 countries on the Human Development Index (Farrell 2007:2), the government's commitment to expanding the ICT infrastructure has begun to radically change the country's outlook on development. However, Rwanda's poor history of educational performance, the World Factbook estimating the 2003 literacy rate at approximately 70%, has limited the population to mostly subsistence agriculture as most peasants do not qualify for official positions in the urban service sector. Industry in Rwanda is nearly non-existent, and the country's landlocked status makes exports extremely expensive (Short 2008:57). With little improvement in primary education over the past decades due to poor teacher salaries, increased enrolment,[33] and lack of funding, more than 90% of the Rwandan labour force continues to rely on agriculture for their livelihood (Government of Rwanda 2000:7). But with a 2009 population growth rate of 2.6% per year and a population density of 365 people per square kilometer (Thaxton 2009:1-2), access to land has been a major concern for the better part of the twentieth century. Shinichi Takeuchi and Jean Marara have highlighted, in fact, that the tensions arising from growing population pressure and concerns about land tenure played a significant role in fuelling inter-ethnic conflicts between the Tutsis and the Hutus since the turn of the century (André and Platteau 1996; Uvin 1998). The dearth of alternatives for poor peasants seeking to make a living outside of the agricultural industry has pushed the government to come up with a solution.

Along with spending one third of the national budget on health and education, Kagame's government has pledged, in the Vision 2020 document, to make Rwanda the leading ICT nation in East Africa, and has recognized that without natural resources or significant export industry, the country needs to focus on its citizens as its most valuable resource. The document also places emphasis on prioritizing the training of citizens in the use of ICT because the government sees this as an opportunity equalizer for Rwandans, who must seek new avenues for income

[33] The Government of Rwanda abolished primary school fees in 2003, leading to spikes in enrollment.

generation in order to reduce population pressure and promote economic growth, peace and development.

In accordance with this ambitious plan, the Ministry of Education adopted a pilot project with the One Laptop Per Child (OLPC) organization in 2007 in an effort to expose its youngest citizens to ICT. The enthusiastic adoption of OLPC in Rwanda is driven by the broader vision that an influx of technology is the key to developing a critical mass of technologically skilled citizens capable of launching the nation into the modern information economy. In the year 2000 the government of Rwanda adopted a National Information and Communications Infrastructure Policy and Plan dedicated to the expansion of ICT infrastructure nationwide (Farrell 2007:2). The subsequent boom in ICT industry and infrastructure attests to this commitment. For instance, the cell phone industry added an extra competitor to the market shortly before my arrival in Rwanda, offering such low prices that I saw countless urban citizens carrying two phones; one for receiving free incoming calls, and one for making calls at reduced rates. Internet cafes abound, and not only in the capital city. Though the most rural areas continue to suffer a lack of access to technology that is readily available in urban centers like Kigali, the improving transportation and road system is beginning to facilitate access. Impressively, Rwandans have been contributing manually to the installation of the nationwide fibre optic cable that will connect them to high-speed internet, as I often witnessed them lining up by the hundreds on the sides of major roads to dig the trenches for the cable with pick axes and in bare feet.

Contemporary Primary School Education in Rwanda

The Rwandan primary school system has been undergoing steady changes in the last few years to accommodate the Government of Rwanda's (GoR) vision of economic growth through the development of its human resources. Rwanda's educational objectives, therefore, are closely tied to its vision for economic development. More specifically, the GoR hopes that encouraging science and technology education and the improvement of ICT skills to develop human resources will support "the aim of attaining per capita income of a middle-income country in an equitable way, and the aspiration to become a modern, strong and united nation, without discrimination between its citizens" (Government of Rwanda 2000:3). Outlining the general structure of the current primary education system in Rwanda will provide context for the way OLPC operates in

Rwanda, since as an educationally oriented organization, it operates on a daily basis within the classroom. The motivations for Rwanda's adoption of the OLPC program, become more apparent when the context of its educational system is outlined

By contrast to other countries in the East African Community (EAC) which offer only six years of primary education, Rwanda has recently implemented a nine year free basic education system, which includes six years of primary and three years of post-primary (or lower-secondary) education without tuition fees (Republic of Rwanda 2008:3). By abolishing student fees for these nine years, the GoR hopes to expand access to education to all Rwandan children. Students who perform well on national examinations are then selected for three years of upper-secondary schooling in public secondary schools with fees that are much lower than their private counterparts.[34] Those who are not selected have the option of attending private secondary schools, but the majority of students cannot afford the prohibitively expensive school fees. Where the first level of secondary school (grades 7-9) is a continuation of primary school that offers a general curriculum with a variety of subjects, the second level (grades 10-12) offers a range of academic options geared toward preparing students for higher education and entry into the work force (World Bank 2004:24).

School activities, then, generally focus on the teaching of curriculum and preparing students for the end-of-year examinations. Teachers and students, based on my observations, tend to take these examinations very seriously and spend the weeks leading up to them revising and studying materials that were previously learned, and reorganizing their schedules to make sure nothing interferes with the preparation process. When the examinations are over, students get a few weeks of respite from studying while teachers are often called to scheduled training sessions, either for language improvement, updating of pedagogical skills, and now, OLPC training.

Other changes include the 2009 shift in the language of instruction from Kinyarwanda in primary schools and French in Secondary schools, to English in both primary and secondary schools (Republic of Rwanda 2008:11). Also, in order to reduce the burdensome overpopulation of classrooms, which has been exacerbated since the abolishment of primary school fees in 2003,

[34] However, not all children who pass these examinations will find a place in public secondary schools, which are cheaper than attending private secondary schools. For example, in 2007 and 2008, less than fifteen percent of students who took the national examinations were selected for public secondary schools. At this rate, the majority of grade six students aged 12-13 are pushed out of the education system (Uworwabayeho 2009:317).

the GoR has implemented a double-shifting policy, which cuts class sizes by having half of the students attend in the morning and the other half in the afternoon. Unfortunately even this only brings the pupil to teacher ratio (PTR) down to about 74:1 (Government of Rwanda 2000); a situation that continues to place a lot of pressure on already overburdened teachers. In order to help reduce this pressure, a new system whereby teachers are now responsible for teaching only two subjects, rather than continuing with the old "homeroom" model where teachers must prepare and deliver lessons in all major subjects to one classroom. By rotating from classroom to classroom rather than teaching to the same students, teachers save time in preparation and have the opportunity to improve on their lesson plans (Government of Rwanda 2000).

Finally, the GoR has begun to emphasize the introduction and integration of ICT into the education system, with such pioneering programs as the New Partnership for Africa's Development (NEPAD) e-Schools initiative and the One Laptop Per Child (OLPC) project. In the summer of 2010, as mentioned before, OLPC had deployed approximately 10,000 laptops to 18 primary schools in Rwanda, and had purchased 100,000 more for future distribution. These extra laptops were destined to reach five schools in each of the thirty districts in Rwanda (MINEDUC 2011:10), and more than 56,000 of them have since been deployed by the GoR (MINEDUCb 2011:2).

The changes in the contemporary Rwandan education system are symptomatic of the discontent of the current Rwandese Patriotic Front (RPF) administration headed by President Paul Kagame with the previously inefficient and deeply discriminatory practices that penetrated all spheres of Rwandan society, including state, church, and school, from the colonial period in the first half of the twentieth century, and the post-independence period until the genocide in 1994.

Colonial and Post-Colonial Education in Rwanda

Though there exist a plethora of explanations for the degeneration of social and political relations into ethnic conflict in Rwanda, the literature often points to the role of the formal education system and especially the national history curriculum in Rwanda in this process (Des Forges 1999; Freedman 2008; Salmon 2004). For the purposes of this thesis, two points about the colonial education system are noteworthy. Rwanda was unfortunate enough to experience the administration of two colonial powers over the last century, with Germans taking over at the turn

of the twentieth century, and the Belgians replacing them after World War One. Jill Salmon (2004:82) has argued that the formal school system, established by the colonial powers (more specifically the religious missions) in 1900, was intentionally designed to be racially discriminatory. Early on, the colonial powers favoured the Tutsi minority for their "racial superiority" while, according to Bird (2003) the Hutu majority often despised the former for their superior status and power (Salmon 2004:82; Longman 2001). Mamdani (2001:89-90) describes a "separatist" education system that favoured Tutsi students with high quality, "assimilationist" education, which, being taught in French helped to groom them for later colonial administrative roles, while Hutu children were streamed into a poorer quality system taught in Swahili. Because the colonial administration favoured the Tutsis as "superb humans" suited to civilized administration, while the Hutu were considered inferior and better suited to menial tasks (Mamdani 2001:88; Longman 2001:169), the segregation of the school system was justified. Bush (2000:10) explains that the discrimination that played out in the everyday lives of Rwandans was also justified in the school curriculum:

> Textbooks during the German and Belgian colonial periods emphasized the physical differences between the Hutu and Tutsis, linking physical appearance and intellectual capacity according to prevailing racist doctrines. Such books praised the intellectual capacities of the Tutsi and classified the Hutu as unintelligent, meek and suitable for manual work (Salmon 2004:82).

Ethnic and regional enrolment quotas were instilled early on, excluding Hutu children on the basis of physical features. According to Bush (2000) one government school was reputed to refuse students who did not meet a minimum height requirement, which disadvantaged Hutu who were on average shorter than Tutsi (Salmon 2004:82). By 1931, the codification of ethnicity was made official by Belgian colonizers, who made identification papers that featured ethnicity obligatory (Uvin 1998; Salmon 2004:80). The situation of racial discrimination was reversed after World War Two, according to Longman (2001:169) when Catholic missionaries began to question the morality of inequality in Rwandan society. By this time, a "Hutu 'counter-elite'" emerged, favouring the education of Hutu children rather than Tutsi (Longman 2001:169). When Belgian colonial favour turned toward the Hutus in the 1950s, discrimination began to flow the other way, where Tutsi began to feel the retribution of Hutu teachers and students (Longman 2001:169). Even after independence, during the 1970s, ethnic and regional quotas restricted entry into government funded schools (Bush 2000; Salmon 2004:82). This

dynamic lasted until the onset of the 1994 genocide, after which the Tutsi-led Rwandese Patriotic Front (RPF) took power. Following the end of the genocide, educational policies drafted by the GoR have sought to redress the nefarious effects of these discriminatory practices.

The educational policies of the GoR have been shaped by two interrelated objectives. First, the overarching mandate of the current administration is to unify the deeply divided population into a nation of citizens undifferentiated by ethnic or regional affiliation by developing a more inclusive curriculum. Second, complementing this change in curriculum is the abolishment of the system of classification of students and teachers by ethnic identity (Obura 2003:18).

In the years following the genocide, the RPF and a number of scholars began to attribute the cause of the genocide almost exclusively to the entrenchment, in school history, of divisive ideology and hatred rooted in colonial attitudes to race, which had been deeply shaped by the early 20th century eugenics movement popular in Europe (Weldon 2003:62).

> History and history teaching in Rwanda reinforced notions of inequality. Colonialism brought the first written histories of Rwanda that conflated the ruling Tutsi dynastic court history with the history of Rwanda (Fujii: 2001), drawing on the pseudoscientific racism of the late 19th century. A mythological version of the Rwandan past ranked ('Hamitic') Tutsi, supposedly later immigrants to the region, above Hutu ascribing to them a biological and cultural superiority as a group. These colonial narratives of Tutsi supremacy became part of schools texts and under the Hutu-led government in the 1950s were manipulated to demonstrate Tutsi abuse of power and some decades later, in the 1990s, to feed into the hate speech that contributed to genocide (Weldon 2003:62).

The Rwandan government has become hyper-aware of the immediate and long lasting effects of mythologized curricula that affect social identity and cohesiveness. Large genocide memorials are held during the three month mourning period that lasts from April to July each year to commemorate the victims of hatred ideology. Frequently, these memorials, which often bring together whole villages and thousands of people, take place at the edge of rivers where the bodies of massacred Tutsis were discarded. The belief that the Tutsi were 'Hamitic' descendants of Ethiopian migrants (Weldon 2003; Mamdani 2001) who encroached on the local Hutu population encouraged countless perpetrators to dispose of them in this manner, the message being that their bodies would float down stream and effectively 'send them back home'. A

Catholic memorial organized by my friend and informant on the river's edge near Gisenyi, close to the border with the Democratic Republic of Congo on May 9th 2010 sought to pay respects to these victims. Following the ceremonial throwing of flowers into the river by families and friends of victims, testimonials of survivors attested to the real-life consequences of racism. A thin woman with unkempt hair and sunken facial features was called to the microphone under a white tent, facing a crowd of two thousand attendees on the banks of the river. Her story, delivered in Kinyarwanda was translated into French for me by a friend. She explained that on the day the atrocities began in her village, there was much confusion. Several men stormed into her home and abducted her husband, her six children, and herself. Her husband was killed, while she and her children were thrown into the river. Though she managed to escape by grasping the reeds on the river bank, all of her children drowned. Because she did not understand what was happening, she ran to the local commissioner to ask for help. While he assured her that he would send for assistance, he called instead the same perpetrators, who returned to fetch her and threw her into the rushing waters once more. Again she escaped, and ultimately survived the genocide. After naming her six children and her husband in commemoration, she concluded by asking: "Why have I been spared, only to be left with this sorrow?" This woman's testimony illustrates on a personal level the persistent aftereffects of the genocide, and highlights the continued threat of recurrence of violence if ideology is ignored.

The RPF recognizes the importance of addressing discriminatory doctrine and has been attempting to do so since coming to power in 1994.[35] The understanding that processes of ethnic reification during the colonial period was the root-cause of the genocide has been so engrained (within the current administration) that a moratorium on the teaching of school history was imposed for a decade after the genocide, pending the development of a neutral history curriculum (Weldon 2003:56).

[35] Despite efforts to unite the Rwandan people into a single nation to avoid a repetition of genocide, civil war, and strife that has plagued the small country for decades, the Government of Rwanda and President Paul Kagame have been criticized for their authoritarian approach to reform. The GoR is suspected of attempts to silence political opponents, and has been accused of having links to the attempted assassination of exiled General Faustin Kayumba in South Africa in June 2010, and the abduction and murder of several journalists. In addition, the country's consistently low scores in the Freedom of Press rankings have added to the concerns of the international community regarding the legitimacy of these dictatorial tactics for achieving unity.

Whether the actual causes of the genocide can be distilled to external (colonial) forces, or whether a confluence of events and circumstances, including overpopulation, tensions over land, economic pressures, and power struggle, is beyond the scope of this paper. What is important to highlight is that President Kagame and the RPF have adopted the trope of the primordial unity of the Rwandan nation, and expound a return to the original state of peace and harmony portrayed in the newly romanticized version of Rwandan history as a way to encourage peace among Rwandan people. The desire to reconcile Rwandans is driving the revision of the history curriculum, along with other subjects that are vulnerable to manipulation for highlighting ethnic division, in order to breed a greater sense of unity and nationhood. Weldon proposes that the current version of history is "equally mythological" to the preceding versions exploited by either colonial Tutsi or post-independence Hutu regimes (2003:63), but serves to unite, rather than divide the nation. The current official history states that:

> Since the 11th century, Rwanda existed as a nation founded on a common history of its people, shared values, a single language and culture, extending well beyond the current boarders of the country. The unity of the Rwandan nation was also based on the clan groups and common rites with no discrimination based on ethnicity.
>
> The colonial power, based on an ideology of racial superiority and in collaboration with some religious organisations, exploited the subtle social differences and institutionalized discrimination. These actions distorted the harmonious social structure, creating a false ethnic division with disastrous consequences (Rwanda Vision 2020:4).

By denying any aspects of ethnic divisiveness through curriculum change, by abolishing teacher and student classification systems based on ethnicity, and by publicizing the cultural resemblances between the Tutsi and Hutu in the period leading up to European colonialism, the GoR hopes to breed a sense of community among Rwandans, which will lay the groundwork for developing a peaceful and prosperous state. In this effort to "repudiate the past" (Scott 2008:5), the government works to avoid dissention from other parties, who may threaten the fragile ethnic and political tension which belies the apparent post-genocide harmony instilled by the current administration. The RPF believes that authoritarianism is the only viable means to ensuring this balance, and this form of rule has spilled over into the way that the government runs the OLPC program.

The second objective, made explicit in the Ministry of Education's (MINEDUC) mission statement, complements the first goal of promoting national unity among Rwandan citizens by formulating an economic platform on which to build a prosperous and unified nation:

> The global goal of the Government of Rwanda is to reduce poverty and in turn to improve the well-being of its population. Within this context, the mission of the Ministry of Education is to transform the Rwandan citizen into skilled human capital for socio-economic development of the country by ensuring equitable access to quality education focusing on combating illiteracy, promotion of science and technology, critical thinking and positive values (MINEDUC 2010).

President Kagame and the GoR have espoused the integration of ICT in education, along with the prioritization of, and increased investment in, science and technology education in order to boost the skills competence of citizens lining up to partake in and develop the information economy in Rwanda. For example, in 2006 the NEPAD e-Africa Commission introduced a project to improve ICT penetration in Rwandan schools by linking up secondary schools across the country (http://www.mineduc.gov.rw/spip.php?article119). The operating axiom underlying this objective is that competitive performance in a global economy that has already been shaped around information and new ICTs requires a change in focus from the primary sector, where comparative advantage is lost due to overpopulation,[36] to the tertiary sector, where returns to investment are perceived to outperform those of the primary and secondary sectors (Government of Rwanda 2000:9). Richard Niyonkuru, the Monitoring and Evaluation Advisor for ICT's in Education in the Ministry of Education, expressed this vision in a speech at the opening of a five day training session for three hundred of Rwanda's teachers, on July 5th 2010: "In Rwanda, we have no gold, no oil, but we have Vision 20/20. *Dans cette vision il faut que nous exploitions la population.* [In this vision we must make use of the population]. We will not use physical power but we will use knowledge." One main objective of the Ministry of Education, then, is to promote future prosperity by preparing Rwandan children to compete in the service or information economy.

> Systemic economic growth is the key to reducing poverty and increasing prosperity. "New Growth" economic models emphasize the importance of

[36] Salmon (2004) cites that Rwanda's population density increased from 106 per square kilometer in 1960 to 280 by 1992 (World Bank, 2003). As a result, the size of family farms were reduced from 3 hectares in 1949 to 0.7 hectares in the 1990s while the population continues to grow into the 21st century, negatively affecting the GDP of most of the population (Salmon 2004:81).

> new knowledge, innovation, and the development of human capacity as the sources of sustainable economic growth. ICT provides tools for empowering societies to change into knowledge economies or information societies leading to growth stimulation. Universal access to an inclusive high-quality education benefits individuals; stimulates public and private sector enterprise; and ultimately leads to economic growth that is more equitably distributed and enjoyed by all (MINEDUC 2010:7).

Less explicit in this statement, but I argue equally important, is the concern for inclusive and equal access to education dedicated to improving Rwanda's economic situation. By focusing on politically neutral subjects such as science and technology, the focus of education moves away from concerns about access to resources based on ethnic or regional lines, but towards moving the entire population in the direction of prosperity and growth.

The current government, then, has pinned its hopes on attaining this vision by gradually saturating the population with access to the appropriate technologies (especially computers), and has begun to employ training strategies aimed at preparing teachers for transmitting knowledge about technology to their pupils. The "Report on the Localization Process of the ICT Competency Standards for Rwandan Teachers" prepared by the Ministry of Education in 2010 reports on the progress of plans to ensure the successful integration of ICT into schools. The draft ICT in Education policy stipulates that teachers are expected to become competent in such spheres as "ICT literacy, content development, pedagogical teaching approaches using ICT, the use of ICT for management and administration and technical skills on implementation, management and maintenance of ICT facilities." There are, however, as of yet no specifications beyond the "2020" deadline as to how long this will take. The One Laptop Per Child program falls under the scope of the government's plan to integrate ICT into the primary school education system.

The Aesthetics of an ICT Nation

The manner in which the GoR has applied the transformations to the education system, including but not limited to the OLPC program, however, appears reminiscent of what James C. Scott (2008:224) described as a rather "powerful aesthetic dimension" of high-modernism. The concern with making sure that things "look right becomes more important than whether they work; or, better put, the assumption is that if the arrangement looks right, it will also, ipso facto,

function well" (Scott 2008:225). Operating on the myth (Ferguson 1999) that the attainment of modernity in Rwanda rests upon the application of a programmatic approach to ensuring technological progress, the GoR has opted to invest in providing access to ICT among its youngest citizens.

However, in a bid to control the outcome of the program as much as possible, the government seems to have become more concerned with ensuring that the OLPC *looks* as though it is functioning well, rather than making sure it is actually fulfilling its desired effects. While OLPC members like Michael Alvarez have attempted to advise the government to apply as much as possible the five principles of child ownership, targeting young ages, saturating the population with access to computers, offering open source software, and internet connectivity so that children will benefit from independent and engaged constructionist learning, the government has instead prioritized the simple distribution of laptops, which offers a sense that things are "moving forward." This concern was made apparent when, as mentioned before, more than 50,000 laptops were distributed to schools across the country with "no great plan[n]ing and no teacher training" (Michael Alvarez, January 5, 2011), where OLPC would have preferred to prepare the teachers for the arrival of the new laptops.

The political dimension to this dynamic was evident during the opening ceremony of a teacher training session that was held for 300 teachers in June 2010, in anticipation of this deployment.[37] A number of invited speakers, some of whom were involved with the Ministry of Education (MINEDUC), offered speeches to the invited teachers before the official training began. My friend translated one of the speeches for me, exclaiming: "He is campaigning for the president! He is saying: 'The one who brought you the laptops [the President] is the one who brought you to the city here for the first time'." Many of the teachers present were from rural areas and had never been to Kigali before, so this was the first time for many of them, the trip having been

[37] To clarify, Michael Alvarez and his team of volunteers were disappointed in this training session as the government had only allocated them five days to introduce the teachers to the laptops, when the majority of them had never used a computer before; they complained that it was not enough time for adequate preparation. Yet the government insisted on this one session, and the laptops were later distributed without, according to Alvarez, much more training.

sponsored by the government. "I can tell you instinctively that he is in the RPF, this man,"[38] added my friend, smiling at what she perceived to be part of the President's re-election campaign for the August 2010 elections (which he subsequently won in a landslide).

From this interaction, and from other conversations that I had with locals and with OLPC volunteers, I got the sense that the government was concerned with making sure its image was well associated with the deployment of the laptops, which were a powerful symbol of technological advancement for students and teachers. This concern was reflected in the speeches given during this training session, and in the actual fact of the premature distribution of the laptops.

In addition to these politically motivated actions, the government, as mentioned before, often restricted the mobility of the laptops that had been distributed during the pilot phase, preventing students at Nonko and Kagugu from taking them home, in order to ensure that the laptops themselves stay intact. The tradeoff for this forcible attempt to protect the investment was the functionality of the program itself, which rested on the establishment of a computer culture in the OLPC communities, rather than on the restrictive computer lab approach which appeared to be dominating the participating schools. By protecting the laptops from theft, the program appeared from the outside to be under control.

The appearance of control was also something that was of concern to the schools involved in the program. My first impression of Rwamagana B primary school, for example, was that almost all of the students had laptops, which I took to be a sign that they must be regularly in use. Walking around the compound on my first visit, I peered into each of the eight classrooms and saw many laptops on students' desks, and many more folded up at the front of the classroom as they recharged at the communal power bars. Yet through the course of my visits to the school, I never once observed a teacher prompt the use of the laptops in a lesson of their own accord. The lessons I did observe with the laptops, they told me explicitly, were for my own benefit, so that they could show me what they thought I wanted to see, since I had come to "study the laptops" in Rwanda.

[38] *« Il est en train de faire la campagne pour le président! Celui qui a emmener les laptops c'est lui qui vous a emmener ici en ville pour la première fois…je peux dire instinctivement qu'il est dans le FPR ce monsieur »* (Mirene, July 1, 2010).

Kagugu Primary school, I was told by Virginia Dias, who was in charge of overseeing the training sessions in many of the schools, was often chosen as the place to showcase the OLPC program for international media. As I mentioned in the introduction, Kagugu is the largest of the OLPC pilot schools that I visited, and being located in one of the richest neighborhoods in Kigali, it was well-maintained and looked inviting. Laptops were kept in storage for safe-keeping, but were distributed in an orderly fashion when they were taken out for training sessions or other lessons. Virginia explained to me that this was the school of choice for showing politicians and the media how OLPC works in Rwanda, because everything appeared neat and under control.

This concern with the appearance of control goes beyond the classroom. In accordance with Rwanda's plans to become a "modern" nation in a short period of time, the metropolitan areas, and especially Kigali, are subjected to strict rules of cleanliness and maintenance. In a 2010 New York Times article, Jeffrey Gentleman described the tension between the neat appearance of Rwandan streets and the controlling nature of the government:

> Under President Paul Kagame, this country, which exploded in ethnic bloodshed 16 years ago, is now one of the safest, cleanest and least corrupt nations on the continent. The capital, Kigali, is not ringed by sprawling slums, and carjackings — a deadly problem in many African cities — are virtually unheard of here. The roads are smoothly paved; there is national health insurance; neighborhoods hold monthly cleanups; the computer network is among the best in the region; and the public fountains are full of water, not weeds. All of this has been accomplished in one of the world's poorest countries.

Yet the appearance of order and cleanliness, Gentleman (2010) argues, comes at a price. In a bid to rid Kigali streets of thieves, beggars, and the homeless, the government has sent approximately 900 of them to the remote island of Iwawa in the middle of Lake Kivu, which borders the Democratic Republic of Congo DRC), where they spend up to three years to become "rehabilitated." In the meantime, the city, with its swept streets, relatively low crime and growing ICT infrastructure seems to be moving closer to the popularized image of "modernity" which offers a certain sense of "order and efficiency" (Scott 2010:224) in an urban metropolis.

To summarize, the tension that I argue exists between One Laptop Per Child and the Government of Rwanda in their implementation of the educational technology program to Rwanda has much

to do with the divergence in their approaches to its execution. OLPC members in Rwanda feel uncomfortable with enforcing their own agenda onto the education system for fear that they will be labelled as neo-imperialists, while the government has concerns about maintaining control over the balance of political and ethnic relations, which Kagame feels may be threatened by more open and democratic application of any sort of development scheme, including OLPC. The political motivation for changing the education system comes from a desire to unite the country and to avoid the collective violence of the past. The government sees the development of an ICT nation as the key to economic growth and social unification, which displaces OLPC's priority of changing the nature of education itself. Even though both parties seek to leapfrog Rwanda into the "modern" age, the government's more authoritarian approach to development supplants OLPC's self-defined educational objectives. The following chapter will discuss the cultural assumptions that led to the belief that OLPC's objectives would automatically be adopted by Rwandans, and will offer a cultural explanation to complement the political account of the rejection of OLPC's goals.

PART II: THE SOCIAL LIFE OF THE LAPTOP

CHAPTER 4

"IT'S NOT A LAPTOP PROJECT, IT'S AN EDUCATION PROJECT"

Conflict between Education and Technology in Rwanda's Development Plan

Nicholas Negroponte, founder of One Laptop Per Child (OLPC), is not the only ambassador for the transformation of education in the developing world. The laptop itself, having been imbued with the meanings attributed to it by its intellectual forbearers at the Massachusetts Institute for Technology (MIT) and its manufacturers at OLPC, reflects in its very form the intellectual orientations of the organization, which seeks to transform education in poor countries. For example, the portability of the laptop reflects the premium the organization places on allowing children to take the laptops home, while the open source software speaks to the potential of the laptop to act as a catalyst for creative programming and constructionist learning. To the dismay of many of the OLPC volunteers and workers in Rwanda, however, the expectation that the meanings attributed to the laptop by OLPC be transferred to the recipients of the laptops is not being met. My observations in Rwandan schools and interviews and conversations with teachers and headmasters especially have revealed a tendency to treat OLPC as an Information and Communications Technology (ICT) project rather than an education project.

The assumption that the laptop will be used for its originally intended purpose runs deep within OLPC, but does not accommodate the intensions of the Government of Rwanda (GoR), which attributes a different set of meanings to the laptop. This chapter will highlight the diverging approaches of OLPC and the GoR by laying out the historical trajectory of the object which lies at the center of the OLPC program – the laptop itself. By showing that it is common, and perhaps natural, for the significance or meaning of man-made objects to change or adapt to cultural settings which may be different from those from which they emerged, I hope to highlight another source of the tension which currently characterizes the relationship between the GoR and OLPC. OLPC has a specific agenda, which may indeed be more rigid than its members have explicitly stated.

When David Cavallo, Learning Expert for OLPC, discussed his emergent design approach to implementing new technology programs, he emphasized the need to accommodate local

expertise and knowledge so that perhaps new and unintended uses for technology may emerge and enrich the project. But the tendency for (especially the foreign) OLPC members to want to impose their educational agenda onto the GoR, rather than try to accommodate any unexpected uses for the laptop, seems to halt the program to some extent. Thus, even though OLPC claims to have gone beyond the imperialist nature of once popular development programs which sought to modernize poor countries, it seems that their agenda takes precedence over building on the local context. The technological "modifier" (Ferguson 1990) to this development program is not sufficient to result in deep change. OLPC is in fact not much different from development programs which sought to modernize through industrialization, in this sense of cultural imperialism. The culture which accompanies the OLPC program, I would contend, is visible in the materiality of the laptop, which finds itself at the center of the organization.

Material and Culture

Jules David Prown (1982:1) describes "[m]aterial culture [as] the study through artifacts of the beliefs – values, ideas, attitudes, and assumptions – of a particular community or society at a given time." Anthropologists who have traditionally taken the material culture approach to the study of culture, have used objects as their primary source of data, and often, as is the case with many archaeologists, have been forced to study objects in isolation from any external sources (such as writing or conversation) of information that may provide clues to the particular ethos of the people in question.[39]

> The underlying premise is that objects made or modified by man reflect, consciously or unconsciously, directly or indirectly, the beliefs of individuals who made, commissioned, purchased, or used them, and by extension the beliefs of the larger society to which they belonged (Prown 1982:1-2).

"Westerners," argues Pfaffenberger (1992), have had two dominant assumptions regarding the invention and adoption of things of human utility such as commodities and technologies; in the first place, inventions have been attributed to a direct fulfillment of a human need, and in the second place, recipients of objects, technologies or commodities invented in another place have been implicitly expected to adopt the meanings attributed to them by their inventors (Schaniel

[39] Of course, the other major assumption here is that people form discreet entities or groups that are congruent with particular patterns of material culture. This is not the assumption that guides the current study, although the inquiry is limited geographically to Rwanda for convenience.

1988, 2001; Howes 1996). If these assumptions are applied to the case of the reception of the XO laptop in Rwanda, the conclusion follows that the reasons for the adoption of the technology there coincide with the reasons for its invention, which is the fulfillment of the need to improve the quality of education. However, though I take seriously the claim that man-made objects can and do say a lot about the people who make them, it is possible that people who use the object may do so for reasons that differ from their originally intended purposes. And indeed, anthropologists have questioned the assumption that the meanings associated with the object travel with it to the recipient culture when its use is diffused beyond the culture of its makers.

Bryan Pfaffenberger (1992) proposed a social anthropology of technology to make light of the culturally taken-for-granted notions of the relationships between technology and culture. He argued that in "the West," there arose a common sense view of technology, where the invention and adoption of new technologies were perceived as being the direct result of necessity. The idiom, "necessity is the mother of invention" highlights this common assumption (Pfaffenberger 1992:495). From this perspective, technological invention or adoption is a natural process based on adaptation to the environment:

> People need water, "so they dig wells, dam rivers and streams, and develop hydraulic technology. They need shelter and defense, so they build houses, forts, cities, and military machines.... They need to move through the environment with ease, so they invent ships, chariots, charts, carriages, bicycles, automobiles, airplanes, and spacecraft (Pfaffenberger 1992:495).

This deterministic argument has in the past been so engrained into common conceptions of technology that it escapes the realm of critical questioning (Pfaffenberger 1992:493-495).

Pfaffenberger proposes instead that "culture, not nature, defines necessity" (1992:496). He argues that technological necessities are in fact culturally constructed, arising from the particularities of a group's sociopolitical configuration and that cultures do not automatically and uncritically adopt any technology to which they are introduced because it technically fulfills an adaptive need. To illustrate, he offers an example from William C. Schaniel, who has written about the relationship between culture and technology:

> In a recent important essay, Schaniel (89) has stressed that *the adoption of artifacts does not necessarily imply the adoption of the system of logic that produced the*

> *technology*. Schaniel illustrates this point by discussing the history of Maori appropriation of iron artifacts. In the first phase, the Maori ignored the artifacts, seeing little or no value in them. After some experimentation, the Maori found that hoes and spades could be worked into their indigenous system of agriculture. European observers were shocked to find that the Maori bound their hoes to short handles and used this implement from the squatting position. The favorite implement for levering up the ground remained the digging stick. The Maori later modified the digging stick by affixing to it a short piece of straight iron (89:496). Schaniel concludes that "the process of adopting and adapting introduced technology ... does not imply that introduced technology does not lead to change, but the change is not preordained by the technology adapted ... The process of technological adaptation is one where *the introduced technology is adopted to the social processes of the adopting society*, and not vice-versa…" (Pfaffenberger 1992:511, emphasis added).

Schaniel's (1988) argument that the system of logic associated with the inventors of an artifact or technology is not necessarily absorbed by the culture that receives the new technology refutes the common-sense view that things in their particular forms and meanings are inextricably intertwined.

Likewise, David Howes, in "Cross-Cultural Consumption: A global market, local realities," highlights the flaw in the supposition that the failure of a culture to adopt a particular set of meanings attached to a commodity by its makers. He makes the claim that "[i]ndigenous uses of Western commodities are often disparaged for the apparent failure on the part of the natives to 'get things right'. However…the failure may lie with the observer who sees only mimesis, and does not grasp how Western goods and values are being reworked in the context of local practice" (Howe 1996:9). Howes (1996:9) offers Comaroff's example of a South African chief who was misunderstood by Europeans to be attempting to emulate them when he purchased a leopard-skin suit made in the European style. Comaroff offers the alternative interpretation that the chief was not in fact attempting to imitate Europeans, but rather was seeking to combine the two symbols of authority that are found manifest in both European dress and the leopard print to maximize his influence within his community (Howes 1996:9).

In accordance with the view that objects often acquire different meanings in cultural settings which differ from that of the object's origin, I extend the argument that even though the XO laptop has its roots in constructionist philosophy, upon arrival in Rwanda it became imbued with meaning that was more relevant to the lives of the people there. But in order to more properly

arrive at that conclusion, it is necessary to trace the social life of the laptop, or more accurately, the historical path that led to the emergence of the laptop and the constructionist software which accompanies it.

The Social Life of the XO

Arjun Appadurai (1986:3) posits that "commodities, like persons, have social lives." By this he means that objects that have economic or social value are not intrinsically endowed with this value, but have acquired value through a cycle of social processes whereby the relationship between the availability and the desire for an object infuses it with social and economic worth. The life of the object, then, may be traced through the social cycle through which it has acquired value.

Taking as inspiration Appadurai's concern with the social dimensions of objects, this chapter analyzes the social life of the XO laptop, with a specific orientation toward understanding the processes by which the social and cultural value of the object has emerged over time and space. This requires a particular approach to understanding the laptop, which incidentally exists not simply as an object or as a tool, but as an object that is inseparable from an idea. The idea rests in the mandate of One Laptop Per Child, which, as mentioned previously is to transform and improve education for children in developing countries. As an object that expresses simultaneously an idea (or ideas), and 'thing-ness' - in the sense of tangibility and materiality, the laptop acts as the focal point of an investigation that aims to place a global development organization in its local context.

From this perspective then, it is useful to "follow" (Appadurai 1986:5) the "thing" in question – the XO laptop – from its conceptual origin to the development of some of its most crucial software.

The Tortoise and the Turtle

Some of the ideas which indirectly led to the development of some of the most fundamental XO software came from a source which seems quite unlikely, given that the final result was so different from its intended purpose. In 1948, W. Grey Walter, famed neurophysiologist built a set

of robots that behaved in "remarkably lifelike ways" (Johnstone 2003:89) by exhibiting behaviours that hinted at artificial intelligence or free will (Freeman 2003:4). The two robots, nicknamed Elmer and Elsie[40] begat the genus of cybernetic animal he called "tortoise" because of its general appearance, which was described as a "small creature with a smooth shell and a protruding neck carrying a single [light detecting] eye" (Walter 1950:2). It was a three wheeled vehicle powered by two motors, the "brain" of which was concealed beneath a shell-like covering (Freeman 2003:3) and demonstrated free will by using a light sensor (the eye) to detect and independently move towards or away from a light source (Walter 1950:2). The tortoises were "autodidacts that could learn from trial and error" and because of this continue to represent models of achievement in the field of robotics for their early sophistication in artificial intelligence (Freeman 2003:4). Grey could not have predicted that nearly sixty years later, the XO laptop's key software activity, Turtle Art, would feature its direct descendent, the Turtle, because despite their similarities, the two classes of machines served very different purposes.

Having known Walter and seen his tortoises in England (Johnstone 2003:89), Seymour Papert and his team of engineers were inspired to design a robot that would help children to think with (Papert 1980:11). In 1970 Papert founded the Logo Laboratory at MIT, and by the following year the first logo robot turtle was built (Feurzig 2010:263), offering students an "object-to-think-with" to facilitate learning (Papert 1980:11; Johnstone 2003:89). The design was very similar to Walter's tortoises, but with one major modification; whereas the former was hardwired to exhibit "life-like behaviour patterns" the latter was not free-ranging but obeyed commands from a computer, which was connected to the turtle with a wire (Papert and Solomon 1971:3). According to Johnstone, "[t]he first Logo robot was a big clunky thing that looked like a canister-type vacuum cleaner on wheels. Painted yellow, it had a headlight in front and a cable trailing from its rear end that connected it to a computer terminal. The robot's hard metal carapace made it look a bit like a turtle" (Johnstone 2003:89). The next generation of turtle, nicknamed "Irving," emerged in 1972 and offered the same type of design but with the added advantage of being wireless (Feurzig 2010:263) (see figure 2, Appendix).

[40] Elmer and Elsie are acronyms for "Electro Mechanical Robots, Light-Sensitive, with Internal and External Stability" (Grey 1950:2).

Papert had already developed a computer programming language called Logo, which was suitable for use by children (Feurzig 2010:260) and was adapted to allow children to program the Turtle. This language was directed toward the establishment of new and innovative approaches to teaching mathematics in schools, emphasizing "learner-controlled instruction" (Feurzig 2010:260). Papert and his team insisted that the purpose was "not to teach programming as a subject in its own right, but to use programming to teach mathematical ways of thinking" and programming was a good way to think about "*something*" (Feurzig 2010:261).

Whereas the impetus for Grey Walter's Tortoises was to some degree "an imitation of life" (Walter 1950), the logo Turtle was designed as a reference point for assisting children in the learning of algebra and geometry (Papert 1980:55-56). In Papert's words, "[t]he Turtle serves no other purpose than of being good to program and good to think with" (1980:11). By entering commands into a keyboard connected to the Turtle, the child can effectively tell it what to do by "talking" (Papert 1980:56) with it in its own language; Logo. Telling the Turtle to "turn right" and "move forward," for example, implores the Turtle to draw the shapes commanded by the user, who also controls a retractable pen that marks the paper on which the robot rolls (Papert and Solomon 1971:4). By offering children the opportunity to learn about angles and shapes through the act of "constructing" them, Papert's constructionist philosophy of learning was put into practice, even though the initial purpose of this variety of cybernetic animal designed by Grey Walter was to test new aspects of artificial intelligence.

The counterpart to the "floor turtle" described above is the "screen Turtle" (Papert 1980:11-12), which offers children the opportunity to transfer the object-to-think-with onto the computer screen. Children have been using screen turtles in various versions of the "Turtle Art" programming activity on computers since the 1960s;[41] the latest version of this program is a central feature of the XO laptop.

My first visit to Rwamagana B Primary school exposed me to this on-screen version of the Turtle. Having been invited to attend an afternoon teacher-training session, where foreign OLPC

[41] But whereas in the past this program was used in educational computer labs with student-computer ratios ranging between 1:50 to 1:400 in the 1980s (Johnstone 2003:111), Papert's dream of achieving a "one-kid-one-computer" (Johnstone 2003:96) ratio has only begun to take effect since the implementation of One Laptop Per Child in 2005.

volunteers and staff instructed the teachers at Rwamagana on the XO laptop software, I witnessed first-hand the latest phase in the evolution of Papert's Turtle Art program.

Upon arrival, I entered the classroom where half a dozen teachers were already at work on their laptops, sitting alone or in pairs, assisting each other. The trainer, Sarah, had already begun the lesson and was sitting in the middle of the classroom, assisting one of the teachers on the laptop. I greeted all of the teachers with a handshake, and was seated next to Francis, one of the local Kigali Institute for Science and Technology (KIST) trained interns who was there to offer support and translation from English to Kinyarwanda during the lesson.

Sarah was giving step-by-step instructions to the teachers, holding up one of the laptops so that the teachers could see what she was doing as she explained each step. The screen featured a white background with a menu on the left comprising a series of coloured bubbles with words like left, right, forward, and back, written inside. In the center of the white part of the screen, there was a small, green turtle about the size of the hole in a loose leaf page. I watched Francis and the other teachers select a series of word boxes from the left menu with their mouse, and drag them one at a time onto the white screen to create a list of connected boxes. "Forward 10, Right 90, Forward 10, Right 90, Forward 10, Right 90, Forward 10." The connected bubbles constituted a string of Logo commands, which, when activated by clicking a green flag at the top of the screen, would tell the turtle to move and trace a red line that followed the commands – in this case producing the shape of a square with 10 cm sides.

At the beginning of class most teachers were starting with simple shapes like squares and circles, and by the end (less than 2 hours later), they were mastering shapes such as houses, flowers, triangles, and other quixotic shapes and patterns. The teachers, many of whom had never used computers before the XO had arrived less than two years previous (and this anthropologist, having never programmed anything in her life), had learned to navigate a user-friendly programming activity in less than two hours, and had applied it to the practical task of understanding geometry.

Despite the similarity of the forms and functions between the tortoise and the turtles, the meanings with which each has been imbued have followed the cybernetic animals' evolutionary tree. I would argue that where the value of Grey Walter's Tortoise rested in its symbolic

representation of artificial intelligence, Papert's Turtle was valued for its ability to help children learn. In addition, where the shape of the tortoise was a coincidental result of the simplest configuration of the robot's functional parts, the transference of the animal shape to the Logo Turtle was intentionally symbolic and functional. Johnstone (2003:90) explains that the "the turtle was chosen as a metaphor because it was easy for kids to identify with it."[42] Being in the shape of an animal, the Turtle permits children to mentally place themselves in its place as they work out the best angles and lengths to command in the drawing of a shape (Johnstone 2003:90). Papert effectively stripped the tortoise of its original functionalities in order to suit his own project of finding a suitable tool for applying his constructionist philosophy to traditional learning activities. Grey Walter, who had designed the first robotic tortoises, never intended for the tortoise to serve as a children's learning tool, and even less so that the robot be deprived of its artificial intelligence capabilities, but the adaptation was necessary for Papert's new purposes. And where function preceded form in the case of the tortoise, the form of the turtle became central to Papert's vision of constructionist education.[43]

Much like Papert's Turtle, though very similar in form to Walter's, came to have a very different meaning to its users than was intended by its original designers, it can be observed that the meanings attributed to the XO laptop by its designers and its recipients in Rwanda are quite different.

[42] Though the turtle may have served as an intuitive reference point for children in the United States or Europe, where turtle species are widely known, I never saw turtles being referenced outside of the Turtle Art Activity in Rwanda. Even in an activity where animal masks were being constructed out of paper and other crafts material during the "Project Rwanda" activities at Nonko primary school, the animals that were used were more typical of the local rainforest or savannah fauna, including monkeys, elephants, and lions. Papert (1980:68) asserts that "cultural syntonicity" where "the Turtle connects the idea of angle to navigation, activity firmly and positively rooted in extraschool culture of many children," is an important factor in ensuring that children relate to the things that the construct, so that they develop a more tangible understanding of the things they learn. I believe the turtle to be an example, perhaps, of the lack of transferability of the turtle as a cultural symbol that may not have as much weight in Rwanda as it may have in the United States.

[43] Of course the Turtle and the Turtle Art program are not the same as the XO laptop itself. Turtle Art has been around since at least the 1980s, and can be installed on almost any microcomputer or laptop, regardless of whether it is an XO. But Papert's vision of constructionist learning became deeply intertwined with the belief in the need for one computer for every child. The XO laptop embodies this vision, and in its unique combination of hardware and software capabilities, is very closely linked with the philosophy that inspired the development of Logo, the cybernetic turtle, and Turtle Art.

"Turtles all the Way Down"?

Clifford Geertz described, in his seminal chapter entitled "Thick Description: Towards an Interpretive Theory of Culture" an Indian cosmological myth that explained the placement of the earth:

> There is an Indian story…about an Englishman who, having been told that the world rested on a platform which rested on the back of an elephant which rested in turn on the back of a turtle, asked…what did the turtle rest on? Another turtle. And that turtle? "Ah, Sahib, after that it is turtles all the way down" (1973:28-29).

Where Geertz conjured this story as a metaphor for the incompleteness of cultural interpretation (no matter how deep the ethnographer's descriptions), I seek to take advantage of the convenient reference to turtles to make my own point. It appears that for a select group of scientists, researchers, educational reformists, and development practitioners, the XO laptop and its associated mission established by OLPC are deeply intertwined with the philosophy of educational reformism associated with Piaget and Papert. The XO laptop, in this sense, can be seen to rest figuratively upon the back of the Logo Turtle, which is at the foundation of the OLPC mission. For those who are aware of and understand the intentionality behind the constructionist paradigm, which is closely associated with the history of the development of the Turtle, the XO is clearly a vehicle for the transmission of a new approach to education.

But for those who stand outside of this select circle, for the recipients of the laptops who are removed from the intellectual development of the organization, the turtle loses its foundational position. The image that could be conjured of the XO laptop sitting atop a turtle is completely lost. The cultural and historical meanings attributed to Grey Walter's and Seymour Papert's turtles are either absent or irrelevant to the teachers and students who use the laptops in Rwanda - as well as to the government officials who are charged with implementing the program. What is important to them, rather, are the promises associated with the use of computers as tools to facilitate access to 'modern' life. For them, the XO is a modified version of a "normal, real, or regular" computer – a simplified version for use by children so that they may grow up to master the use of their 'grown-up' counterparts.

It is important to note that none of my conversations or interviews with teachers or students revealed any concern on their part with the changing of the educational system, nor with teaching or learning techniques. Some of the OLPC contractual employees seem to have had somewhat of a grasp of the concept of constructionism, and made an effort to apply this philosophy to their training sessions with teachers and students, but they often felt restricted in their knowledge of the concept, as did Stephanie, who had been working at ESCAF for some time:

> I haven't read many books about [constructionism], but read Papert's book about "Mindstorms"[44] and it's important because it talks about the reason he started working with constructionism and Logo. I know it's the basis of OLPC because it's using the computer as a tool to enhance the learning process and to speed it up for the children. I think that I have applied it [constructionism] in the sense that I have worked with the students here at ESCAF, for example, and they have used the laptops to solve problems in their communities; they're able to construct something, and use the laptops as a way to express themselves to find solutions for their problems. I don't think I have totally applied it [constructionism] but I have tried. I think I would need more training in technical aspects, for example. With the teachers, that's where I have used a little bit of constructionism - in Turtle Art activity.

The community problem solving activity to which she alluded was an ongoing project that the ESCAF and Kagugu P5 students had been assigned to encourage their use of the laptops in a constructionist fashion. At Kagugu, for example the instructions for this project were for the children to use the Etoys activity on their laptops, which allows the students to enter text and manipulate photos in the same page (among other things) to write the causes, consequences, and find solutions to the problems in their community. The idea was to get the students engaged in creative problem-solving while at the same time developing multiple computer skills; getting them to download and take pictures, use Wikipedia and the internet (if they could find access to it on their own time) to find information, and bring it all together into a document to show their ideas. The volunteers intended this to be an avenue for creative, non-instructionist learning. Of all the students I observed, however, the only things I saw on their computer screens was the title of the assignment "Problems in my Community" and one listed "problem;" either "No food" or "No water." I could not tell whether these listed items represented the reality experienced by the children, or whether they were simply repeating the suggested items offered by the trainers as examples for the assignment. But most of the students seemed stalled after the first item, and

[44] Papert, Seymour 1993 Mindstorms: Children, Computers, and Powerful Ideas. Da Capo Press.

either sat idly, talked or played with their neighbors, fiddled with the font or spelling, or played games. Thus, even with the desire to apply constructionism to their training sessions, the contractual employees face the reluctance of students, who are may feel uneasy or unaccustomed to the open and flexible nature of constructionist projects.

Furthermore, despite efforts on the part of the OLPC team, especially from Michael Alvarez and Virginia Dias, who were constantly at the forefront of the organization on the ground, to impart to Rwandans the significance of the organization's presence in the country and the reasons for the use of the laptop as a springboard for development, the message appears to have gotten lost along the way. Michael explained to me: "We put a lot of energy last year into telling people what this project is about, and I think the first challenge we had is that this is not an ICT project – it's not "Teach Excel for Kids." It's really about teaching other skills. Virginia added, "And that was the mindset when we arrived here… that was the mindset for everybody, that this project is about ICT." These statements were corroborated by my own conversations with teachers. For example, one teacher opined that "the goal [of OLPC] is to introduce the children to technology; to ICT. The world has evolved. Those who have not learned [ICT] will be left behind"[45] (Primary level 5 (P5) Teacher: June 30th, 2010). Another teacher expressed the importance of preparing children for use of computers in high school:

> The children, those who use the laptops, they're the children who will go to high school. When they arrive in high school, the government program ensures that there are machines [computers] there too. That's why we teach these children in fourth to sixth grades to better use the laptops. So that at the end of primary school they enter secondary school with a certain level of expertise (P5 teacher: July 8th, 2010).[46]

And yet another P5 teacher expressed that "the government program is to know how to use [the laptop] – that, each Rwandan knows how to use the [real] machines for communication…It's important because the world is evolving (P5 Teacher: July 8th 2010).[47] And yet significantly,

[45] *« Le but [de OLPC] c'est d'introduire les enfants sur la technologie, sur ICT. Le monde a évolué. Ceux qui n'ont pas appris seront dépassé ».*

[46] *« Ces enfants, eux qui utilisent les laptops, ce sont les enfants qui vont aller à l'école secondaire. En arrivant à l'école secondaire, le programme de l'état dit que dans les écoles secondaires, il y aura des machines aussi. C'est pourquoi on apprend à ces enfants de la quatrième à sixième de mieux utiliser les laptops. Pour qu'à la fin de leur niveau primaires ils entrent à l'école secondaire ayant une certaine connaissance » .*

[47] *« Le programme de l'état est de savoir utiliser – que, au moins chaque Rwandais sache utiliser les grandes machines pour la communication… C'est très important parce que le monde évolue ».*

Michael made a distinction between the tendency of teachers to associate OLPC with an ICT project, and those who are more closely involved in the implementation of the project from above:

> If you talk with the President, if you talk with Minister Murenzie[48] [who was] in charge of Science and Technology at that time, they knew what they wanted. So Minister Murenzie specifically, he knew that [OLPC] is for critical thinking development. That's not for ICT. But this message doesn't circulate very well outside the minister and [to be] really honest… I'm telling them "this is not ICT" [but] they don't have other references. So, what is this about? So this was the war. Really getting Richard[49] [who] was the coordinator of the project at the time, really working with him, really promoting things, bringing the Government together to see what we are doing with the kids...(Interview with Michael: July 2010).

I was struck, on a number of occasions, with Michael's sincere dedication to spreading an understanding of the OLPC mission:

> [I]f you ask me why do I believe in laptops I will bring you a whole understanding of the work of Piaget,[50] the work of Seymour,[51] the work of others, of Freire.[52] I have some reasons that make me believe why this is better than what we have. So I don't feel that I don't have a background on that. I do have a background… We want to promote [a] genuine understanding of teachers, but we also have to give them genuine time for them to understand that (Interview with Michael: July 2010).

It becomes evident that from the point of view of OLPC supporters, the adoption of the laptop in primary schools in Rwanda is not going effectively "according to plan." Michael and Virginia's concern with spreading the "correct" understanding of the purpose of the program among teachers and administrators is patent. The message that OLPC is "not an ICT project" but an educational reform project is central to their mission, and the apparent failure of many of the teachers (and even politicians) to accept this is seen as a challenge that must be overcome.

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[48] Romain Murenzie, Minister in GoR Office for Science, Technology, Research, and Information and Communications Technology (ICT) from 2007-2009.
[49] Richard Niyonkuru was the coordinator of the OLPC program in the Ministry of Education until he was replaced by Nkubito Bakuramutsa in 2009.
[50] Jean Piaget developed the constructivism, upon which Seymour Papert's philosophy of constructionism was built.
[51] Seymour Paper, who developed constructionism.
[52] Paolo Freire, author of "Pedagogy of the Oppressed" (1970) and critical pedagogy theorist.

One contractual employee, who was in charge of training teachers and students in the use of the laptops in several of the OLPC schools during the summer of 2010, poignantly expressed her sense of failure in achieving OLPC's objectives. She felt a certain disappointment because, as she put it, she had "been working [her] butt off" for five months and yet could only see a small impact. She claimed that "many people in the United States tend to praise OLPC Rwanda for its lofty goals and expect that there are major, widespread impacts" but she affirmed that the impact is actually "very miniscule" compared to what she had expected (she said this bringing the thumb and forefinger of each hand together and almost touching to demonstrate a small size). She attributed this failure to the divergence in objectives between OLPC and the Government of Rwanda:

> What I think is that the government wants to deploy laptops to all the elementary students and to develop the use of the laptop in school. I think that's what the goal is; to let the kids have the laptops and use them in school. [How] that is done doesn't matter. On the other hand OLPC's mission is to change the way teaching is done, to improve that in every way possible. And to do that I think that's where the obstacles are found, because *the objectives are different* (interview with OLPC employee: June 30th 2010, emphasis added).

She expressed, in addition, her belief that the government was only paying lip-service to the OLPC mission, while seeking to forward its own objectives. To illustrate her point she discussed the upcoming training session which was scheduled at the beginning of July in Kigali as a first step towards the deployment of the 100,000 laptops. Three hundred teachers from 150 schools were to attend this training session in order to familiarize them with the laptops before they were to be distributed to the schools. For OLPC, this training was necessary to expose the teachers to the objectives of the organization, and to prepare them for the successful integration of the constructionist approach in their schools. The employee with whom I was conversing, however, believed that the government was more inclined to simply hand out the laptops for the sake of providing access, rather than promoting a change in pedagogical techniques. Her interpretation was that the GoR was simply meeting its minimum requirements toward OLPC (in offering a

brief training session) in order to have access to the laptops,[53] without investing too many resources in the organization's mission:

> We put [forward] our conditions and our needs and requirements… to make [the program] successful, and they give us the minimum in order to show that they are going to distribute the laptops. They are just meeting their needs. Like I told [you], it's supposed to be a five day training. Originally they just wanted one day, they just want the photos to show what they are doing. But we said it's impossible, we need a month, two weeks. So they gave us five days. But really it won't be five days because politicians need to talk for the first day and on the last two days different activities will take place. So our needs aren't being met (OLPC employee: June 30th 2010).

From the point of view of OLPC members, then, the general tendency among Rwandan teachers, administrators and politicians to construe OLPC as an ICT program represents a "failure on the part of the natives to "get things right" (Howe 1996:9). The original "system of logic that produced the technology" (Pfaffenberger 1992:511; Schaniel 1988:493), that is, the constructionist philosophy, has not yet been adopted by the recipients of the foreign technological commodity. Of course, from the point of view of an organization with a specific mission in mind, it makes sense to understand the discrepancy between objective and achievements in these terms. However, from a more abstract and analytical perspective, it may be of some use to adopt Howe's approach toward cross-cultural consumption as this point of view highlights the complex interactions between material and culture.

The reasons why it may not necessarily be "turtles all the way down" for the recipients of the XO laptop in Rwanda is critical to understanding the friction that has built between OLPC *a la* MIT and OLPC *a la* Government of Rwanda. As I have been arguing throughout this thesis, the source of this tension rests mainly with the differing motivations for the adoption of the program. Where the improvement of education is the answer to achieving sustained economic growth that will push Rwanda into a modern service economy, for the GoR, the answer to attaining modern life is simply ensuring that the majority of the country's youngest citizens have access to new technology, so that they may be prepared to contribute to modern life when they graduate from high school.

[53] As mentioned earlier, OLPC does not impose its mandate on any participating country, but in order for a government to be allowed to participate in the program, there must be some clear effort to meet the five principles outlined in Chapter 1.

The power dynamic which manifests itself between the various actors who contribute to OLPC in Rwanda results in a sense that Rwandans are "getting it wrong." The fact that the ideas behind OLPC come from the United States, which is often agreed to be the most culturally and politically influential country in the world, plays into the tension between OLPC and the GoR. When OLPC members like Michael Alvarez or David Cavallo express their ideas about what the program should be doing in Rwanda, despite their reluctance to impose their views, when their expectations are not met, the impression they get is that something is not going right. At the same time, the government officials who are responsible for running OLPC in Rwanda, such as Richard Niyonkuru and Nkubito Bakuramutsa who replaced the former in 2009, face the pressure of meeting the President's Vision 2020 objectives, which involves a 10 year modernization plan based on an ICT economy. The authoritarian nature of the resistance to some of OLPC's objectives leaves little room for members like Michael to vocalize with any impact their own agenda. As a result, the impasse leads to OLPC members feeling as though they are not being heard, and that the project is not proceeding according to plan.

The purpose of this chapter was not to arrive at a conclusion about which of the two perspectives is the "right" one, but to highlight the friction that has developed in the attempt to apply a large-scale, top-down development program with the goal to modernize the country. By following the social and material life of the XO laptop as it emerged conceptually and unexpectedly from the robotic experiments of a mechanically inclined neurophysiologist in the 1940s and by demonstrating how the robots were re-appropriated by Seymour Papert and his team of engineers in the 1960s to fulfill a need that diverged from its originally intended purpose, I showed the error in the pervasive "Western" assumption (Pfaffenberger 1986) that technology, once transferred to new settings, will be used in the same way. The point of this chapter was to show that although OLPC assumed Rwandans would use the XO laptop in the ways that they intended it to be used, the resistance to this prescription in Rwanda reflects a tendency for locals, including the government, to adopt the parts of objects that they deem most important. In the case of OLPC Rwanda, it becomes clear that what Rwandans and their government see as relevant and important is not so much the fulfillment of lofty and somewhat abstract educational objectives, but the act of working towards what they see as a concrete strategy that will lead them more quickly to their desired end-point, which is a modern ICT nation.

CONCLUSION(S)

New technologies of the digital variety have recently begun to play an important role in the shaping of global politics, human rights and international development. Attesting to this trend are series of popular uprisings in the Middle East that sprang up during the winter of 2011 which, among other revolutions, saw the overthrow of Egyptian President Hosni Mubarak. International media sources have often attributed the application of social networking media such as Twitter and Facebook to these rebellions, which has subsequently been pegged as "Revolution 2.0" – the latest and most exciting phase of the adoption of new technologies for the large-scale promotion of social well-being. Contemporaneously, the Information and Communications Technology for Development (ICT4D) movement has also privileged the use of digital technology, and especially internet connected computers, as the most relevant tools for bridging the allegedly growing divide between those who have regular access to information, and those who do not. Proponents of ICT4D see, by extension, the digital divide as one of the major obstacles to economic development.

On the surface, One Laptop Per Child (OLPC) offers one of the largest, fastest growing, and most publicized examples of development organizations seeking to rectify the discrepancy in global access to information. That OLPC offers one of the cheapest alternatives to the traditional laptop is only one indicator of its perceived role in the realm of ICT4D. Yet, as I have argued throughout this thesis, attaching the label of ICT4D to OLPC is not an adequate characterization. In my effort to "make improvement strange" (Li 2007:3), I have followed the laptop from its theoretical origins at MIT, where the conceptual marriage between computer technology and education was forged, to the classrooms of grade five students in Rwanda half a century later, where that marriage seems to have disintegrated. The ideas and ideals of a constructionist revolution have traveled with the laptop by the fact of being embedded in its form (Prown 1982:1-2), yet have failed to transcend the physical boundaries of the laptop's software and hardware to penetrate the educational culture of Rwanda.

This miscarriage of ideals is not the result of an "innate intelligence of School" (Papert 1993:39-40) which musters invisible forces to resist change, but rather has much to do with the dynamic

of cultural and political interactions between stakeholders in the program, including students, teachers, headmasters, OLPC members and political leaders in Rwanda, who attribute value to different aspects of the program. Furthermore, the resistance of some of the schools and teachers to the adoption of the core premises of OLPC may at first glance appear to be a "failure on the part of the native to 'get things right'" (Howes 1996:9). I hope that I have shown, however, that this assumption of failure has more to do with unreasonable culturally-based expectation that the ideas or values which originally accompanied an artifact at its production phase will necessarily follow the object to its destination (Schaniel 1988). Rather than focus on the mismatch between original intentions and final results, I would propose that perhaps it would be sounder to understand the pattern of adoption on the terms of the people who do the adopting.

The primary adopters of the new technology, in this case, were the ministers in charge of the program at the Ministry of Education (MINEDUC) in the Government of Rwanda (GoR). The program priorities which emerged from MINEDUC became the creed of adoption in the schools that received access to laptops. Through public campaigns, such as the training session with 300 teachers that occurred in July 2010, the Vision 2020 document, and the President's own assertions of the value of OLPC as an ICT project, it became evident which aspects of the program were favored by the GoR. As I argued throughout this thesis, rather than immediately accepting the educational theory that accompanied OLPC, the GoR sought to mold the program to suit its own agenda, which was a two-fold concern to unite the deeply divided population while offering an attractive and feasible alternative to boosting economic growth and social well-being. That alternative became the ICT4D approach, which the GoR had already adopted in its 2000 version of the Vision 2020 document, and which preceded by several years the founding of One Laptop Per Child. The practical and ideological concerns of the government to revolutionize the economy in such a short period of time quickly outweighed the educational abstractions of OLPC, to the point that the message which trickled down to the teachers of Rwandan schools was the importance of modernizing the country with the help of computers, rather than with an overhaul of the education system. In this manner, OLPC indeed became an ICT program, much to the dismay of many of the organization's leaders.

I have attempted to show, through the prism of the anthropology of development which questions the principles and premises of the development enterprise (Escobar 1997:6), how the

underlying and sometimes hidden premises that guide OLPC in Rwanda affect the way the program manifests itself on the ground. When stepping back from the organization to uncover the subtleties that shape it, it becomes evident that OLPC belongs in the category of development organizations which Arturo Escobar (1997:3) has labeled as problematically "top-down" and interventionist. The uprisings in the Middle East, which made spontaneous use of digital technologies to enhance communication for the purposes of inciting social change, differ dramatically from the programmatic approach to development championed by development organizations like One Laptop Per Child (OLPC), which require some sort of planning from "above." Though OLPC positions itself as an open, flexible, and organic approach to achieving poverty reduction in Rwanda and in its other participating countries, the process of designing, manufacturing and distributing laptops, along with the application of the theory of constructionism to teaching and learning in primary schools, places OLPC in the realm of development "scheme." This, in itself, is not necessarily problematic, since any attempt to make any long-lasting and widespread change may require planning of some sort, albeit with space for unpredictability and adaptability. But history, according to Escobar (1997:3), has shown that this variety of development program has been known to show "poor results" owing to the inability of rigid blueprints to accommodate the unexpected.

James C. Scott's (2008) criticism of authoritarian blue-print schemes to improve the lives of the less fortunate, I have proposed, may be appropriate for the OLPC program in Rwanda for a number of reasons. First, although the leaders of the organization, such as David Cavallo and Michael Alvarez, express discomfort with imposing their agenda on the Rwandan government, their attitude remains that if the GoR does not come to the conclusion, of its own accord, that educational revolution is the answer to developing the country, they will have gotten it "wrong." This leaves little to no room for the government or for the teachers and students to come to their own conclusions about which aspects of the program are most relevant to them, which may reflect to some degree, a dynamic of cultural imperialism. Second, the GoR's own agenda to promote the ICT side of the program has become authoritarian to the point of not considering the concerns of the primary school teachers, who must fend for themselves in applying the government's program. Though the teachers are expected to integrate the use of computers into their lesson plans, they express a strong ambivalence to doing so owing to their discomfort with the new technology, and their sense that they have not received enough training. The

government's move to distribute the remainder of the laptops without a significant training program to prepare the schools and the teachers is something that OLPC fears will lead to failure. And finally, that both OLPC and the GoR adhere to the ideology (Scott 2008), myth or expectation (Ferguson 1999) that following a predetermined technology development scheme will leapfrog Rwanda "into the 21st century," which is just a euphemism for a modern, urbanized, wealthy, technologically advanced and arguably Westernized nation, does little to differentiate the program from mid-twentieth century modernization theorists.

Whether or not OLPC will succeed in its endeavors, which differ depending on whether they are stipulated from the point of view of the organization or from the GoR, is beyond the scope of this thesis. But I hope that my analysis of the intellectual and ideological trajectories that have shaped the program, as well as my close-up examination of the character of their manifestation on the ground have provided useful insight for further investigation of the program, and others which will likely follow in its footsteps.

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APPENDIX

Figure 1: Neighborhood children playing "English for Fun" on the XO laptop at a home in Rwamagana.

Figure 2: Papert's Cybernetic Turtle. Source: "The Children's Machine"